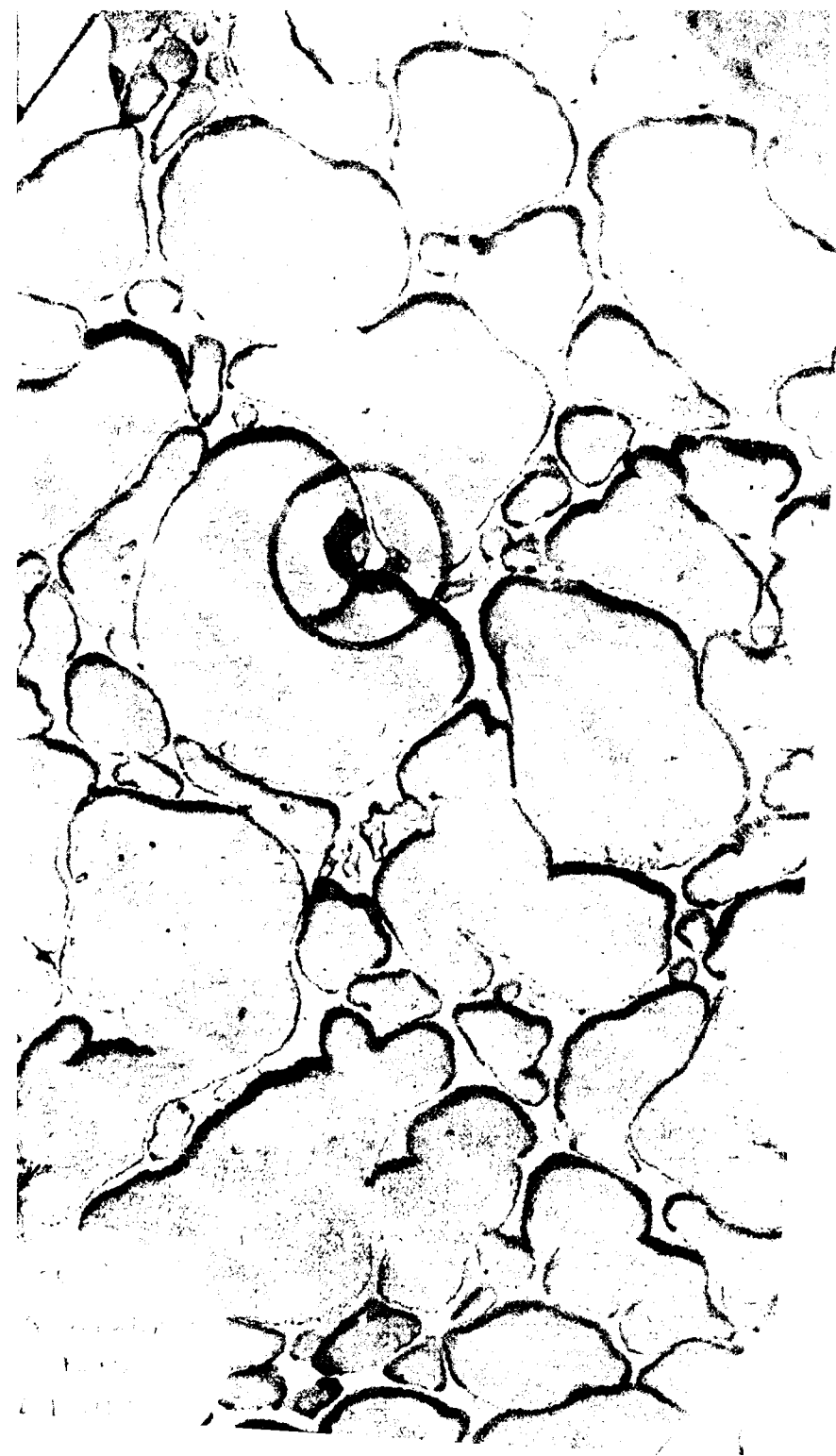




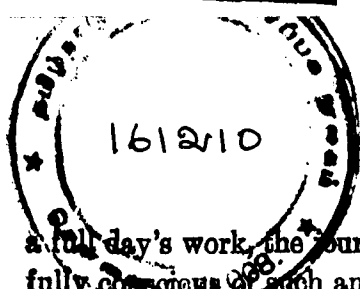
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*N. B:-Contributors are requested to send in their contributions
typed or written legibly in ink on one side of the paper
only.—Editor.*

Editorial Notes.

With the current issue of the journal we are entering upon the 7th year of our existence and we take this opportunity to thank our subscribers for the kind patronage they have given us in the past. Some of them have been with us from the year 1911 when we made our first appearance as a modest *Year book* under a yellow wrapper. Till November 1914 we ran as a quarterly and from that date onwards we have been issuing the journal as a monthly. These are indeed rapid changes but we live in rapidly changing times. Both praises and criticisms we have had from various quarters and we have been trying to keep to the even tenor of our ways fully profiting by the latter and not getting elated by the former. Edited as it has to be by a body of officers during off times and very often after



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a full day's work, the Journal has its shortcomings. We are fully conscious of such and we assure our readers that we are constantly trying to remove them as early as possible. We do trust and hope that our subscribers will continue to extend to us their patronage in the future as they have so kindly done in the past.

The Indian Science Congress which met at Bangalore between the 10th and 13th January 1917, though but 4 years old, bears distinct promise of soon becoming an important factor in the promotion of Scientific Research in our country. It is closely modelled on that august body. The British Association for the Advancement of Science.' The rapid progress, it has made, during the 4 years of its existence is evident from the fact that at Bangalore it was represented by as many as 230 members from all parts of India as against the 80 more or less local members who sat at its first session in Calcutta in the year 1914.

The meeting of such a large number of scientific men with the consequent rapid exchange of thought that such a meeting always implies, is bound to be of great value to the workers themselves. This advantage is all the greater in a land like ours where the men of Research are comparatively few and often very widely separated from one another.

Nor could there be any doubt as to its practical utility when it is remembered that there were a large number of papers in the Applied Sciences such as 'The improvement of cotton cultivation' 'Agricultural Insurance' 'Spike

disease of Sandal' 'Wood distillation' etc. This, we presume, will convince even the strictest commercialist that the time, money and energy spent on the Congress are well-spent.

It is, of course, unthinkable that such a Congress should meet at Bangalore without being fully represented by Coimbatore, which, with its Research Institute, may be said to possess a more congenial atmosphere for research than any other town in the Presidency. In Rai Bahadur K. Ranga Achari, it contributed the president for the Botanical Section and the following papers were read before the different sections.

- (1) Tinnevely Flora by K. Ranga Achari.
- (2) The Method of Inheritance of Certain Characters in Rice by F. R. Parnell.
- (3) Pollination in Alysicarpus by K. C. Jacob.
- (4) Some South Indian Cecidomyids by Y. Ramachandra Rao.
- (5) Study of Flowering in the Sugarcane by T. S. Venkataraman.
- (6) Sucrose Variations in Cane-joints by T. S. Venkataraman and K. Krishnamurthi Rao.
- (7) Enzymes of germinating Dholi by B. Viswanath.

A large number of Departmental officers were on deputation at the congress including Dr. W. H. Harrison and Messrs. G. A. D. Stuart, W. McRae, J. Chelvaranga Raju, D. Ananda Rao, D. Balakrishnamurthi and M. R. Ramaswami Sivan.

While opening the Second Session of the Congress in Madras in the year 1915, His Excellency Lord Pentland

remarked on the fewness of the papers in Agriculture in spite of the great facilities given in this Presidency for Agricultural Research. The Agricultural section at Bangalore presided over by J. Mac Kenna, Esq. I. C. S., Agricultural Adviser to the Government of India, had an overflowing programme and was a decided success. Fifteen papers were read and many of these were followed by valuable and informing discussions.

In opening the Agricultural section the president spoke on the Rotation of crops in Agriculture and emphasized on the advantage of such a practice. We understand that the papers are to be published *in extenso* in a special Science congress number of the Agricultural Journal of India and so forbear from making detailed references for the present. One paper, however, which struck us as novel and distinctly original was that on Agricultural Insurance by J. S. Chakravarthi. He made an attempt at formulating a scheme whereby cultivators would be able to insure against bad agricultural years.

The Cotton Trade of Nandyal.

The cotton coming into this market goes under the trade name of Northerns and on the average the quantity dealt with annually is about 30,000 bales. Two qualities are recognised white and red. The main difference between the two being that white is not so red as red. The latter, however, fetches from 10 to 15 Rs. per candy less than the former.

The parties that participate in the trade are:

- (1) *The Producer* who may belong to either of the two classes, namely, (a) The small ryot who at the time of harvest is badly

in need of money, who cannot therefore wait his time for selling and has to sell his produce at once as kappas and at a low rate. In this class are to be found a few ryots who have taken advances from middlemen and have contracted to sell their produce at a rate agreed upon, which is generally considerably lower than that ruling at the time when delivery is made.

(b) The bigger ryot who can afford to wait for his price or to have his produce ginned and is therefore in a better position to bargain than are the members of class (a). Some members of this class are village middlemen.

(2) *The village middleman.* He buys kappas and has it ginned. He is mainly responsible for the mixing that is done, because he either does not take the trouble to keep different qualities apart, or purposely mixes a good quality with a poor one to make a larger sample which will pass as good or will be only slightly allowed. The middleman sells on contract to the dealers and to the firms but also sells on ready delivery.

(3) *The dealer.* The dealer makes contracts on the one hand with the firms to deliver within such and such a date cotton of such and such quality for which he will be paid such and such a rate, and on the other hand with the middleman or ryot of class (b) to take cotton of a certain quality at a certain rate, to be brought within a certain date. He however also buys cotton and speculates on the market.

(4) *The firms.* These are: three European firms, two of which own presses, two Japanese firms, two Indian firms one of which owns a press and a ginning factory but which is really only a combination of dealers who sell to any of the other firms.

System of dealing. The system is the pressed bale system, i. e., the firms deal in lint and do not make final payment until the lint has been pressed and weighment of the bales made.

Advances are however made when cotton is brought but pressing cannot be done for some time.

Procedure. i. e., the manner in which lint gets to the firms.

(1) The firms make forward contracts on the lines indicated above, chiefly with dealers to whom some firms pay brokerage but also with ryots of class (b) and with middlemen. Warning is usually issued about a week before the final date on which delivery can be made and if it is asked for, an extension of time is generally given, but if delivery is not made, the firm can buy in the open market on the day on which the contract expires and charge the contractor with the difference between the contract rate and the rate at which they bought or they can demand the difference between the contract rate and the rate prevailing on the day on which the contract expires. When these contracts are entered into, 1 (b) and 2 usually have cotton in their possession either in their own godown or lying at some **ginny** waiting to be ginned, and 3 may have cotton but not necessarily so.

(2) The ryot or middleman watches the market.

When he thinks the price is high enough to suit him he brings his cotton for sale. He leaves his carts with attendants on the roadside while he goes round making inquiries as to what the rates are and who is likely to pay him the best price. Having decided whom he will try first, he brings his cotton into the compound and offers it for sale. The cotton is examined and the bargain is struck. The dealers who have thought on speculation also watch the market and will tender cotton which they have stored in their godowns either against contracts they have made or for separate sale according as they decide which will pay them best.

Defects of the system. From the point of the final buyer, the village middleman, the ryot and of the Agriculture Department which is interested in two ways in this trade (1) to

make the crop more profitable for the ryot and (2) to aid the buyer in getting a better quality of produce (if he wants it), the system bristles with defects.

Firstly. Buying on forward contract is carried on practically right throughout the season. This method of dealing does not permit the buyer to see what he has bought until the cotton is tendered against the contract. Theoretically, this does not matter, for all that the firm has to do, is to reject or heavily allowance if the cotton tendered is not up to contract quality. In practice however this cannot be done because any one firm which did this would soon find that it would not get cotton. If all the firms concerned would agree on what qualities they would reject and on what allowances they would make for qualities below their standards and at the same time would agree to pay ~~more for better quality, then they would get better quality.~~ But as the system works at present cotton is rejected, is heavily or lightly allowance or is passed; as much on the need of the firm concerned to have cotton and on the ability of the seller to stand out against the allowances as on anything else. There is always the fair chance that the cotton will, though it is an obvious mixture of qualities, get through without any allowance or with only a small one. The system is in fact a direct encouragement to the dealer in kappas to mix as little as possible of a good quality with as much as possible of a poor quality in order to get a big lot of lint which will be passed with little or no allowance.

Secondly. When cotton is brought for sale by the ryot or the middleman it is the seller who goes round making inquiries to decide to whom he should sell. After he has made his decision and has taken his cotton into a firm's compound no other firm can see it unless a bargain fails to be struck. It does sometimes happen that two firms will bargain on the roadside

for cotton they have had a cursory look at but this is not the common procedure. There is a lack of that competition for good lots that there would be if all the cotton which came in on one day were put in one place where comparison of different lots could be made. The seller of good quality is in a disadvantageous position because all the firms do not see his cotton and it is not offered in direct competition against other lots.

Thirdly. The system is an inconvenient one for the ryot. He is a man who when he brings produce for sale likes to get it sold, receive his money and get back to his village the same day. In this case he cannot do so. After he has delivered his cotton, it has to be pressed and until it is pressed final payment cannot be made. It not infrequently happens that the buying firm cannot press for some time, a week or longer, either because, if they own a press, they have contracted to press for some other firm, or if they do not own a press, they have not arranged for pressing. Advances are given to the ryots, yet he has to arrange to be at hand when pressing is done so as to get his business finished. This all means trouble and expense to him and it may interfere with his cultivation. This is really one of the most objectionable features of this system.

Fourthly. As a natural sequence to this arrangement in which the dealer holds the place he does, it following that the ryot and the middleman are the sufferers when cotton is allowanced and not the dealer unless it happens that he bought cotton outright. When he delivers cotton against a contract he does one or more or all of three things, he tenders cotton which he has purchased himself, he instructs the ryot or middleman with whom he has made a contract to deliver the cotton or he brings in a ryot or middleman who has brought cotton for ready sale. If the buyer proposes to allowance he will argue the point might and main where his own cotton is concerned but in the other cases will not offer so much opposition

and may even agree at once without a murmur. The reason is obvious.

Fifthly. The system permits of the perpetration of fraud. It is not asserted that such is a common occurrence but the possibilities are there. A dealer can make a compact with a dishonest sub-agent to have a ryot's cotton allowanced with the intention of sharing the allowance with him and in order to dupe the ryot, will play the part of being reluctantly convinced of the necessity for the allowance to perfection. Again, when cotton has been tendered against a contract and accepted, the buyer may not be able to press and may not have money to give the dealer an advance. The dealer may then instruct the ryot to be at another office where he will get an advance. He may then go earlier than the time agreed upon, get the allowance and disappear leaving the ryot in the lurch and having other use for the money will put off payment for as long as possible.

Sixthly. The Department has put out a cotton which is acknowledged by the buyers to be of better quality than ordinary white Northerns. Hitherto this has not been backed up by any definite offer of a higher price for this cotton. Some lots have been sold for higher rates but that was because higher rates were demanded. The result of this has been that most of this cotton has been used up in grading poorer qualities and the work of the Department has been lost in the ginnyery.

The above is an account of the state of affairs up to a recent date. This year one firm started to buy kappas and loose cotton and another firm has stated its willingness to buy loose cotton.

G. R. Hilson,
Dy. Director of Agriculture, Bellary.

Arrowing in Sugarcane.

The flowers of sugarcane are technically known as "arrows." These arrows set seeds and canes can be obtained from them. But, as it is not easy to produce canes from these seeds, and as the canes obtained from them are not at all uniform, it is impracticable and unwise to grow them on large areas. On the other hand, this arrowing is of great scientific interest to the plant breeder. It is from these arrows that plant breeders of other countries have evolved, after careful and prolonged research, very good sugarcane seedlings with high sucrose content and good outturn, and saved the sugarcane industry of those countries from decay and possible extinction.

In India, the outturn from one acre of sugarcane is low and is on an average only about 1 ton. The outturn in the North Indian sugarcane tracts, where we have about 90% of the total sugarcane area in India, is lower still and the canes grown are very thin and of low sucrose content. Any small increase in the outturn per acre of sugarcane in those North Indian sugarcane tracts, will materially add to the wealth of the country. It is for the purpose of evolving good sugarcanes suited for the North Indian conditions that the Government have established near Coimbatore a Sugarcane Breeding Station. Coimbatore was selected for this purpose because, here sugarcane varieties arrow freely and are fertile. So far, the work at the station has been successful and very encouraging results have been obtained.

Apart from its scientific interest, a knowledge of, the signs of arrowing, conditions of arrowing and the effect of arrowing on the outturn of the crop, would be useful for the practical farmer.

Signs of arrowing:—Each variety before shooting forth its arrow gets into shot blade. The upper leaf-sheaths become enormously elongated and the laminae shorter. The top joint which produces the arrow is round and is much longer than the one below it. The top joints get pithy and this pithy portion gradually extends downwards.

Causes of arrowing:—Any condition that arrests growth appears to be the main cause of arrowing, e.g. want of drainage, want of sufficient

organic matter in the soil, water-logged condition, growing on poor land etc. Using sets from canes which had arrowed is also said to be another cause for arrowing.

Season:—Generally in these parts the arrowing season is from October to December. Canes planted in October and those planted in February arrow about the same time, though the former is about 13 months old and the latter only 9 months. This would appear to be due to one of the peculiar effects of season on the growth of crops.

The canes that arrow:—It is observed that the first formed canes of a clump only arrow, that is to say that if a clump has 5 canes and of these only 2 have arrows, these 2 arrowed canes appear distinctly older than the non-arrowed ones.

Effect of arrowing:—Arrowing ends the vegetative growth of canes. Hence, there is less tonnage obtained from an acre of land and the material for planting purposes will be much less on account of ~~shooting~~.

Arrowing is no indication of the ripeness of canes, for, the arrowed canes give higher percentages of sucrose when periodically analysed afterwards.

EXAMPLES.

Variety.	Dates of analyses.	Not-arrowed.	Arrowed.	Remarks.
		Sucrose %	Sucrose %	
White mauritius.	5-12-10	15.90	16.90	The canes were planted from the 1st Feb. to 25th Feb. 1910.
	17- 1-11	18.75	19.25	
	1- 2-11	17.80	18.65	
	17- 2-11	20.10	19.95	
	8- 3-11	18.50	18.30	
Striped cane.	5-12-10	17.10	18.25	Do.
	17- 1-11	17.75	19.70	
	1- 2-11	19.10	19.30	
	17- 2-11	21.25	21.70	
	8- 3-11	18.75	19.70	

Chitta Rastali.	5-12-10	15-10	17-30	Do.
	17- 1-11	17-25	17-30	
	1- 2-11	17-25	18-65	
	17- 2-11	18-20	18-00	
	8- 3-11	18-44	17-60	
Barbados 208	24- 1-12		16-80	Do.
	24- 2-12		18-60	
	13- 3-12		19-25	
Vellai cane.	24- 1-12		15-30	Do.
	24- 2-12		16-65	
	13- 3-12		17-75	

I am indebted to Mr. Krishna Iyengar of Oorghally, Mysore, for kindly supplying me with the above figures. Besides the above a number of analyses were done here and they confirm the above results.

From the above figures it is seen that the arrowed canes start with a higher sucrose content than the non-arrowed ones. In the case of Chitta Rastali it will be seen that the arrowed canes reached their maximum sucrose content as early as 1-2-11 and began to deteriorate rapidly.

The arrowed canes on account of shooting and the formation of pith at the top joints deteriorate sooner than the non-arrowed canes and should not therefore be left unharvested growing on the ground much longer than about 2 months from the time of arrowing. It would be an advantage to harvest the arrowed canes first and sometime afterwards to take up the harvest of the non-arrowed canes. This would ensure uniformity in the ripeness of canes harvested and would save possible loss due to either over or under maturity.

K. Krishnamoorthy Rao.

Green manure crops in the Periyar tract.

If a traveller from Madura nearing Kodaikanal Road looks at Vikramangalam hills to the west of the railway, he would notice the

almost bare *Zemin* area of the hill in striking contrast to the adjacent forest reserve well-stocked with trees. This is evidently due to the unrestricted license given by the Zemindary to the removal of leaves from that area. If the Forest Department had not stopped the depredations of the leaf-cutting knife in portions of this presidency, I fear most of the hills would long ago have been what the Zemindary hill is to-day, and the ryots ever-increasing demand for green leaves would still remain unmet. The disastrous effects which the want of vegetation brings in its train would be an additional evil. A timely solution of this difficulty has been very luckily found in the idea of producing the leaf-requirement of a land from the land itself by the raising of green manure crops. It is much cheaper to grow crops to be ploughed in, than to cut and cart the leaves to the field. It will also be seen that a green manure crop usually adds to the soil a by far larger quantity of vegetable matter than any possible heavy dose of carted leaf at from Rs. 6 to Rs. 10 a cartload.

An ordinary tenant thinks of green-manuring as a means invented by the land-lord to save his expenses on manure, the more so, when the tenant is left alone to face the difficulty of ploughing in the rank growth of the green-manure crops. The laziest of tenants would prefer penning sheep or cattle to any other sort of manuring, not for its manurial value, but for the ease with which he can carry on the preliminary cultivation. This is a point which every land-holder will do well to remember when his tenants deprecate the value of green-manuring. It is in fact easier to plough in cattle manure than a green manure crop, and to minimise this difficulty is one of the aspects of the problem.

If a ryot chooses to sow Dhaincha in a standing crop of paddy in a single-crop land a few days before harvest, he allows it to grow till it is time to plough the land. This means a growth of from 5 to 6 months. By this time the stem grows woody, seeds are formed and both the seeds and leaves may shed. A sense of false economy on the part of the ryot is often the cause of a reduced seed rate of Dhaincha with the result that the difficulties of dealing with this crop subsequently increase and Dhaincha growing becomes unpopular as it

should otherwise be. If the seed is sown thickly, the stems will be very thin and the crop will not seed soon. In addition to this, limiting the duration of the crop to 3 months in the Periyar tract would obviate all the difficulties, at the same time supplying a decent amount of green-leaf. Another minor complaint is, that the growing of a green manure crop in wet lands curtails the grazing area of the village. This complaint is usually from ryots of the stamp that have their animals to take care of themselves and they have not much use for them. And we know the indifferent grazing they get in wet lands during the dry months. If the duration of a green manure crop is curtailed within reasonable limits to suit the land and the crop, a good portion of the wet land will yet be available for grazing, at any rate for sometime.

A set of thoughtful ryots contend that growing green manure crops on lands during hot months, prevent the proper cracking of the land and the free action of the weathering agencies on it. The contention is not far wrong. To meet these attempts should be made to shorten the duration of the green manure crops within limits ~~so as to~~ allow the land time to lie fallow during the hot months. This aspect of the problem affects single crop lands most. Therefore the question naturally resolves into one of a judicious selection of the suitable green manure crop and the time of sowing it. I should like to emphasise this point very much, as the success of growing of green manure crop depends largely upon those 2 factors.

Dhaincha is the crop for saline lands and Kolingi and Sann Hemp for sweet ones. Dhaincha takes from two to three months Sann Hemp nearly two months and Kolingi five months before being fit to be ploughed in. Therefore in single crop lands Kolingi can be sown undressed in the puddle at the transplanting time. This undressed seed remains unaffected under water and sprouts when the fields get dry.

Dressed seed may be sown before the last draining of the previous paddy. Kolingi grows very slowly at first and spreads out fast with the early rains of the monsoon and as such keeps the land practically

exposed during the hot months. It is also to be remembered that Kolingi does best in red, sandy or even slightly gravelly soils and these soils do not require as much exposure as a heavy soil. In ill-drained soils it often fails to germinate. Double crop lands cannot afford sufficient time to allow the Kolingi to grow thick enough to form a green manure crop. In saline lands it is unsuccessful. Sann Hemp, does well in all other description of sweet land including red soil. It needs much less time than Kolingi. This enables the ryot to grow Sann Hemp in both single and double crop lands. This is grown with the May or June rain in the latter, and in July or early August in the former. If so grown, even the heavy soils that require fallowing most, get it in spite of the green manure crops.

Saline land not benefitted by fallowing and Dhaincha, the green manure crop for such lands, can be sown just a day prior to the draining before the harvest of the second crop in double crop lands, and with the first receipt of water in the channel in single crop lands. This prevents the crop remaining longer than necessary in the field. The seed rate of Dhaincha should never be less than three Madras measures per acre. Even 4 measures is not much. If a ryot has no irrigation facilities to sow Dhaincha so late as to enable him to obtain a crop fit for being ploughed in, he may as well sow them to suit the availability of water and cut the crop at the proper stage of development and heap the cut stuff in the field. These heaps may be covered with a layer of earth and can be used when required. This also affords an opportunity of exposing the land to the hottest sun of the year.

The seed rate of a green manure crop will have to be slightly increased when the sowing is late. If a crop grows too high, the large volume of vegetable stuff which it produces cannot be possibly ploughed into the 3 inch surface soil that is moved by the ordinary country plough. Therefore in the usual course of events a heavy green manure crop becomes unwieldy and the ryot is naturally inclined to remove a portion of it to other unmanured lands. In sweet lands it has been found to affect the subsequent paddy crop very badly. Therefore it is necessary to see that the crop is not unwieldy at all.

When slowly mould board ploughs, like the Climax (which was tried by the writer and warmly appreciated here), come into greater use, the ploughing in of green manure crops will be an easy affair. It is worth noting here that the Climax plough is being worked by an average sized pair of this locality and it turns out much better and more thorough work than a country plough. It may be necessary to rotate one green manure crop with another to suit the changing conditions brought on by green manuring. A field may with advantage be not under a green manure crop for a year just as land is fallowed in regular rotation.

If a green manure crop is on a fertile land or the growth of the crop is very thick the land often requires a dressing of a phosphatic manure. This is probably due to the increased nitrogenous and other matter supplied by the green manure crop, requiring a proportionately increased supply of phosphates to enable the crop to take full advantage of the situation.

The above points are being brought to the notice of the ryots through the efforts of the Agricultural Department and even the few people that had taken wrong lines and got disappointed are one by one coming forward to take it up again.

K. Unni Krishna Menon.

Some experiments in Manganallur Agricultural Station.

While on a visit to the Manganallur Agricultural Station, I had the opportunity of meeting a retired government official who is spending the days of his retirement in taking care of his lands which he probably purchased during his official career. He had heard of the Farm in his district of Tanjore where he was told that improved varieties of seed could be obtained and with the object of obtaining them and getting some information about the improvement of his lands, he visited the farm one morning. He evinced a great deal of interest in all that the Manager had to say and he congratulated

himself on having actually come and obtained the information first hand. But he eventually finished up by saying "these experiments are all so expensive," meaning that the ryots cannot follow such methods. It had to be explained to him that because the ryot is poor, the department is undertaking the work of investigation in his behalf and that it did not follow that the cultivator should follow all the experiments because the Government is doing, but choose only those which suit his conditions best and which are within his easy reach.

I was not a little surprised that educated and enlightened as the Government official was, he had not caught the spirit underlying the institution of such an experimental farm, and it occurred to me that there may be a very large number even among the readers of the Journal who do not know the object of the Government farms and the nature of the experiments conducted therein. This then, in short, is the only excuse for this article.

Manganallur is situated in the Tanjore district, where the chief crop grown is Paddy under the Kauveri delta. Naturally therefore the problems that require elucidation would be those concerning paddy.

In Tanjore district it is often the practice in double crop wet lands to take a crop of 'Udu' consisting of a mixture of Kuruvai and Ottadam paddy. These are mixed in proportions which vary according to locality. Both grow together, but Kuruvai matures earlier and is harvested along with the growing Ottadam which latter is allowed to sprout again. As there is not enough manure for both the crops, the cultivators apply what little cattle manure they can get to the first crop leaving the Ottadam to take care of itself. The problems that suggested themselves to the department were, whether it would be profitable to manure the second crop also and if so what manures could replace or supplement the present available cattle manure. To this end, several plot tests are made with Nitrogenous, Potassic, and Phosphatic manures, to find out which are most profitable for paddy under conditions existing in the Tanjore delta. In one series cattle manure is applied to the first crop and artificials to the second and in

another series the manures are reversed. In each district there are to be found organic manures which if they could be proved suitable, would be cheaper. Therefore an experiment has been instituted to test the relative advantages of cattle manure, groundnut cake, fish manure etc., In conducting these experiments, the time of application and the quantity to be applied should be considered and these are also included in the tests laid down.

The department recommends the growing of certain crops to be incorporated into the soil as manure prior to the paddy crop. Such crops may be grown on the same land or outside it. These have been found to be economical compared with other manures and at the same time have very beneficial effects on the physical condition of soils. It is, however, not known in what form the green manures are most profitable. Hence, a series of plots is arranged so that in one plot the green manure is cut and air-dried before puddling; in another it is rotted in water before puddling; in the third, lime is added at the time of ploughing in green manure and in the fourth plot, it is rotted in aerobic conditions, i. e., in conditions where there is free access of air.

Soils may be deficient in certain mineral ingredients and these deficiencies could be found by the chemical analysis of soils. The Farm soils are found by such an examination to be deficient in lime, and to decide the exact quantity required to obtain best results, plots are laid out to receive varying doses of lime, ranging from 3 to 10 cwts per acre.

From experiments so far conducted it has been found that paddy requires phosphatic manures. It has also been tested that the addition of Superphosphates to an application of green manure increases the yield more than a mere application of super, and this increase is about equal to a double dose of super. This at once proves the economy in the application of green manure crops as compared with Superphosphate which is much more expensive.

Though phosphates are known to be desirable manures for paddy, the right quantity to be of most profit has yet to be enquired into. An attempt is therefore being made to test it in varying doses of 100,

200 and 300 lbs compared with a no-manure plot, and in order to ensure more reliable results these plots are duplicated.

To go a step further, phosphatic manures may be roughly divided into two classes, namely those that are readily available to the crop and those which are not, but which, to show their effect require more than one season. These latter are however much cheaper, so that if systematically applied in large quantities, may give better results than those which are more readily available to the plant, but unfortunately more expensive. This is a problem which is being investigated at this farm on Bonemeal and Trichinopoly Mineral phosphates.

Among Nitrogenous manures, Ammonium sulphate is remarkable in its quick effects on the paddy crop and in consequence is used as a top dressing on crops which require forcing up. This is, however very expensive and its more extended use in consequence is precluded. There is however, another manure of more recent origin which has come into the market known as Calcium Cyanamide which is manufactured in India and is cheaper. A comparative test of the two manures is being made to test their relative merits.

In certain researches conducted by the Government Agricultural Chemist, it has been noted that there are two periods in which the paddy crop puts on its activity. It is suggested that by manuring during those periods, more economical results will follow in the application of manures instead of applying the full dose at the time of planting. The two periods are the initial period following on planting and a final period when the crop commences to form shot-blade. Therefore to verify these researches a three-plot experiment is arranged in one of which Superphosphate is applied in one dose at the time of planting, in the second, half the quantity is added at planting and another half at the second weeding, while the third is treated as a check plot. This then is the rough outline of some of the important experiments that are being conducted at Manganallur. It may be that some of them are entirely of academic interest, but there is no gainsaying the fact that the majority of them are concerned

with problems of immediate interest to the Tanjore ryot and if sooner or later the Agricultural Station should be the means even in a small measure of improving the paddy of the locality, its existence maintained at public expense will be more than justified.

A visitor.

Notes.

Rothamsted Agricultural Station and the War.

The work of the station had to be largely modified owing to the war. Two-thirds of the staff are engaged either in fighting or in some direct war work. Some hold commissions in the Sanitary corps, some are in the Infantry regiments, some are busy with the manufacture of a certain indispensable constituent of high explosive under the Ministry of munitions, while others are occupied with special enquiry sent in by the Board of Agriculture. Experimental and Routine work, however, is carried on as usual, this having been possible by women workers successfully taking the place of men. The organisation is thus kept in readiness for full development to deal with the problems which will arise after the war is over. (*From Nature*).

M. R. R.

The Soil-Balance of Humus and Water. "Cultivation, in that it aerates the soil, tends to increase the oxidation of organic material. The high temperatures met with during the summer months in this State (N. S. Wales) also make for the increase in the oxidation process. Thus, in the conservation of water the excessive cultivation has caused a considerable loss of organic material in many of our soils. In fact, there are many who believe that the loss of organic material by such frequent cultivation, is more serious than the loss of water caused by systems employing less frequent cultivations. As with all things, we usually find a happy medium, which is better than going to either extreme. Too frequent cultivation is extremely exhaustive of organic

material: too infrequent is just as exhaustive of the irrigation water. The type of soil, the location and the crop will all have a bearing on the frequency and depth of cultivation. In the heavier types of soil, cultivations are usually more frequent, while the lighter soils are frequently well protected from evaporation by a single cultivation after each irrigation." (*The Agricultural News* Vol. XV. No. 372, Page 247 dated 29th July 1916).

The above shows that frequent and deep cultivation in high temperatures is not beneficial.

K. K. Rao.

Utilising the water hyacinth for commercial purposes. Reference having been made in North Coast papers to the utilisation of the Water Hyacinth for the manufacture of rope, twine, matting, sacks, etc., in Cochin-China and Cambodia, Mr. J. B. Suttor, Commercial Commissioner for New South Wales in the East, was requested to obtain further particulars of the process. He has now forwarded a copy of a report furnished by M. Perrot to the General Consultative Chamber of Commerce and Agriculture of Cambodia, which is as follows:—

• *Utilisation of "LUC-BINH" as a Textile Plant:*—During quite recent years there has been planted in Cambodia an aquatic plant which the Annamese have called "Luc-Binh," the Cambodians "Trakiet," and the scientific name of which is *Eichhornia Crassipes*, (= *E. speciosa*) of the family of the *Pontederiacæ*. According to some, it came to us from Java or from the Phillipines, and according to others from Japan. In Tonkin its appearance dates from 1902, and in Cochin-China from about 12 years back. In 1906 it was quite unknown in Cambodia, except in some watercourses of the provinces bordering on Cochin China. Thanks to the rapidity of its growth, it now infests the smallest of our watercourses as well as our large lakes, and even those persons most indifferent to the vigorous vegetation of the tropics knew this plant with its slender stalks, its leaves a little bit curled on the edges, and its pretty mauve flowers, growing in spikes.

From observations made, it was found that a single foot of "Luc-Binh" could, in a few months, cover a space of 600 square metres. The growth by seeds is not so much to be dreaded. The original foot throws out suckers, which, in their turn, rapidly throw out more, to such an extent that it furnishes a growth so rich and so thick that the natives simply throw down a plank on the impenetrable mass, to cross the water dry-shod.

This reproduction was so extraordinary that a cry of alarm arose in 1909; the watercourses of Takeo and Prey-Veng were blocked up so as to be impassable. Caught in the midst of these plants, boats could not move freely; it was impossible for junks and sampans to traverse the thick carpet and make a way through. Already difficult in the large waterways, navigation became impossible in the smaller ones.

At some time, the noxious plant carried by the annual floods, must have found root in Cambodia. Five years have been sufficient for it to become an insurmountable obstacle to navigation—a veritable scourge. It has been suggested that the "Luc-Binh" be pulled up and burnt on the river banks, or destroyed by some other radical means. The province of Battambang has been obliged to set apart on its budget large sums to be expended on the destruction of the "Luc-Binh."

Having been able to see for myself that the "Trakiet" possessed fibres, I suddenly remembered having seen the Blacks of Mouni (at Gabon) using an aquatic plant, perhaps of the same family (for then I attached no importance to this fact), to weave matting and drawers. Since then I have sought to utilise the noxious plant, and have made experiments. I had at first to obtain the fibres by the primitive means at the disposal of the prison, so I modified a Duchemin de-fibring machine. After stripping the "Luc-Binh" stalks of their leaves, I had them passed between the blades of the machine until they were

completely cleared of their pulp. After that, I had them dried in the sun. I had bad results. The action of the sun's rays caused them to ferment. Without being discouraged, I had others dried in the shade. I was successful. I had healthy fibres flexible and supple. I soon thought of their utilisation. I had rope made of it, and string with which were made articles of furniture surpassing in comfort, elasticity and solidity all the rattan furniture made up till then.

But, if restricted to basket work, the "Luc-Binh" could interest only a limited section of the public. I thought of extending its utilisation on a larger scale. It was then that the idea came to me that it might very well replace jute in the manufacture of paddy sacks, which are so largely used in Indo-China. I strove to realise this project with all the more eagerness, as the jute sacks are of foreign manufacture, and that in consequence the new industry would not compete with an article of French production.

For the manufacture of the cloth for the sacks, I had put up a Cambodia weaving loom. After different attempts, I had the satisfaction of getting from the loom strong plaint cloth with a textile strength as great as that of jute. So as to have an idea of how the sacks compared in weight I had them weighed. Equal in length and breadth, they both returned practically the same weight. This is due to the hygrometry of the "Luc-Binh" which is essentially aquatic. But this weight can be diminished by one third, by treating the fibres in a bath of alum and chromium which, while it contracts the pores of the plant renders it anhydrous and permits, on the other hand, of its absorbing any dye whatever. In this manner we have subjected rope and fabric of "Luc-Binh" to a bath of carbolineum and have noted that the results obtained were altogether satisfactory.

The breaking strain of "Luc-Binh" rope 5-m. m. in diameter and 1 metre long is from 49 kilos, and the elongation is from 10

cm. In the French ropeyards will surely be found an outlet that the Cambodian villages will undertake to supply. The defibring of the plant and the drying being very simple, any native at all can do it. The fibres could be compressed into bundles, after the manner of army fodder, and they would be despatched like bales of cotton.

So that this plant, until yesterday still considered a national danger, will become, thanks to its applications, a source of revenue to the countries with it overruns.

Samples of the furniture and ropes made from the fibre are being procured by Mr. Suttor. While the prospect of turning to account such a pest may be possible in Indo-China where labour is so abundant and cheap, and where the plant spreads even more rapidly than on our northern rivers, it does not follow that it will be profitable to utilise it in this way in this State. The plant is composed chiefly of air and water, and the handling of non-fibrous matter would be enormous. The percentage of fibre in the Water Hyacinth is even less than in the prickly pear.

Reference to the possible use of Water Hyacinth for paper-making, &c., was made in the Agricultural Gazette, Vol. XXIV, 2nd August 1913, page 712, and it will there be noted that it was proved to be quite unsuitable both for paper-making and for upholstery work. *From the Agricultural Gazette of New South Wales, November Vol. XXVII, part II, page 817 A 118.* R. T.

Departmental Notes.

Assistant Farm Manager M. Virarghava Rao is granted privilege leave for 1 month and 16 days from 7-11-16 with permission to avail himself of the Xmas holidays in continuation thereof.

Assistant Farm Manager S. Sitarama Patrudu is granted privilege leave for 15 days from 7th December.

M. R. Ry., T. R. Ranganath, Assistant in Mycology, is granted leave on medical certificate for six months from 4th December 1915.

The privilege leave granted to Assistant Farm Manager, S. Sitarama Patrudu, Anakapalli Farm for one month, is extended by one day.

M. R. Ry., N. S. Yegnanarayana Sastri, Supervisor. Pumping and Boring, Chingleput Section, is granted privilege leave for a fortnight from the 3rd January with permission to prefix the Xmas holidays thereto.

M. R. Ry. K. Narayana Ayyengar, Agricultural Demonstrator is granted combined privilege leave for two months and 29 days and furlough for 1 year in continuation thereof with effect from 12-10-16.

M. R. Ry. T. Lakshmana Rao, Assistant in Chemistry is granted combined privilege leave and leave on medical certificate for 6 months from 1-11-16.

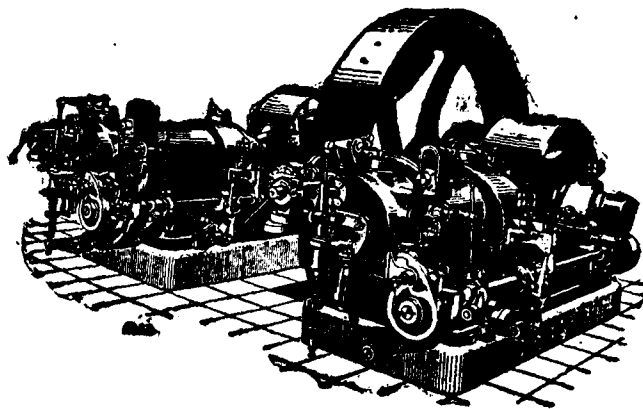
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THE JOURNAL
 OF
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Union.

Vol. V. February 1917. No. 2.

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

Editorial Notes.

We are publishing elsewhere in full the recommendations of the Royal Commission on Public Services so far as they relate to our Department. On the whole, we consider, that the recommendations have been made in a liberal spirit and with due regard to the claims of Indians for service in the Department.

The conditions of recruitment recommended for the posts of the Deputy Directors of Agriculture and Scientific Experts are such as to ensure greater efficiency all round and once this is secured in the higher offices it is sure to filter down to the lower.

According to the Commission, Pusa is to be the premier Agricultural Institute in our country and is to play

the part till now played by institutions such as the Royal Agricultural College at Cirencester, England. In fact it is to be so equipped as to be capable of affording the highest training in agricultural research and supply candidates for direct recruitment into the Imperial service.

The commission has rightly realized the need of a regular service between the Imperial and the Subordinate services. At present there is too wide a gap between the two services as regards pay and status and this precludes anything like comradeship in the various pieces of research that come up from time to time.

We are unable to understand why the commission discourages the deputation of promising young men to countries outside India for training. We can readily name a few instances in which such a training is bound to be useful; for instance sending out a man to Java or Mauritius to study the sugar industry of those countries. In fact that go-ahead state of Mysore is systematically sending out young men, and we understand, with satisfactory results.

The Commissioners recommend direct recruitment for the Provincial Service. In our opinion such a system has both its merits and demerits. On the one hand it will secure for the service a certain amount of young blood with its implied vigour, and enthusiasm. On the other, it will deprive the service of the ripe experience, and the mature judgment of people who may be easily secured from the upper regions of the subordinate grades. We are in favour of recruitment from both the above sources.

The commissioners observe that 'the whole of the normal requirements of the staff should be met from India within a reasonable period of time.' We are glad of this for we have always held that sooner or later we should be fit for any post in the Department. We are an old agricultural race and if Heredity does not belie us we are sure to have the agricultural instinct somewhere in our blood.

We regret to have allowed an error to creep in in the article "Some experiments in Manganallur Agricultural Station" in our January issue. The writer
 A correction. wishes us to correct that Calcium Cyanamide is not yet being manufactured in India, though proposals are on foot to start the industry.

Tribulus—the thorny weed.

Tribulus terrestris, Linn. known in Tamil as *Neringi*, in Telugu as *Palleru*, and in Canarese as *Neggina mullu*, is, it is to be trusted, a familiar acquaintance to most. To refuse to recognise it is almost tantamount to a confession to a non-out-door life. Around Coimbatore there seem to be two main races of this plant. One with thick fleshy stems and branches, large silver-grey hairy leaves, stout fruits bearing rather short thorns; and the other with long thin branches carrying small dark green smooth leaves and rather thin fruits with long sharp thorns. The fact that these two may often be seen growing side by side precludes the idea that they are simply variations due to differences in the nature of the soil. The fruits when dry divide into about 8 parts each carrying a thorn, and get distributed mainly by adhering to the feet of men and cattle. They are most

abundant by the beginning of the dry season in January. When the rains commence, these seeds germinate and young plants grow up which are soft to the touch and present an innocent appearance and are even positively handsome when the flowers appear. If one wishes to rid a field of this weed, it is just at this time that he should take action. A fairly large iron nail or a small screw-driver is the only instrument that is needed. A day after a good shower, the ground will be soft and moist and with the aid of the nail, the soil around the base of the plant can be cleared, and the plant easily pulled out. It is essential that the tap root should not be cut near the collar, as in this case the plant sprouts again more vigorously than before. Hence the usual method adopted of employing women-coolies to remove the weed with hand-hoes is not efficient, though it is easier and quicker. In case fruits are already formed, the plants must be carefully removed and buried in a pit.

The precincts of the Officers' club at the Agricultural College, Coimbatore, as well as the open *maidan* to the south and east, were badly infested with this thorn. This caused much inconvenience to the members but the worst sufferers, by far, were the picker-boys, who had perforce to stumble into the thick of it for picking the tennis balls out. Last year an attempt was made as an experiment to fight this weed. The club boy and the pickers were instructed, especially on wet days, when they had no other work, to search for these plants and pull them out; when there was leisure the writer also personally attended to this work. As usual, in all campaigns, the work was not so simple as it seemed. In the region of Mythology one hears of drops of blood issuing from the body of a slain demon as having been capable of raising each a fresh horde of demons. It was an experience of a somewhat similar sort that confronted us. For every plant that had been pulled out, several more were, to the dismay of the writer, noticed to have sprung up, when

examined about a fortnight later. Of course this only meant that some of the very young seedlings had been overlooked and that some more of the thorns lying on the surface of the soil had sprouted. It only led to a more decided and repeated effort. The plants were on the whole picked out, off and on about 5 or 6 times during the year. The results have not been as satisfactory as they might have been if conducted on more organised lines. Yet it is a fact that the thorns around the building and in the adjoining *maidan* have considerably been lessened and the pickers do not now draw long faces in picking tennis balls.

Just as the look of a clean whitewashed wall is marred by bills stuck on by haphazard advertisers, in a very similar way is the beauty of any play ground or open *maidan* impaired by the free growth of this weed. In as much as it can be readily removed with some little trouble, it would not reflect much credit on the body of persons using the ground or the *maidan*, if this weed were allowed to grow unchecked.

Y. Ramachandra Rao.

Farmers and Improvements.*

The country of Alangudi is a low lying plain of gravelly laterite soil with a water-level high enough to make direct flow irrigation from wells possible. As such the dry lands are being converted into wet wherever possible by lowering their levels and bunding. Thus the existence of such surface springs has given rise to the increasing of the *ayakat* of several tanks and ponds which in ordinary seasons would hardly contain water to irrigate half the area at the most. Paddy was grown successfully in good seasons on such lands called *achakuttu*. But of late the rains have not been certain, timely and sufficient. Thus failure of Paddy in *achukattu* lands, mostly rainfed, was frequent.

*Based on experiences in dealing with them in the Alangudi Taluk of the State of Pudukotah.

To meet the situation, the ryot is now sowing Paddy mixed with a dry cereal-varagu-and often succeeds in getting Paddy in a good season or varagu in a poor season, and occasionally both. The variety of Paddy used for this is called *Kalakottan*. Formerly when farmers were few and forests plenty and near, no difficulty was felt in obtaining leaf-manure. Later on each had to reserve a plot of ground for growing green manure crops such as *Virali* and *Aavarai*. As time wore on and the population increased this area was encroached upon for growing food crops leaving the poor and rocky soil for the growing of green leaves. Since this area is not cultivated, and receives no manure, the yield is naturally poor. Leaves from 2 to 3 acres are barely sufficient to manure one acre of wet-land. Moreover the supply is inadequate since there are only 7400 acres of *Virali* and *Aavarai* for a total irrigated paddy of 34880 acres. After the forest acts were passed, no one is allowed to enter the forest and take leaves free. The right of collecting leaves is auctioned. To bid in public auction is utterly impossible for the small holders. The industrious *Nathambadis*—a class of practical cultivators—overcame this difficulty by growing redgram as a green manure crop on the wet land itself. It is usually grown mixed with Cumbu or Gingelly. It is surprising to note that this practice has not been sufficiently followed by the other classes in close proximity. Hundreds of ryots may go week after week to the town market to dispose of their raw produce travelling over miles of cultivated areas where crops different from theirs may be cultivated, practices entirely different from theirs may be followed, implements quite foreign to them may be used, and a prodigious outturn obtained; and yet beyond a casual glance at them and perhaps a momentary surprise and a look of admiration at the strange and superior sight nothing in the nature of a permanent impression is left in their minds, and no interest is created to prompt them to observe and enquire about the practices and about the excellence of the crops they meet with. This is more or less entirely due to the conservative nature of our ryots, to their want of education and to the entire absence of training in observation, and to their exclusiveness. Last year in Tiruvarangulam village, there was a splendid sight to be seen with a striking contrast—a green patch on one side, and a desolate waste of ground on the

other side of the road. The *Nathambadi* cultivators by ploughing 3 or 4 times, one after each earlier summer showers were able to conserve moisture, and at a subsequent small shower sowed *Dhall* and *Cumbu*, dhall for its green leaf. On the other side, the *Kalla* ryots did not plough after the earlier showers thinking of sowing once for all after a heavy rain in the season. But the *pattam* or seasonal rains failed, and the Paddy nursery dried up. But for a few passing showers, the monsoon failed completely. But those who suffered were certainly not the *Nathambadis*. The redgram sown in the wet-land during summer grew and gave a fine harvest. The chances of success in agriculture are always with the industrious.

In a country where the vagaries of the weather are frequently felt, this kind of cultivation is necessary. But *Dhall* cannot grow on alkaline or low lying lands subject to water logging. *Dhaincha* is advocated and about 500 Madras measures of this seed were sold during the past 2 years. This is grown purely or mixed with summer ragi in wet lands. The advantages of growing this are now well known and there is already a keen demand for the seed. Arrangements are being made to grow the plant for seed to meet the local demand without having to go outside.

We now come to consider another case where the ryots have come to realise the necessity for changing their practice to overcome some difficulties that they have to encounter. This is in the case of rotation of crops. Varagu after *Dhall* and *Cumbu* is the rotation in dry lands, and the principles that underlie the system are fairly well understood, but now not followed owing to changed economic conditions. The modern farmer often grows crops for the world markets. Such commercial crops put him at the mercy of international commercial fluctuations. By subordinating the rules of practice to the ambition of making money at any cost he grew groundnut year after year on the same land until at last he found the yield too poor to meet even the cost of production. Besides this the land became infested with weeds, and plenty of diseases and pests cropped up. In one place the *Harigai* grass had spread so much as to make the land unfit for any crop. The owner hence had a number of holes dug on the land to plant coconuts.

As regards Varagu there is a similar tale to tell. The small holder out of sheer necessity put the land under Varagu continuously for years. The result is the devastation of the crop every year by the parasitic weed *Striga*. This increases the cost of weeding. Many found cultivation on such land unprofitable and had to abandon it to obtain their livelihood elsewhere. The havoc done by this weed can very well be imagined when I say that it has earned the name of *kudiviratti poondu*—the weed that scared out the ryot. *Inam* and *Varam* lands are generally poorly cultivated, and in consequence are full of weeds. It must be noted that not only do the small holder and absentee land lord suffer, but they make others to suffer in as much as these plots, though small are yet big enough to serve as breeding places for weeds and pests which spread rapidly to the adjoining good land. These experiences demonstrate the necessity for co-operation as otherwise the carelessness of one person tells upon the prosperity of his careful neighbour. The farmers were advised not to grow any cereal crop on such lands and to pull out and burn the *Striga* plants preferably before flowering. Since the pest has taken a firm hold, it will be many years before the land is quite free from it.

Another item which equally attracts our notice is the way the ryot disposes off his produce. After harvest all the ryots take their produce to the market simultaneously. Thus there is greater supply than the corresponding demand, and the price naturally falls. In the sowing season immediately after a shower of rain all rush in for seed, thereby creating a keener demand than the possible supply, with the result that they have to pay an exorbitant price for seeds. Moreover they are not well trained in the art of presenting their produce in an attractive manner in the market. All these go to lessen the price of their stock. But the *Nathambadis* especially of *Kammangulam* are a rare exception. They are very careful in storing grains and in selecting seeds for sowing. They always take care that the grains are cleaned and winnowed before they are taken to the market. This undoubtedly fetches them a higher price and the seed is known in the market as "*Kammangulam Paddy*." As I have said above, the farmer places himself at the mercy of the traders and merchants first when he buys

articles for his use and again at the time of selling his produce. People can live in ploughing, in irrigating their lands by turns when the water supply is short in the tank, in celebrating temple festivals, and in cock and bull fights. Can they not co-operate in disposing of their produce and get a larger return? Unlike the manufacturer the farmer can afford to get on for a fairly long time without the necessity of selling his products. The farmer can keep his produce and dictate his own terms. That is possible only when he knows these tricks. There are about ten credit societies working in these parts. The ryots are already appreciating the value of the village banks in as much as they get money cheap and at short notice when needed. Six months ago a "Farmers' Association" registered under the co-operative act was started having for one of its objects the joint purchase and sale of goods on behalf of the members. It has begun to work in right earnest. In his recent visit to the place the Hon'ble Mr. L. D. Swamikannu Pillai, the Registrar of Co-operative Societies, wrote favourably in the visitors book of the association. Another encouraging feature is that His Highness the Raja is taking a keen interest in rural improvement and has lately sanctioned Rs. 10,000 for starting grain banks.

I have now given a brief sketch of some of the methods of Agriculture employed in my district, and with the knowledge that I have gained of the ryots I can say that some of the methods practised by them appear to be the best suited for their locality and conditions; for example the growing of Dhol and Cumbu in wet land in summer. I would recommend the introduction of this method in similar localities.

It sometimes happens that ryots are no better for the adoption of improved methods because the profits so derived are squandered away in drinking, gambling, litigation &c. Unless those in charge of the other kindred departments co-operate with us in devising practical schemes for the general benefit of the people at large any amount of work done by one department single-handed cannot elevate the Agricultural classes.

It is the general opinion of many, perhaps rightly too, that modern conditions have been directly or indirectly instrumental to the migration of the rural population to the neighbouring towns or distant colonies in search of other remunerative employments than agriculture. The educated classes do not consider agriculture a dignified profession. Agricultural labour is always rated at a discount. A writer in the Pusa Journal observes that in America a farmer worth a lac of rupees could ordinarily be seen at work in his own farm with his family and servants and a man worth ten thousand rupees would work on other farms for wages whenever his farm does not require his services. In our country a farmer worth five thousand rupees never works by himself, but employs poor inefficient cooly labour for his farm operations. Present day agriculture is thus left in the hands of inefficient labour, conservative to the very core and blindly following the traditional path of hundreds of years and incapable of adapting itself to the changing conditions of the times. Such are the people the District Agricultural Officer has to deal with. But the suspicion about new ideas, the fear and dislike of change, the difficulty of believing that things can mend—all these great obstacles, slowly yield to agricultural demonstration when successfully done in his own field. In this connection I shall instance my experiences in persuading the ryots to adopt single planting of Paddy. In September 1914, I visited a village called Kulandirakottai, and spoke for an hour about the advantages of single planting of Paddy. Every one nodded assent to my proposal and agreed to adopt it in his fields the next day. I returned home fully confident of the success of my efforts. But two days later, when I again went to the village to see how far they had given effect to my proposal, to my surprise I found nothing whatever had been done as promised. Of the six ryots that I had addressed, one left the village, another had his lands completely transplanted in his old usual way, the third said he was only a tenant, while the fourth told me that I should convince

his aged father before he could venture on any such innovation, the fifth said he would not try this unless he saw the new method demonstrated to him, and after much persuasion the last man consented to plant half an acre of land just as a matter of personal obligation. He did transplant half an acre with single seedlings. The crop came up well and gave the inevitable increased yield. Next year I found the very same ryot following this new method on 10 acres using only 90 Madras measures for seed i. e., a third of the local seed-rate. If he had followed the usual method the seedlings would have been barely sufficient for planting 3 acres. Owners of neighbouring lands who had witnessed this demonstration were satisfied and adopted this system of planting over 150 acres this year. This and other departmental activities do but quicken the improvements which may be effected in course of time by the ryots themselves.

There is, at present, no line of activity, except perhaps agriculture, which has not been rich in results. Tunnels have been bored, the earth has been dug into to a considerable depth, broad rivers have been spanned with bridges, pearls are got out of the depths of the ocean; new towns are being planned and magnificent buildings being built every day. If a bit of this intellectual activity is directed into the fields of agriculture and when education begins to shed its light on rural darkness, the uplifting of the agricultural population is a certainty of the near future.

State Farm, Pudukotah.

K. R. Sankar.

Public Services Commission Recommendations, Agricultural Department.

1. Regular services should be established to do the work lying between that done by members of the Imperial Service on the one hand and of the Subordinate service on the other.

2. Rural Commissioners should be appointed for charge of the agricultural, veterinary, co-operative credit and arts and crafts departments.

3. Deputy directors of agriculture should be recruited from among persons whose life has been spent in agricultural surroundings and who, after obtaining university degree in science or diploma of a recognised school of agriculture, have had at least two years experience of practical farming, or, alternatively, at least two years experience in the provincial branch of the department on the staff of a deputy director.

4. Candidates for the research branch of the Imperial service should be required not only to possess a suitable qualification in the particular science relating to the appointment, but also to have spent a period of at least two years in research work under a scientist of established reputation in their own subject. This training should have had a bent towards agriculture.

5. Candidates who are over 30 years of age should not be eligible for appointment in the Imperial branch of the department.

6. Facilities should be provided at the Pusa Research Institute for the training of selected students in agricultural research up to the highest standard.

7. Students who satisfactorily complete this course of training should be eligible for direct appointment to the Imperial branch.

8. The Government of India should announce that not less than half the recruits required for the research and teaching side of the Imperial branch will be chosen from among statutory natives of India who have been through the Pusa advanced course, provided that, in the opinion of an expert committee, duly qualified candidates are available for appointment. Similarly, not less than half the vacancies in the grade of deputy director should be filled by statutory natives of India appointed in India, provided that duly qualified candidates approved by the selection committee are forthcoming.

9. Every effort should be made to discover and recruit competent men in India wherever they may be found, and the whole of the normal requirements of the staff should be met from India within a reasonable period of time.

10. Vacancies should be advertised in the Indian press and in the various colleges throughout India.

11. The claims of provincial service officers to promotion should be considered by the selection committee.

12. In cases where it is necessary to resort to recruitment in Europe, appointments should be made by the Secretary of State with the advice of a specially constituted selection committee containing an Indian member.

13. Appointments to the provincial services should ordinarily be by direct recruitment.

14. The practice of sending prospective candidates for the provincial services for courses of training outside India should be discontinued.

15. Officers directly recruited to the provincial service should be on probation for three years.

16. Both in the Imperial and in the Provincial branches improved facilities for training should be provided.

17. Supernumerary officers for the agricultural side of the Imperial branch should be posted to provinces, not to Pusa.

18. The normal scale of salaries in the Imperial branch should be fixed on the basis of recruitment in India and the rates of salary for officers recruited in India and in Europe respectively should be as stated.

[R. 350—35—1,050 for former and 500—50—1,500 for the latter.]

19. The salaries of Provincial service officers should be increased to the extent stated.

[Rs. 150—40.3—450—50.3—500].

20. The cadre of the Imperial branch should be increased.
21. If specially good candidates for the Imperial branch come forward, they should be appointed at once, provided that there is a prospect of absorbing them in the authorised cadre within a reasonable time.
22. The Provincial services should provide for their own leave and training reserve when they become sufficiently developed.
23. The provincially recruited services should be as the Madras, Bombay &c., agricultural services, the term 'provincial' being abolished.
24. In future, officers who, when they enter the department, are paid salaries at the higher rates fixed for officers recruited in Europe, should be subject to the European service leave rules. All other officers in the department should be subject to Indian service leave rules.
25. The arrangements for the grant of study leave should be revised under expert advice.
26. Subject to the general provisos, officers of the Imperial branch should be allowed to reckon as service qualifying for superannuation pension the number of completed years by which their age at the time of appointment exceeded twenty five years.

Notes.

Some Wild Fodder Plants of the Bombay Presidency. I have read with much interest the recent Bulletin on the wild fodder plants of the Bombay Presidency by Dr. Burns, Mr. R. K. Bhide and two others. This is the second of its kind to be published in India, the first being Duthie's. It is to be hoped that this bulletin will stimulate work on similar lines in other Provinces. As far as Madras is concerned, the subject has been before the Department

of Agriculture for over ten years,* but the attempts at a serious study of the question have necessarily been rather spasmodic. With the recent appointment of the Cattle Expert, however, it is to be hoped that it will receive the full attention it deserves. In the district of Nellore it is said that even to this day the riches of a man are judged by the number of cattle he owns, and the size and number of fodder stacks he commands, and often enough the cattle-shed is better kept than even the dwelling house.

I am of opinion that nothing short of a thorough botanical survey coupled with a chemical analyses of the different fodders will be needed at present. Later on a plotwar cultivation of the different grasses of possible fodder value will be required before we could be said to have broken the back of this interesting and important problem.

I note among the 34 Bombay plants of fodder value, the Chengali, Molava, Nanabalu, Karu, Gogada and Pandibellam, the popular grasses of the circars, botanically known as *Iseilema*, *Andropogon annulatus*, *A. foveolatus*, *A. pertusus*, *A. monticola* and *A. contortus* respectively and *Pennisetum cenchroides*,—the Kolukkattai grass of Coimbatore fame. It will be interesting to see if the authors would include in their next issue *Ischaemum laxum*,—the Nendra of the Andhra country and *Iseilema laxum*—one of the Chengalis both of which are considered valuable fodders in Guntur and Nellore districts.

In conclusion I would suggest the inclusion in the bulletin of a short botanical description of each plant at least corresponding to the details shown in the illustrations at the end or a reference under each plant to the book or books where it is described. The plates would be more complete and instructive with a miniature picture of the entire plant. *A Lover of Cattle.*

* As at least 2 special tours were undertaken by Mr. C. Tadulingam in connection with the botanical study of this question.

The late Prof. Wrightson—The death of Prof. Wrightson at 76 years of age deprives the agricultural world of a well-known authority and writer. He was Professor of Agriculture in the Royal Agricultural College Cirencester for several years and was founder and president of the Downton College until its closure in 1906. He was also Professor of Agriculture and Agricultural Chemistry in the Royal College of Science. His "Principles of Agriculture" and "Text book of Agriculture" are standard books on Practical Agriculture. He was Agricultural Editor to the London Times and wrote the periodical reports on crops to that paper to the last. His name will occupy an honoured place in the history of British Agriculture, especially with regard to educational developments, as he was connected with the Royal Agricultural College, Royal Agricultural Society and the Board of Agriculture from 1864. *From Nature.*

M. R. R.

Agricultural Section at the Mangalore War Fete. On the 6th January a very successful War Fete Entertainment was held at Mangalore and nearly 12000 rupees were collected in aid of the War Fund. The Agricultural Department attempted successfully to demonstrate its activities in the district, to the public. Although the Department has done appreciable work in the sugar-cane cultivation of the district, a certain section of the public which did not care to go to villages and see the work of the Department, often doubted the merits of the improvements. Two sets of shows were arranged side by side. In one set local sugar-cane was milled with wooden mill and jaggery prepared in small pans over old imperfect hearths. In the other section Mauritius and Barbadoes canes were milled with iron mill and jaggery was prepared in big iron pan over improved furnace. There was a striking difference between the 5 feet stunted local canes and the 15 feet high Mauritius and Barbadoes canes, between the few lbs. of jaggery prepared in small pans over fuel-wasting smoky hearths and the maunds of jaggery prepared in big iron pan over

steady burning and fuel saving improved furnace, and between the noisy wooden mill which retained lot of juice in the megass and the noiseless iron mill with its higher juice extraction. The conservative critic saw the improvements, nodded his head, purchased a piece of jaggery and a cup of juice, ate and drank and went away rejoicing. The demand for cane juice and jaggery was so great, that a small cup of juice went for an anna and a lb of jaggery was sold for 6 annas. Very excellent jaggery was prepared from Barbadoes canes. There were refreshment stalls on either side of the Agricultural Section and stall keepers envied our sale. Our volunteers, Vittal Punja, Shenai, Ramana Rai and Kallai Sanjeeva Rao disposed of all jaggery and juice in no time and collected about sixty rupees. In the end the demand for juice was very great and the buffaloes which were honestly contributing their share of labour for the Tommy's comforts, could not bear the strain. The cane growers around Mangalore took part in the demonstration, personally testified to the merits of the improvements and unreservedly spoke to the crowd about its advantages. This had a great effect on the conservative critics.

K. T. A.

Tanjore Dt. Co-operative Manure Society. Our readers will probably remember that in the issue Vol. IV. No. 8, August 1916 we made a mention of the starting of a co-operative manure society in Tanjore District as the result of the efforts of one of our members, an old Saidapet Diplomat, Rao Sahib A. Seturama Iyer. From the report just to hand we are glad to note that the Society has been registered as a co-operative Society on the basis of Limited liability by the Registrar of co-operative societies, Madras. It has been doing very useful work from the 7th October 1916 and the report deals with work done for 2½ months. The work done so far may be summarised as follows:—

No. of members.	Paid up share capital.	Entrance fee.	Associate members.
36	Rs. 385	Rs. 30-8-0	41

The Associate members need not contribute any share capital to the society. These are pariahs who are gathering bones to the society. The society has collected during the period 8112 lbs of bones. The Associate members are paid Rs. 1-8-0 per 100 lbs. of bones collected and delivered in the office store room. Before the society came into existence, they were getting from the skin merchants at 12 as. per 100 lbs of bones. They are better paid for their labours now. The ordinary wages of a man-cooly here is 5 annas that of our associate members for bone collection is 8 annas per day. In a day of 10 hours, only $\frac{1}{2}$ a ton of bone-dust is got from the disintegrator, the screen being $\frac{1}{2}$ inch mesh. It took 3 days to get 3670 lbs. of bone-dust. One ton of bone-meal and dust cost the society Rs. 62. The committee has fixed a rate of Rs. 65 per ton of bone-dust to members. About Rs. 90 worth of bone meal has been sold to members.

Phosphatic nodules. One ton of the nodules was delivered in the office for Rs. 25; it took 8 men to crush them. Within 6 hours, the disintegrator converted the nodules into a very fine powder called *Flour Phosphate*. It cost the society about Rs. 10. One ton of flour phosphate has cost Rs. 35 to the society. The committee has fixed a rate of Rs. 37-8-0 per ton of flour phosphate to members.

Green manure seeds. One of our members has sown about 10 bags of wild indigo seeds in all his paddy lands.

Oil-cakes. The committee is now negotiating to store about 40 candies of oil cakes to members.

A. S.

Vernacular Agricultural School in Mysore State. The Government of His Highness the Maharaja of Mysore has been allotting funds liberally for improving the agricultural conditions of the State in all possible ways; but this does not prevent a private landholder like Mr. Ugre Gowda from making a free gift of a magnificent school building and sufficient land for a farm, but also a solid endowment of Rs. 25,000 for starting and conducting a Vernacular Agricultural School in the Tumkur District. School expenses and the pay of the teacher will be borne by the Government,—a very small item, after

all—but the interest on Mr. Ugre Gowda's endowment is to cover the *living expenses of the students*, who will thus be *educated and fed free*. The course is to be in the vernacular of the State, Kanarese, and will extend to 1 year. Schemes for the establishment of 3 more similar schools are under development and each of the schemes contemplates a very large measure of private enterprise. All honour to Mr. Ugre Gowda and men of such ilk in Mysore! (*From the Mysore Agricultural Calendar 1917*). M. R. R.

Agricultural Education in Elementary Schools in Mysore State. Agricultural Education, in the strict sense of the term, is not considered a suitable course of study in the ordinary Elementary schools, both by the Educational and Agricultural Departments in Madras and by the Board of Agriculture in India. In Mysore, the question of giving some form of agricultural education in the existing schools has taken a definite shape and 8 schools have been chosen in different centres by the Department of Education, in consultation with the Agricultural Department and it is expected to start work immediately. Is it to be agricultural education or nature study? whichever it is, we shall await the progress and success of the experiment in Mysore. (*From the Mysore Agricultural Calendar 1917*),

M. R. R.

Scholarships in Agricultural School, Hebbal, Bangalore. The late Saidapet College was noted for its institution of about 27 scholarships and most of the students were scholarship-holders. The large number of applications over the number which could be conveniently accommodated and taught, shows that there is no need to institute stipends as an incentive for joining the College at Coimbatore. In the Mysore Agricultural School of 2 years course established at Hebbal, 7 scholarships—3 of the value of Rs. 10 each, 3 of Rs. 8 each and 1 of Rs. 5—are awarded by District and Taluq boards to deserving students. We hope that students will not join merely for the stipends, as was once the case with Saidapet. All the same, we think that the institution of a few scholarships at Coimbatore will not be without its

advantages provided they are given for merit to deserving students on one side and are *endowed* by non-official bodies like the District Boards and Municipalities and by rich landowners on the other. M. R. R.

Feeding Stuffs:—A note from U. S. A. Department Experiment Station Record. Vol. 35. No. 6.

“*Commelina nudiflora* allied to *Kanankera* (Tam) is described as an extremely succulent feed, much relished by cattle. Cattle fatten and produce an abundance of milk when pastured where it is plentiful. The total yield of green feed per acre, calculated from an experimental plot 10 feet square, was 223.6 tons. Per acre production it compares very favourably with green alfalfa both in protein and in other food constituents.

It is stated that as a pasture grass *Paspalum dilatatum* has given excellent results. Its strong deep root system enables it to withstand the trampling of stock in wet weather better than any other grass tested that is equally relished by the cattle.

Cane top silage has proved of value in feeding operations. Some of the cane tops were cut two weeks before they were put into the silo. Notwithstanding the resulting staleness and the excessive amount of water that went into the silo during filling, the silage was of fair quality and was eaten readily by the cattle and horses. The yield of cane tops per acre is about 10 per cent of the weight of the usable cane, and on the unirrigated plantations this by-product would run from 4 to 8 tons of cane tops per acre. C. T.

Influence of Forests on Rainfall. A *Forest Series Bulletin* has recently been issued consisting of a note by Mr. M. Hill, the Chief Conservator, summarising all the information which has been secured during a long series of years on the much-debated question of the influence of forests on rainfall. The important conclusion has been reached that contrary to general belief forests as such have very little effect on rainfall. Rainfall in India depends largely on wind currents and atmospheric conditions obtaining outside the continent. The

denudation of soil owing to the destruction of forests, however, is a well established fact, and all planters should take every precaution against this loss of capital both for their own benefit and the welfare of the state. (From *Planters' Chronicle*, 6th January 1907). C. N. A.

Estate Notes.

The Indian Industries Commission. The Indian Industries Commission sat in the Collector's Office, Coimbatore, from the 5th to 8th February 1917 for taking the oral evidence of the appointed witnesses. Our Department was represented by Mr. G. A. D. Stuart and Dr. W. H. Harrison. Dr. Barber was the third witness but was unavoidably absent on tour in Burma. The members of the Commission visited the College, the Central Farm and one of them the Sugarcane Breeding Station.

The Entomologists' and Mycologists' Conference. The Govt. Entomologist and the Govt. Mycologist with their Assistants—Messrs. S. Sundara Rama Iyer and Y. Ramachandra Rao—have gone to Pusa to attend the above conference.

Officers' Club. Advantage was taken of the residence on the estate of Sir R. N. Mukerjee, C. I. E., of the Industries Commission, to invite him to the officers' club. He honoured the club with a visit on the evening of the 8th inst. The following short summary represents the trend of over an hour's general chat which the members had the pleasure of having with him:—India can never be great until she is industrially far more forward than now. Industrial success depends upon 'Industrial Morality' a virtue which the Indians had very much to cultivate and which the European nations possess to a high degree. The British nation was specially advanced in this line. A high sense of duty was an indispensable necessity to such morality. The general training, domestic environments, and social and religious

habits of the average Indian act as a very real drag upon a speedy development of such a sense of public duty and morality. Things are definitely changing and the progress was much more rapid than many imagined. The Indian labourer and artisan required special notice and care. He was excellent at work to which he was set, but a lamentable lack of general all round culture makes him a sad failure at anything requiring initiative. The general rise in the standard of comfort of the masses was a healthy sign and full of promise for the future of Indian Industry. A special feature of the chat was the unreserved narration made by the knight of very many instructive little incidents in his own life and career.

On Wednesday the 21st of February Mr. P. H. Rama Reddy, M. A., B. Sc., was invited to a conversation and the members had the benefit of his experience during the four years he stayed at Edinburgh for his studies in Agriculture and Forestry.

Departmental Notes.

M. R. Ry., K. T. Alwa, Agricultural Demonstrator, College of Agriculture, Coimbatore, 2 months privilege leave from 1-4-17.

Privilege leave for 3 months to Assistant Agricultural Demonstrator, V. G. Dhanakoti Raju is granted from date of relief by Assistant Farm Manager Ratnaji Rao.

Assistant Farm Manager E. K. Kunhappa Nambiyar is posted to Nandyal in relief of Ratnaji Rao.

M. R. Ry. K. Govinda Menon, Supervisor, Pumping and Boring Section, is granted an extension of privilege leave for a week in continuation of the 2 months leave already granted.

THE JOURNAL

OF

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No. 3.

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

Editorial Notes.

Readers of our journal might remember the short extracts we published from time to time regarding the dietetic value of sugar. In fact it is now freely acknowledged that sugar is not a luxury but an essential article of food and new uses are constantly being discovered for sugar as a food, as an energizer and as a dressing for wounds.

India's
possibilities
as a sugar
producer.

Ever since the declaration of the present European war, patriots in different parts of the empire have been paying marked attention to a consideration of the ways and means by which the output within the empire could be so augmented as to put the enemies out of our Empire's markets for all time to come. Naturally enough India is frequently mentioned as the country where the problem

could easiest be solved because of its extensive acreage, its cheap labour and its, as yet undeveloped, resources.

We have recently received a copy of a booklet entitled 'The High price of Sugar and How to Reduce it' by Harold Hamel Smith, Editor of the '*Tropical Life*.' In the above the author discusses the future possibilities of India as a sugar-producer and passionately pleads for a rapid increase in the Empire's output—if possible even before the war is over—so as to stifle all attempts at competition by our enemy countries when once peace is restored.

The Chapter entitled 'When will India export Sugar to England' is very instructive. At present India with its over 2,000,000 acres under cane, produces only 2,600,000 tons of sugar while her palm sugar industry gives an additional half a million tons. Her normal annual requirements is estimated at 4,550,000 tons and this consequently necessitates an import of 800,000 tons from abroad. He argues that if only the yield of sugar per acre could be increased to the modest amount of 2 tons as against the 4 tons of Java or the 9 tons of Hawaii, India could not only produce all the sugar she wants but besides export to the extent of 500,000 tons. Such an increase would make her richer every year by £ 26,000,000 which is a little over one fourth of India's gift towards the expenses of the War. In the words of the writer the possibilities for India as a sugar producer 'beats anything that Mr. Dunlop is telling us in his clever advertisements of 'The Dunlop Rubber Co.' "India has not got the sugar in her warehouses but probably has got it in her

canes or would have if the land was properly manured and cultivated as it should be and is both in Java and in Hawaii." As practical agriculturists we know that all this may not be so easy as it appears on paper but there is no doubt that the above figures warrant a thorough study of the question in all its aspects.

In the opinion of the writer the present low yield is attributable in the main to the following three causes.

(1) * Unsatisfactory cultivation and inadequate manuring.

(2) The inferior nature of the varieties grown.

(3) Defects in the methods of manufacture which is estimated to result in a loss of about 25% of the sugar.

The first problem is being worked out now practically throughout India, while the second and the third are in the hands of the Govt. Sugarcane Expert and the Sugar Engineer respectively.

As examples of the enormous profits which Sugar Industry on a factory scale puts into the pockets of its votaries the author mentions the South Porto Rico Sugar Co., which declared an aggregate dividend of 58% one year and those of Hawaii with dividends between 24 and 36 %.

We trust and hope that with the new situation created by the war this question will receive increased attention and India will, ere long, take her legitimate place among the great sugar-producers of the world.

We have received from a gentleman who from his position has had exceptional opportunities of watching the origin and progress of the Union a letter congratulating us on the capital way in which the Journal is maintained. We are indeed thankful for such appreciation and shall do our best to deserve it in future. The work is not light but we hope that with the help of our numerous readers, a regrettably small proportion of whom are contributors, the present standard will be maintained.

The annual routine of a ryot in South Canara.

Though the title is comprehensive I confine myself to a particular village, namely, Belenji of Karkal Taluk, which is located about 25 miles distant from the coast line and borders the Western Ghats. The soil there, is chiefly laterite. The rainfall is very heavy—about 150 inches in some years—and commences about the first week of June. The soils are fertile and the money-lender is satisfied if he gets 4% interest on his investment. The land is classified into:—

- | | |
|-----------------|------------------------|
| 1. Bettu lands. | (a) Bana Bettu. |
| 2. Majalu. | (b) Thale Neeru Bettu. |
| 3. Bailu. | |

1. Bana bettu is land which depends for water entirely on Bana (=sky) i. e., rain. Thale Neeru bettu is land which has some source of water at the Thale (=head) of the bettu land.

2. Majalu lands occupy an intermediate position between the Bettu and Bailu lands.

3. Bailu lands are those which are abundantly supplied with water. These are either single, double, or triple cropped, according to water facilities.

The ryot begins to plough the nurseries—which must of course be fertile, in December. This is also the period for the cultivation of

Suggi (=second) crop. About three ploughings—lengthwise and crosswise—are given in a month from December onwards till about March-April, when sowing of seeds take place. Thus in all about 15 ploughings are given. Clods are crushed after each ploughing, the chief object being to thoroughly pulverise the soil. About 100 head-loads of manure are then applied per acre and this is ploughed in subsequently. During the last ploughing seeds of unsprouted paddy are dibbled behind the plough. The levelling board is then passed after which the field is marked out into furrows which serve later on as drainage channels.

If the season is favourable with heavy showers, which continue for sometime, the ryot begins ploughing his bettu lands, because the rain is too heavy for his wet land cultivation. The field is ploughed and cross ploughed once. It is left, after levelling, in that condition for about 5 or 6 days by which time, the weeds ploughed in, would have begun to rot. The ryot then ploughs the land for second time. Manure which was previously removed from the loose-box and stored in a pit is applied to the fields either at the time of the second ploughing or reserved till the third ploughing, when transplanting begins. The last ploughing is invariably followed by levelling done by the feet of the ploughman.

Weeding commences when all the fields have been transplanted. A cooly woman pulls out 60 bundles of seedlings and transplants the same in clumps of 4 or 5 and gets $1\frac{1}{2}$ seers of rice (Rs. 0—4—0) for her work.

After the transplanting season is over, the estate is usually fenced. This is done by male coolies with thorny branches. As there are very few live fences, fencing is taken recourse to annually. The coolies go to jungles merely to bring bundles of wild fibrous plants for fibre.

There is complete rest for the land holder till the month of October when harvesting is done. This long slack season is utilised by the ryot as period of recreation. He takes part in organising hunting parties to ward off wild boars and deer which if left without

any molestation often visit at nights and nip off the growing shoots and paddy earheads. The lifting of cattle in these parts is not by professional rogues as in some parts of Malabar and other districts, but by tigers and leopards.

This is also the time when a large quantity of manure is prepared. Several bundles of green leaves are brought daily early in the morning and spread uniformly in loose-box shed. In a few days the shed is filled to the brim with several layers of manure and this is now and then removed from the shed and stored in a pit outside the shed.

Every land holder besides owning working animals (bullocks and buffaloes) maintains a small herd of bulls, cows, and heifers of an indifferent kind. There are two compartments in the shed—one for the working animals which are tied and the other for the miscellaneous animals just mentioned above. These are not secured by means of ropes but are allowed to roam about freely in their own box. It is here, more than on the grazing ground, that the evil effects of indiscriminate breeding take place. Castration is unknown to the ryots and even the old method of mulling is resorted to only when the animals have attained some size.

The local breed, as it exists, is a nameless one; but here and there where people live by hiring carts, a mixed breed of Mysore with the local cows can be seen. It is because of this, that Mysore bred bulls are brought down from parts of Mysore, where cattle fairs are held.

The expenses of the ryot on the feeding of cattle is very meagre. Working animals are, during the working period only, fed with boiled horsegram given in the evening after work—rice conjee in the morning before work and either green grass or chaffed paddy straw well boiled in water, rice gruel and rice bran water. This latter stuff is fed twice daily, morning and evening. Not much attention is paid to other animals and they are only now and then given paddy straw. A large quantity of paddy straw is wasted in thatching houses.

Labour is becoming, of late, dearer and dearer, though not more costly than in some of the large centres of business. Low caste people are bound down to some of the fortunate ryots to work for them. They live in huts provided by their master. The whole family works for the landlord on his land. The land holder, in return, pays them in kind and gives them food and clothing when they are disabled by illness. They are treated for all intents and purposes as members of the same family though of course they are of different caste. But time has changed and is changing and the good old customs of rural parts can remain, in such happy terms, no longer. These people have heard that by migrating to other parts they can secure higher wages for their work and consequently an enormous number of coolies annually pour into the borders of Mysore where they are paid in cash. The coolies are blinded by this payment of ready money and do not realise that payment in kind in their own native land is better than cash in a different country. The number of permanent coolies of the type described already is not in proportion to the extent of the holding of the ryot. The permanent coolies and their families, however large, must be maintained by the ryot.

Harvesting is done in October. The straw is cut to a height of about 6 inches from the ground with serrated sickles. It is left in the field in small bundles for a day or two to dry. These small bundles are then heaped one over the other and made into bigger bundles, tied tight with fibre ropes and carried by men and women to the threshing floor. Threshing is done by beating these bundles against raised planks. The straw is stacked in a corner of the threshing floor to be subsequently threshed by bullocks. Paddy, after threshing, is stored in the threshing floor in straw bins. Rice is made during the hot months and stored in straw "mudis."

On the Bettu lands only a single crop of paddy is taken. After the harvest of this crop, the land is ploughed once and left to weather till June when transplanting is done.

On Majalu land, sugarcane substitutes paddy in some years. When sugarcane is not grown, vegetables and chrysanthemum for domestic use and market purposes, are cultivated after paddy.

On Bailu lands, second crop of paddy is followed by a pulse crop or by a third crop of paddy. Artificial manures are unknown in this village, as in very many other parts. Loose-box manures and burnt earth, excreta of fowls mixed with ash are the only principal manures. Burnt earth is made as follows:—Green branches of trees which are felled for fuel purposes are brought and heaped up here and there in the field. When this is completely dried up in the hot season, a layer of earth of about a foot high is spread over it. Over this layer dried branches are again put to form another layer. Thus a mound about 6 feet high of alternate layer of earth and dried branches is formed. This is then set fire to and the whole mound gradually falls to ashes and burnt earth is obtained in a few days. This important manure is spread over the field in baskets just before the rainy season commences.

B. S. Tolar.

Seed Selection.

The Agricultural Department and others in various parts of the world have demonstrated that, without doubt, very considerable improvement can be made in the quality and yield of many of our staple crops by the adoption of a system of seed selection which could, and should be carried out over a period of years, and in fact, indefinitely, to attain the best possible results.

The following simple system which guarantees an improvement in yield of at least 20 to 50% and laid down by Mr. A. E. V. Richardson may be adopted for cereals or other crops as it involves little labour; but it should be carried out in detail.

Method of Improvement. The method proposed is to apply the same principles to the improvement of cereals as have hitherto been applied to the improvement of stock, choosing the seed only from the best individual plants. An ordinary crop of, say, wheat or paddy consists of a mixture of high yielding plants, average yielding plants, and low yielding plants. When we harvest such a crop the seed obtained is of average yielding capacity, is no better, if as good, as the seed which produced it.

If there were some means of isolating the prolific plants and growing the seed from these plants, we would find that the yielding power of the seed from these plants would be considerably increased, according to the judgment displayed by the operator.

One way of isolating these high yielding plants is to go through a crop just before harvesting and select the best developed and most compact heads from the best developed plants. These heads are threshed, the seed then graded and sown on the plot. Such a plot, because it consists of specially selected seed is called a "Stud plot." A convenient size for such a plot is $\frac{1}{4}$ of an acre. To get sufficient seed for such a plot about 25–30 lbs. of head would be collected. This represents not more than a half-day's work. These heads are threshed, and graded with either sieves or a blower, so that the undersized grains are removed.

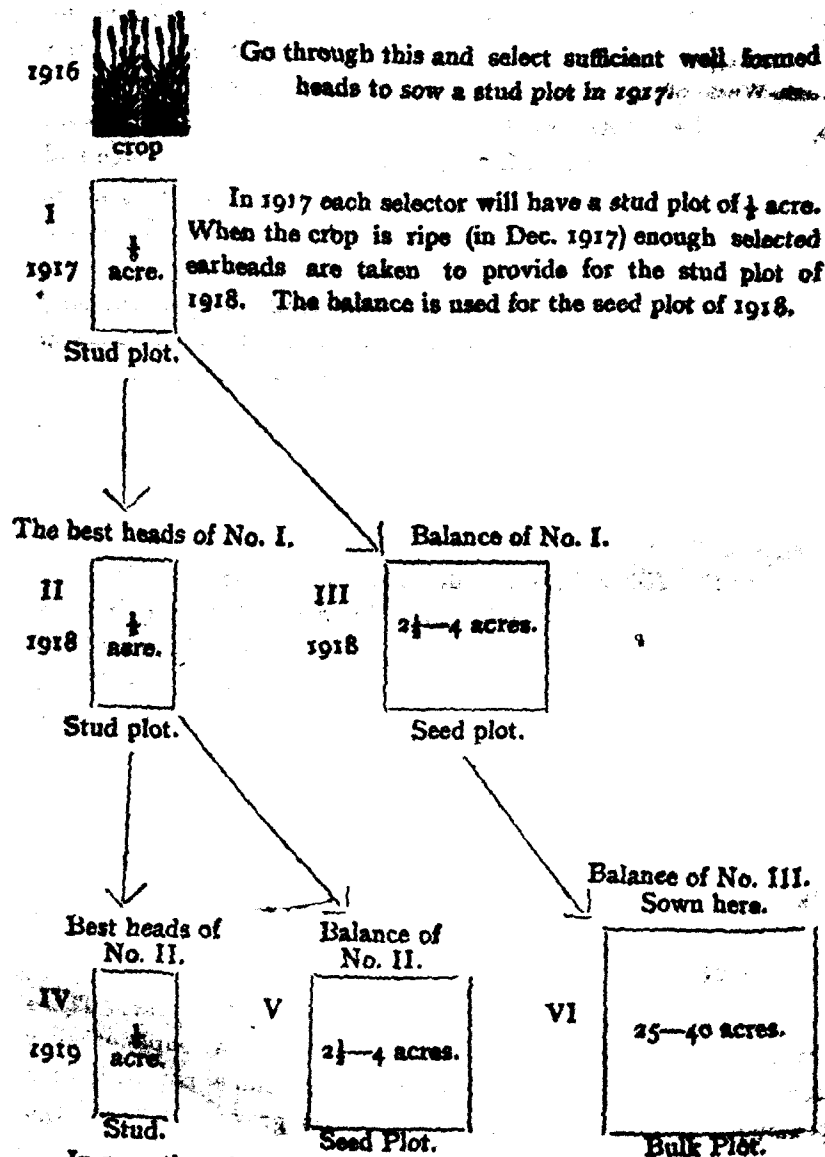
This seed should be sown on a plot of well-manured land in 1917. Before the stud plot of 1917 is harvested, preparations for the second year are made. Another 25–30 lbs. of heads are selected for the second year—the heads this time being taken from the stud plot instead of the general field. The same procedure of threshing and grading the selected heads is carried out, and the stud plot is sown as before on a fifth of an acre in 1918. This stud plot of 1918 has two years' selection behind it—selection of the best from the best.

The produce of the 1917 stud plot is harvested, the seed graded and sown the second year (1918) on as much land as the seed is available will permit. In an average season there should be sufficient graded seed from stud plot to sow at least $2\frac{1}{2}$ –4 acres. This plot we may call a "seed" plot. It is better seed than the main crop of the farm, but it is not quite as prolific as the "stud plot."

In the second year, therefore, there will be two plots—a stud plot of $\frac{1}{4}$ acre and a seed plot of $2\frac{1}{2}$ –4 acres.

At the 1918 harvest. As before we have to get the seed for the stud plot again selecting the best heads of 1918 stud plot. The seed plot of $2\frac{1}{2}$ –4 acres will be sown from the balance of the 1918 "stud" after the selected heads have been taken.

The seed plot of 1918 will be harvested, and sufficient seed should be obtained to sow about 30 acres in 1919.



In 1919 the selector will have three plots.

Journal of Agriculture, Victoria, Feb. 1917. C. N. A.

Notes.

Sheep Farming in Pachapalayam, Coimbatore District:—The village Pachapalayam is situated about 5 miles to the South-West of the Central Farm, Coimbatore, on the road to Muttam. The ryots are Kurumbers, whose fore-fathers were shepherds. They migrated from Mysore, settled in this village and took incidentally to Agriculture. They have not completely given up their original calling. Each family owns at least 50 sheep which are in charge of one of the male members, and there are families which live entirely by sheep-farming. In fact the only method of manuring in the village and neighbourhood is sheep penning which they do both for garden lands and dry lands.

One man can easily look after a flock of 50 sheep which is reckoned as the unit. This is known in Tamil as *50 ga Gaining*. A flock of 50 sheep costs on an average Rs 200 and usually consists of 2 rams, 30 to 35 ewes and the rest kids. The sheep belong to the Kurumbadu breed. The animals are usually white in colour some having a black face. The first kid is brought forth when the ewe is 1 1/2 years old and the sheep give only one kid at a time i. e., 2 kids for the year. Allowing for late parturitions, young animals, abortion and death, about 60 kids will be got on an average from a flock of 50 sheep annually. The kids are sold after a time at Rs. 2 each.

Breeding does not appear in any way to be controlled or regulated, with the result that no improvement is evident. The only precaution taken is to see that the rams are healthy and have no bad points about them.

The sheep get sufficient grazing throughout the year. There are large areas under wet land cultivation within a couple of miles from the village where the sheep are in constant requisition for penning. Moreover, Ragi and Tobacco are grown to a very large

extent in the garden lands of the villages near by and sheep-penning is the orthodox method of manuring such crops. The sheep are kept in these parts from January to September and taken to the West Coast in September—October. When cultivation commences here during the period September to January the sheep are grazed on the Malabar hills or penned in fields there for which the usual wages are obtained.

Some sheep are clipped in September, while others in June. The sheep are washed well, allowed to dry for 3 hours and the wool is clipped off close to the skin. Seven sheep yield wool sufficient for making one blanket (kambli) which requires 10 palams (12 oz.) to make i. e., each animal gives on an average $1\frac{1}{2}$ palams of clean wool. Rams give more wool than ewes. The wool is worked and woven into kambli by the women in looms at home.

The sheep of this locality suffer from a variety of diseases acute and chronic, contagious and non-contagious, but no trouble appears to have been taken to study the symptoms of the disease nor is any medical relief given to the animals. It is treated in the usual philosophical way of our people as due to God's will, and the animal is left alone to fight out the disease as best it can or succumb to it. The Farmer expects in a year about 5 deaths, —2½% on an average—in his herd from diseases or other causes.

On the whole the earnings for a man owning a flock of 50 sheep are as follows:—

By sale of 6 or 7 Kambli at Rs. 5 to Rs. 6 each	Rs. 35—0—0
By sale of 60 kids	Rs. 120—0—0
By wages for Sheep-penning @ 1 Vallam } per night throughout the year=12 } Salagais of grain @ Rs. 5 per Salagai }	Rs. 60—0—0
Total	Rs. 215—0—0

Against this may be set off—interest on Rs.200 @ 6%Rs.	12—0—0
Depreciation of the stock owing to aging of the animals, death &c. @ 6%	Rs. 12—0—0
Cost of loom, bill hook &c.	Rs. 11—0—0
Total	Rs. 35—0—0
Net income	Rs. 180—0—0

This is just sufficient for maintaining a family.

S. K.

Action of lime on Potash felspar:—In addition to supplying food requirements of plants, correcting acidity and helping nitrification in soils, the chief effect of lime on soils has been hitherto held to be to liberate potash from felspars, whether the lime is applied in the form of slaked lime, carbonate or gypsum. This view has been so universally accepted both by chemists and agriculturists, that conclusions drawn by Lyman J. Briggs in the recent issue of the Journal of Agricultural Research that lime does not liberate potash from felspars, and that in some cases, it depresses the availability, are not likely to go unchallenged.

Samples of Pegmatite and Orthoclase,—types of potash-bearing rocks—were finely ground and shaken for a number of days with aqueous solutions of Calcium hydroxide and of Calcium sulphate in different concentrations. The hydrate solutions did not modify the solubility of Potassium in Pegmatite or Orthoclase, while the gypsum solutions depressed the solubility of Potassium in Orthoclase, the quantity of Potassium dissolved decreasing progressively as the concentration of the sulphate increased.

Virgin soils of granitic origin were tested similarly and no more Potassium was dissolved in these soils when shaken with Calcium hydroxide or sulphate than with distilled water.

The addition of gypsum to a salt which was under cultivation and apparently less weathered than the virgin soil, decreased the solubility of potash.

Again it is generally accepted that sprouted seedling of wheat manifests a strong demand for potash entirely out of proportion to its demand for Nitrogen or Phosphoric acid. Thus when potash is present in a readily available form the young wheat seedlings will, during the first three weeks of growth take up potash to the extent of nearly 8% of their dry weight. The availability of potash in feldspars was tested by the growth of wheat seedlings. The analyses of wheat plants so grown showed that the potash content was the same in water containing finely ground Orthoclase and in saturated Calcium sulphate solution containing the same quantity of Orthoclase. The question is not likely to be set at rest, in view of the great position which Lyman J. Briggs holds in the ranks of Agricultural chemists. "From the Journal of Agricultural Research."

M. R. R.

A ploughing match :—The first of what is hoped will be a long series of ploughing matches took place in the Central Farm on Thursday, March 8th. Though the event had been well advertised, only a few people came from outside to watch the competition, but they seemed most keen in the ploughing. Competitors were permitted to use their own cattle, and in fact the entrance fee of two annas which was charged, was remitted in the case of those bringing their own animals. Unfortunately the serious outbreak of foot and mouth disease on the estate kept away all outside animals, and only two competitors from outside came.

The plough used was the Monsoon plough, and the area set apart was 25 cents. As a result of a previous trial to reduce the number of the farm men, it was thought that this would take about 8 hours to complete, but the first man finished in just under

The competition was stopped after 24 hours, when the sixteen competitors had finished. Judging was done by a score card, which was settled as follows :—

Speed	...	...	10	10
Efficiency	{	Straightness	...	5
		Ends and corners	...	5
		Middles	...	10
			20	
Total.			...	30 marks.

To judge of the efficiency of the ploughing the earth was lightly scraped away in a line right across the plot and thus crossing every furrow, and thus the furrow sole left could be seen. This varied very much, in some cases a perfect series of ridges were left, due to the ploughman either taking too much land, or working with his plough pointing into the ground—a trick which is very common. There were also a good many marks lost over untidy ends, mainly by allowing the animals to come round in a circle instead of going straight to the finish. This proved disastrous when the change from gathering to splitting took place.

There were sixteen competitors of whom two came from outside the estate, but failed to get a prize. All the maistries were entered compulsorily, but one had a bad foot and was unable to compete. The five judges, Mr. Parnell, Mr. Ananda Rao, Mr. Wood, M. R. Ry. S. Subrahmanya Ayyar and C. Nanyana Ayyar, went over the ground the next morning and unanimously put Komaran first. Two maistries and two other men, one of them a chuckler, were the other prize winners. The first prize was a Monsoon plough complete, the others were clothes and whips.

B. C. W. or

Calcium Cyanamide.—Calcium Cyanamide is known as a very good manure to the agricultural world and is gaining favour with farmers year by year. In fact the hopes of scientists are centered about this grey-black substance as the one that will be mostly responsible for the world's food supply in the near future. It is this that can compensate for the incessant drain of nitrogen from the soil. Though it is a substance quite familiar to every progressive agriculturist, yet, very few of us know how it is made and what a bright future it has before it.

Dr. Geoffrey Martin in his interesting work on "Modern Chemistry and its wonders" gives a description of its manufacture, an abstract of which is given below.

Calcium Cyanamide is a compound made up of Calcium, Carbon and Nitrogen and the combination is effected in huge electric furnaces with a current of some 4000 amperes at 50 to 120 volts. These furnaces are nothing but the familiar arc lamps on a gigantic scale. Coke and lime are first reduced to small pieces and then introduced into these furnaces. After some time the lime and the coke melt and unite to form the familiar Calcium Carbide—the carbide of cycle lamps—in a molten state which has then the enormous temperature of 3500 degrees centigrade. The molten mass is then tapped out of the bottom of the furnaces into big cast iron moulds and after cooling is crushed.

The next operation is the conversion of this carbide into calcium cyanamide. For this purpose, it is heated in special-retorts into which atmospheric nitrogen forced at a temperature of about 800 degrees centigrade. The atmospheric nitrogen is obtained by first liquefying the air and then submitting the liquid air to fractional distillation. By this means the nitrogen is separated from the oxygen and is then pumped into the retorts under pressure. The result is that a portion of the carbon of the carbide separates out as graphite and the rest is formed into calcium cyanamide (Nitrolime) containing about 20 per cent of nitrogen. It is then cooled and crushed and ground to a fine powder and treated with a little water to decompose

any carbide still present. After drying it is sent into the market as a manure ready for use.

This manure is in great demand. Though started only in 1907, yet in 1913 about 223,500 tons of this manure were produced in the whole world.

This industry thrives best in places where nature has provided an abundance of water power for generating electricity which is the most important source of energy for this industry.

The principal centres of calcium cyanamide production are situated at Odda in Norway, where rushing water-falls and down-pouring torrents abound.

So much as a manure. In addition it seems capable of being utilised in other directions and its future possibilities can hardly be predicted. Cyanamide, which can be obtained from calcium cyanamide, possesses the very interesting property of combining with water with the formation of urea—the substance which occurs in urine. Taking advantage of this property urea is now made in tons to meet the demands of the Pharmaceutical World. Guanidine, another product of the animal body is also made from it.

Another, and still more wonderful achievement is that one of the substances of the human muscle, creatine, which is the stimulating principle of beef tea, can actually be prepared by uniting sacosine with cyanamide. Dr. Martin rightly exclaims, "Perhaps we may look forward to the time when many of the actual constituents of our food are directly manufactured from Atmospheric nitrogen!" B. V. N.

The Sweetness in sweet potatoes :—Readers of this Journal might have had instances when sweet potatoes were found insipid instead of being sweet. It is not uncommon to brand sweet potatoes exhibited for sale by a particular vendor or the produce of a certain village or farm as particularly insipid. This lack of sweetness is sometimes attributed to the deficiency

of the soil or seed or both. These may also be partly responsible for the want of sweetness in the roots, but the main cause appears to be that the roots are dug out and exposed for sale as soon as the vines are cut off without allowing time for the necessary changes in the Carbohydrates of the roots and the ultimate production of sugar, which is essential for the tubers to be sweet.

That changes occur in the Carbohydrates of sweet potato on storage has been recently demonstrated by Heinrich Hasselbring and Lon A. Hawkins in an interesting paper in the Journal of Agricultural research. They experimented with both the sugary and starch types of sweet potatoes and in both cases they found that changes in the Carbohydrates occur after the activity of the vines was stopped. They conclude that the sweet potato has a very low sugar content during the period of its growth and that the reserve materials from the vines are transferred almost entirely in the form of starch; but immediately after harvest there is a rapid transformation of starch into cane sugar and glucose.

The authors have also concluded from the experimental data before them that the first conversion product of starch is glucose which is in turn converted into cane sugar. The conversion of starch into sugar is inhibited as long as the vines are growing, but as soon as the vines are cut off the influx materials from the vines to the roots is stopped and the process of further elaboration begins even if the roots are left underground.

It thus seems that a reasonable period of storage, say, about a week or ten days, contributes to an increase in the sweetness of the sweet potato.

B. V. N.

The D'Silva Memorial Fund.

2nd List of Subscriptions Promised or Collected.

M. R. Ry., K. T. Alwa ...	Rs.	5-0-0
" T. Budhavidia Rao ...	"	2-0-0
" S. L. Mathias ...	"	50-0-0
" K. Raghavachari ...	"	2-0-0
" Sambasiva Aiyar ...	"	1-0-0
" K. Ramiah ...	"	2-0-0
" G. N. Rangasami Ayyangar ...	"	1-0-0
" C. R. Srinivasan ...	"	2-0-0
" C. Tadulingam ...	"	5-0-0
" U. Vittal Rao ...	"	2-0-0
" T. A. Rangasami Ayyangar ...	"	1-0-0
" L. S. Narayanasami Aiyar ...	"	1-0-0
" M. P. Kanni Kutty ...	"	1-0-0
" V. S. Narayanasami Aiyar ...	"	1-0-0
" M. Mangesha Rao ...	"	1-0-0
" K. Krishnamurthi Rao ...	"	3-0-0
Total ...	Rs.	85-0-0

Amount subscribed already (1st List) ... Rs. 160-0-0
Grand Total ... Rs. 245-0-0

Old students and admirers of Mr. D'Silva are requested to kindly send in their contributions at an early date, so that it may be possible to arrange to unveil the portrait of Mr. D'Silva when they meet at Coimbatore, for the coming College Day and Conference.

T. N. V. Tirumalpad.
K. Raghavachari.

Joint Secretaries.

Estate Notes.

A Hockey Match :—A friendly match at Hockey was played on our grounds on the 20th ultimo between *The Town United Eleven* and our team. The match was not well-contested as we had no regular practice for this term. The opponents had made up a good team by bringing players from several institutions, and to their credit scored 5 goals against one.

A Lecture :—A public meeting was held on the 2nd instant under the auspices of the Students' Club when Mr. K. T. Alwa read an interesting paper on "The South Canara Ryot" under the Presidentship of Mr. D. Ananda Rao, B. Sc. There was a fair attendance of students and officers. The lecturer gave a graphic description of the agricultural practices of the ryots of the South Canara District.

The Tennis Tournament :—The annual Tennis Tournament for the "Cecil Wood Cup" was held in the first week of this month. As many as 20 students competed and the finals were played on the 5th instant between T. G. Muthusami of class II and K. K. Subramaniam of class I. The game was rather one sided and T. G. Muthusami who had already met and defeated the other good players in the early rounds, easily defeated his opponent in 2 straight sets.

The principal who kindly umpired the match, in requesting Mrs. M. R. Ramaswami Sivan to present the cup to the winner, narrated the circumstances in which the present cup was instituted by Mr. B. Dwarakanath, who was himself the winner for three years in succession of the cup then instituted by himself. After Mrs. Sivan presented the cup to the winner, cheers were proposed to Mrs. Sivan for presenting the cup to the winner and the umpire of the day, all of which were lustily responded to.

Medals were also presented to the winner and runner up. Scores are noted below.

Semi Finals :—T. G. Muthusami beat S. Kuppusami 6—3; 10—8.

K. K. Subramaniam beat R. Jagadisan 6—0; 4—6; 6—3.

Finals :—T. G. Muthusami beat K. K. Subramaniam 6—3; 6—4.

Contribution by the Union :—A very welcome contribution of Rs. 50 was received from the Union towards the permanent equipment of a proper stage for the various performances which are held at times in the College Hall. It was thought best to make a start by purchasing a pair of good proscenium curtains, and eventually a sum of Rs. 35 was spent on a full sized pair of blue curtains. Rings for these were kindly presented by Mr. Mac Rae. A sum of Rs. 8 was spent in arranging a frame for this and the balance of Rs. 7 has been paid into the Students' Reading Room Fund.

The "Parlakimidi Cup" :—Our readers may remember, that in our issue for October 1916 an announcement was made of a donation of Rs. 100 by the Zemindar of Parlakimidi for the institution of a cup for the best athlete of the College. We are glad to learn that the cup has been awarded to S. Dharmalingam Mudaliar as being the best all round sportsman of the past year. The rules governing the award of the cup are as follows.

1. The cup is a winning cup and is open to present Student members.
2. The cup will be held by the winner for the year and the name of the winner will be inscribed on it.
3. The following is the system of marking.

(a) Athletic sports 5, 2 and 1 marks to be given for the 1st, 2nd and 3rd in the following events.

- | | |
|-----------------------------|------------------------|
| 1. 100 yards race. | 6. Obstacles. |
| 2. $\frac{1}{2}$ mile race. | 7. Long jump. |
| 3. $\frac{1}{4}$ mile race. | 8. High jump. |
| 4. 1 mile race. | 9. Cross-country race. |
| 5. Hurdles. | 10. Putting the shot. |

Sports held
on College
day 1916.

4. Hockey and Foot ball and Tennis 12, 9, 6, marks for the 1st, 2nd, 3rd and 4th in each of the games.

5. Cricket, 6, 4, 2 marks for the 1st, 2nd, 3rd respectively.

6. The points for Hockey, Foot ball, Tennis and Cricket is left to the Committees appointed by the Principal of the College.

The total marks come to 94.

Students' Club:—Our friends must have been wondering at the long continued notice of the coming Students' Reading Room, but we are happy to be in a position to state that the building is now well under way and will be finished if all goes well by the end of March. We take the opportunity therefore of asking now for subscriptions so that on the Opening Day, if we cannot actually point to the books on the shelves which would be ready for them, we shall have some ground for our imagination to picture them. All contributions, large and small will be most thankfully received by the Students' Union. Pending the election of a selection committee on which both Officers and Students will be represented, the Principal has consented to receive subscriptions which will be duly announced in the Journal of the Union.

First List of subscriptions for the Students' Reading Room.

Anonymous ...	Rs. 100-0-0
R. Cecil Wood, Esquire ...	Rs. 20-0-0
Balance of stage curtain money	
From M. A. S. U. ...	Rs. 7-0-0

Garden Prize (from students of

Block I ...	Rs. 6-0-0
Dr. C. A. Barber ...	A fine set of Chambers' Encyclopaedia.
Anonymous ...	Rs. 2-0-0
From students of Class II (1915 admission)	Rs. 100-0-0.

Officers' Club:—Two of the members Messrs. J. G. Rodrigues, and Y. Ramachandra Rao, M. A., had to leave the Station—the former as Inspector of Agricultural Offices and the latter as Officer on Special Duty, Lantana Pest Investigation. The Club arranged suitable send off to both of them.

Variety Entertainment in aid of the Madras War Fund:—The above entertainment by the Students of the College, came off on the 3rd Feb. and was quite a success. Two short pieces were put on boards,—the "Old Score" in English and "The Demon Land" in Tamil. There was quite a large audience from Coimbatore, and a sum of Rs. 435 was collected. Out of this amount Rs. 325 has been sent in aid of the War Fund. We understand that Rs. 110 which represents the total expenses, has been usefully spent in making necessary additions to the stage fittings and costumes with a view to enable the students to have a set of them permanently as otherwise considerable amount has to be spent annually as hire charges for these during entertainments. We have been authorised to thank the several gentlemen from the maffasil who were kind enough to send in donations for the above.

Reviews.

Janopakar—a high class Tamil monthly devoted to Social, Literary, Economic and other topics of interest, Vellore S. India—Annual subscription Rs. 3.

We are thankful to the publishers for sending us the January issue. The above Journal has apparently completed the first year



A Peculiar Coconut Tree.

(See Page 86)

THE JOURNAL
OF
The Mādras Agricultural Students'
Union.

Vol. V.

April 1917.

No. 4.

Editorial Notes.

On the 31st of March 1917 a meeting was held in the big lecture room of the College for the purpose of presenting 'Certificates of Proficiency' to the successful students of the 2 years' course. The function was shorn of some of its usual importance by the fact that there was to be no presentation of 'Diplomas' and the visitors missed the usual academic-robed 'Senatus' on the dais.

The Principal opened the proceedings by briefly reviewing the principal activities during the past collegiate year and said that with the coming year the college was entering on a considerably altered course of studies. The Students' Club, he remarked, had shown a rather marked activity during the year under review. The outgoing students had had the rather unique privilege of taking part in the construction of the 'Games Pavilion' of the college and in this they had shown great enthusiasm. By their

own personal exertions they had made possible the construction of a more spacious building than that covered by the government grant and are thus leaving behind a rather substantial legacy to the future students of the college. We can easily imagine some of these students hanging about this structure of brick and mortar at future 'College Day' celebrations and feeling a sort of filial love towards it. He greatly commended the spirit in which the outgoing students made a joint contribution of Rs. 100 for the purpose of providing book-shelves in this pavilion.

After presenting the certificates the Director of Agriculture gave a stirring and instructive address to the outgoing students. He dwelt on the paramount importance of Agriculture for a country like ours and pointed out the value and possibilities of Agricultural research in this country. He asked the students to remember that the free education they have been receiving at the college had really cost the government a good deal. Every pie of this sum was ultimately derived from the ryot—the patient, toilsome, hard-worked and sun burnt figure which one can see anywhere and everywhere. To him they owed all the comforts while at the college, the superb buildings, the well-equipped laboratories and the training they had received. Their duty then was plain and that is 'to try and return to the ryot what little they can in return for the bounties they had themselves enjoyed.' We hope that this earnest and direct appeal has sunk deep into the hearts of all the students past and present.

We understand that small stocks of Natal Java Indigo seeds on hand at the experimental station at Peradeniya, Ceylon, would be made available for those who wish to experiment with that plant, at 25 cents (4 annas) per ounce to cover cost of packing and postage. Supplies of up to 4 oz. will be allowed to each applicant and it is estimated that this should be sufficient to plant 1/16 of an acre, but as the stocks of seed are extremely limited, applications should be sent in early. It is thought May-June would be the best time to sow the seed and full instructions will be sent with each packet of seed.

We are extremely sorry to announce that B. Satyanarayana Sastri, a promising student of the present first year class died on the 23rd ultimo at Chodavaram, Vizagapatam. He has been ailing from dyspepsia for over a month and went home for treatment. We offer to his father-in-law Mr. M. Subba Rao, B. A., B. L., First Grade Pleader, Chodavaram—and his other relatives and friends our sincere condolence.

*** A brief recollection of the life of a South Canara Ryot.**

Ryots of any locality are the simple and humble children of their surroundings, trying to take advantage of Nature's blessing and to avoid as far as possible Nature's curses in growing crops and thereby earning a livelihood. To understand the surroundings of a Canara ryot, one should know the physical features of the district.

*Brief note of a paper read under the auspices of the Students' Club.

Canara is a long strip of land in the Malabar Coast lying between the Western Ghats and the Arabian Sea. It is about 150 miles in length from North to South and 25 miles in breadth at its narrowest and 50 miles at its broadest. It is a very uneven district with numerous rivers taking their source on the Western Ghats and flowing in a westerly direction into the Arabian Sea. It is a district of hills and dales. It is a district which is full of networks of river basins, valleys and hollows varied with hills, ridges and elevated plains. In such river basins, valleys and hollows, under the shade of the coconut trees lives the peaceful and contented paddy grower of South Canara. The ryot always lives in his land. There is nothing like village sites in Canara as we find in southern districts. The houses in the villages are scattered about and each farmer will have his homestead in the midst of his holding where he lives with his family permanently. This is the chief peculiarity of South Canara and Malabar. Canara is entirely a paddy growing district and the crop is rainfed. On an average, the annual rainfall is 120 inches and the major portion falls during the south-west monsoon. The distribution of rain is as follows, hot weather rain,—about 6 inches in April and May, south-west monsoon,—about 95 inches from June to September, and North-east monsoon rain,—about 20 inches from October to December.

Soil and Classification of land :—The soil of Canara is mostly a shallow laterite soil having a very thorough drainage. But here and there along the coast, sandy soils are found and also some stiff soils in the interior parts. The paddy lands of the district are divided into four main classes such as *Patla*, *Bailu*, *Majalu* and *Bettu* lands. This classification is partly based upon the number of crops raised in a year and partly on the level of these lands. *Patla* lands are the most low lying lands which will be under water during the first crop season, so no cultivation is possible then. Such lands are not found in all villages and form only a minority. They are generally found near back waters and river basins and only one paddy crop is raised. *Bailu* lands are higher than these and in this class of land two paddy crops and sometimes a third crop of pulse are taken in a year.

Majalu lands lie a little higher than the *Bailu* lands and one crop of paddy and another of pulse are taken in a year. *Bettu* lands are situated higher than *Majalu* lands and a single crop of paddy is taken. The above classification is a general one and slight changes in the number of crops might take place according to the availability of water or moisture.

Seasons :—The *yanelu* or the first crop season commences in June and ends with September—October; the *suggi* or the Second crop season begins with October—November and ends with January—February. The third crop known as *Kolakai* is raised during hot weather from March to May. At this season invariably a pulse crop is raised on *bailu* lands and in very rare cases paddy is raised wherever water is available. First crop paddy is grown on all three classes of land except *patla* lands where no first crop is raised on account of their submersion under water.

Systems of paddy nursery :—The agricultural year begins in April and the first work of the ryot is to prepare the nursery for the first crop. There are three systems of preparing nursery (1) Dry nursery (2) Wet nursery with the aid of irrigation (3) Rainfed wet nursery. After the harvest of the previous paddy crop in February, the ryot ploughs the land intended for dry nursery in dry condition and tries to conserve moisture, applies ashes and cattle manure to these plots and sows the seed in about the middle of April. The seed sometimes germinates if there is sufficient moisture in the ground, or the ryots get some hot weather showers in April-May which help the germination of these seeds. Hot weather wet nursery is sown in May and irrigated from tanks or any other water source. The third, the rainfed wet nursery is sown in June after the setting in of the monsoon. As soon as the monsoon sets in about the end of the first week of June, the ryot prepares his best lands and transplants them with dry nursery seedlings, then he transplants some more lands with seedlings from the second kind of nursery and lastly he pulls out seedlings from rainfed wet nursery and transplants them. From the middle of June till the end of July the ryot will be busy with first crop work. These different kinds of nurseries, sown at different times, help the

ryot to adjust his work evenly and properly. After transplanting till the harvest time in September-October the ryot has very little work. In August he will direct his attention towards his coconut garden. He will open the bottoms of coconut trees and manure them with green leaves. He is also engaged in collecting cattle manure in his loose boxes for the second crop paddy.

Second crop nursery:—About the end of August or early in September, the ryot prepares his nursery for the second crop of paddy. For this purpose, he keeps a portion of his bettu land without raising the first crop, or prepares his nursery about the end of September, after harvesting a portion of his first crop paddy in bailu land. In fields intended for nursery, he puts an early maturing variety during the first crop season.

Second crop season:—After the harvest of the first crop in September-October, he immediately prepares his bailu lands for the second crop, manures them and transplants them in October-November. The harvest of this crop takes place in January-February. Generally for the second crop a short duration variety is put. In Majalu lands after the harvest of the first crop, a pulse crop such as horsegram is taken and bettu lands are left fallow.

Water supply:—The first crop in South Canara is entirely rainfed and for the second crop rain is supplemented with flowing water. Each village will have one or more streamlets which take the extra rain water to a neighbouring river during the south west monsoon. In November these streamlets are bunded at convenient distances and the flow is stopped. Water collects and is utilised for irrigation purposes. These streamlets serve as drainage channels during the first crop season and as a source of irrigation during second crop season. Sometimes water is lifted from rivers and tanks with picotah for the second crop.

Third crop season:—After the harvest of the second crop from bailu lands, a pulse crop is taken during the hot weather and when there is water facility a third paddy crop is sometimes taken. This

crop is harvested in April-May and the ryots agricultural year ends with this.

Source of manure:—The important and the only manure of South Canara is the cattle manure from loose boxes. This system of collecting manure is universally adopted in the district and Canara is the home of this mode of collecting manure. This system is the outcome of the surroundings of a Canara ryot. In a place having 120 inches of rain with strong winds, ryots cannot tie the cattle in open sheds. They should have strong and well built cattle sheds. When there is no work and when there is heavy rains, cattle remain in these sheds. Just after rain sets in, the ryot gets a lot of green grass and for wetland work buffaloes are better suited than bullocks. These buffaloes eat a lot of green grass and void large quantities of urine and loose dung. The cattle shed soon becomes dirty and the ryot thinks of preventing his animals from becoming dirty. Canara is a hilly district and is full of vegetation. The ryot brings green leaves from hill sides and spreads them over the dung and urine. This forms a very good manure and plays an important part in the paddy cultivation of the district. In the months of August and September ryots are busy in collecting manure for their second crop paddy. At that time lot of green litter is available in the common village forests and Kumhi lands.

Kumhi lands and common village forests:—The Government waste land lying near a cultivated area is left to the use of the adjoining ryot free of assessment. From this the ryot brings green leaves for his cattle shed. Such lands are called Kumhi lands and the extent of this is about 100 yards from the boundary of an assessed land. In certain villages we find common village forests. Government has given to the ryots certain waste lands for grazing cattle, bringing litter for cattle sheds, and collecting thatching grass for the homesteads of ryots. This forms the common property of the villagers and it is managed by them. But of recent years, on account of greater demand for land, such lands are becoming patta lands and are being assessed. For the first crop during the heavy southwest

monsoon; ryots are not in favour of applying much manure to their lands except to high lying lands. For the second crop all available manure is applied. He has ample green leaves in July, August and September for litter and ample green fodder for his cattle and the mire loving buffaloes find the litter in these loose boxes, a warm bedding during the rainy season. A very superior quality of manure is got from these loose boxes. The district is not a very fertile one and it will be an average one. Taking both the crops, an acre of bailu lands might yield 2500 lbs. to 5000 lbs.

Holdings and the agricultural classes of the district:—A good portion of the cultivated area is in the hands of the *Bunts* who are both the land owning and the cultivating class of the district. By this I do not mean that no other castes own land and cultivate it. Every caste from the Brahmin down to the Pariah owns land and cultivate, but the Bunts are known as the agricultural class of the district. Jains, Billawars and Christians also cultivate a good portion of the land. The farmers may be divided into 3 or 4 classes:—
 (1) Tenant farmers are those who cultivate the land of others;
 (2) tenant and wargadar farmers are those who cultivate their own land, in addition to this, they cultivate others' land. Their own land is not quite sufficient to maintain their family. (3) Moderate wargadars cultivate their own lands which is sufficient to maintain their families. (4) The big wargadars cultivate a portion of their lands and the remaining portion they let out on lease. The 1st and the 2nd classes are not in affluent circumstances, but the 3rd and the 4th classes of farmers are in moderately good position. The wealth is well distributed in South Canara. We have no big zamindars or mirasidars as we have in Malabar or Tanjore. Another peculiarity of the district is that we have very few absentee landlords. Most of the landlords are themselves farmers and live in their land and see what their tenants are doing. They are in a position to know the requirements of their lands and tenants. They are in a position to know who is a good tenant and who is a bad tenant. This system of close association between the landlords and tenants has a lot of advantages to both parties. Another factor which might have had

some influence on the agriculture of the district might be mentioned. Most of the agricultural classes such as jains, bunts, billawars follow a joint family system. According to this system, the inheritance to the property passes from uncles to nephews in the female line. All the members of the family by the common ancestress live together and the family property is not divided. The senior most member of the family is the manager of the family property and he as well as other members work for the common good of the family. As the property was impartible and all able-bodied members worked for the common good, cultivation of the family property was very effective and paying. These joint families had land, capital and men to work, the three essentials of wealth. But of recent years some change is taking place. Management of the family property is not properly done. Dissention arise and family members do not take part in agriculture. Hired labour is not efficient, so agriculture suffers. Home cultivation is given up, lands are given on lease to poor ryots who have neither the capital nor the energy to do work. If such things are allowed to continue, it will affect the agriculture of the district as well as the prosperity of the agricultural classes.

Agricultural labour:—The most important class of field labourers is the Holaeya or Pariah class. They form a very large proportion of the population of the district and are eminently well suited for wetland work. They contribute a large share to the prosperity of the agricultural classes. These holaeyas are attached to their agricultural masters in two ways such as Mula Holaeyas and Salatha holaeyas. Mula holaeyas are attached to the family of the ryot or to the land itself from time immemorial. Salatha holaeyas are attached to their masters on account of certain debt which they borrow from their masters especially at the time of their marriage. The latter as soon as the debt is paid off is free to go wherever he likes, but the former cannot so easily change his master. Although, there is no legislation to keep these Mula holaeyas from going away, yet custom keeps them attached to their masters, but of recent years the custom is slowly giving way to better wages outside the district. These Holaeyas are very good workers and identify themselves with the

prosperity of their masters. Wages are paid in kind, a man gets 2 lbs. of rice and a woman 1½ lbs. per day. In addition to this, they get presents in the shape of clothes and grain at the time of harvest and festivities. The district being an entirely paddy growing one, there are certain slack seasons and also during the heavy rain of the south-west monsoon, it is difficult to get any outdoor work. Such being the case, these poor people suffer and of late years, they have begun to go out to the Coffee and Rubber estates of Coorg and Travancore. Now the ryots have begun to feel the labour difficulty.

Leases:—There are three systems of leases, viz., annual, periodical and permanent. Landlords prefer to give their lands on annual leases, but tenants always wish to have periodical or permanent leases. Generally landlords receive some money from tenants and give their lands on periodical and permanent leases. Periodical leases run for 10, 15 or 20 years and sometimes to the life period of a man. If the tenant does any improvement in the land, the landlord will have to pay for it at the end of the term of the lease, and he cannot evict his tenant or increase the rent before the term expires, provided the tenant pays his rent regularly. The same conditions hold good in the case of the permanent lease, but the tenant and his family enjoy the land permanently instead of a period. In this case, the landlord almost loses his hold on the land, but he has only a right on the fixed rent. On account of the great demand for land for cultivation, a certain amount of shifting of tenants is going on, but the landlords care much for the good opinion of their tenants. If a landlord often shifts his tenants, he loses the confidence of his tenants and becomes low in the estimation of other landlords. So even if the leases are annual there are tenants who have been attached to certain landlords for generations and generations. The connection between the landlord and the tenant does not stop with the land alone, but it runs in the communal life of the village. They recognise one another's importance in the social life of the village. The landlord fully knows that the good opinion and the adherence of his tenants are quite essential for his reputation as a trustworthy landlord. Such being the case there is harmony between the landlords and the tenants in most cases.

Other crops:—Next in importance to paddy comes coconut. Every ryot in S. Canara will have a few trees around his house and on the bunds of his paddy lands. This is a very important crop to a ryot and he cannot comfortably get on without it. It forms an important part of his diet. There is a good supply of fish all along the district and the coconuts supply the fatty constituent of the food of the poorer and the middle classes of people who are not vegetarians. As the cattle of the district is very poor, much ghee cannot be had. So nature has supplied these people with a cheap form of fatty food. Sugarcane cultivation is slowly coming into prominence in the district. One finds large areas under arecanuts in the interior part of the district.

This brief note on the agriculture of the district is written to remind the students that agricultural practices vary from district to district and certain practices are the outcome of natural surroundings.

K. T. Alwa.

Planting of single seedling of paddy.

The following extract about the paddy seedling experiment taken from the Annual Report of the Chinsurah Agricultural Station for 1912-13 seems to bring to light that success of single planting of paddy depends upon certain conditions.

“Paddy seedling experiment:—The transplanting of one, two and four seedlings was compared during the last three years viz., 1909-10, 1910-11 and 1912-13. In order that one seedling may give its maximum return transplanting should be done sufficiently early to allow the plants to tiller to its greatest capacity.

In the first year one seedling gave the highest outturn, but in the second year when transplanting had to be postponed to

to the end of August four seedlings gave the highest return. In the third year transplanting was done in July and one seedling again gave the highest outturn. In 1912 transplanting was late and again four seedlings were best. The following table shows the average result for 1909, 1911 and 1912 and of original plots only for 1910 in which year the duplicate plots could not be transplanted :—

No. of seedlings transplanted 10" apart.	Average outturn per acre		Outturn per acre		Average outturn per acre.			
	1909-1910,		1910-1911.		1911-1912.		1912-1913	
	grain	straw	grain	straw	grain	straw	grain	straw
	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.
One seedling	31½	33½	8½	9½	19	39	20½	20½
Two seedlings	25½	31½	12	14½	16	31½	22	27 & 1/5
4 seedlings	24½	28½	17 & 7/8	16½	17½	36½	30½	38½

“To determine up to what date transplanting of one seedling may succeed, one seedling was transplanted on 7 different plots every week from the first week of July. The results shown below are striking and explain why one seedling has not been successful in many cases :—

One seedling transplanted in	1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week
	July	July	July	July	August	August	August
Outturn per acre in mds. } grain	32½	27½	22 & 2/5	24½	21½	18½	17½
} straw	34	32	27	26	23½	21½	18½

The success of planting singles is bound up with the earliness of the main crop season. There also seems to be a limit in the season for planting singles beyond which the singles will not give good results.

In a way the results of the experiments conducted at the Chinsurah experimental station about the planting of paddy seedlings singles or doubles is quite comparable with the results of the spacing experiments conducted at the central farm Coimbatore. The following table has been compiled from the annual scientific reports of the central farm from 1907 to 1915.

Sinna samba.

‘Out-turn per acre in lbs.’

Date and year of transplanting.	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15
	27 Au.	11 Se.	27 Au.		14 Au.	30 Jl.	17 Au.	22 Au.
Singles 9"	3208	2244	3483	3123	3478	2709	3197	3513
Doubles 9"	3422	2319	3691	3195	3099	2773	3581	2566
Trebles 9"	3509	2538	3843	3631	2905	2813	3297	3224

The dates of transplanting are only approximate.

Though the table is compiled from the results of the spacing experiments, yet it sufficiently and accurately goes to corroborate the results of the Chinsurah experiments.

In the Central Farm the planting has been done at some period between the end of July to the second week of September, and in all years when planting had to be done late either the doubles or the trebles have been giving good outturn. In 08-09 when planting was done about the 11th of September the trebles headed the list. On the other hand in the year 1911-12 when planting was done about the 14th of August, the singles gave the highest return. Again in 1907-08, 1909-10, 1912-13, 1913-14 and 1914-15 when transplanting had to be done some days in the third or the fourth week of August, doubles or the trebles were best. The same table arranged according to the date of transplanting from the earliest to the latest runs as follows :—

‘Out-turn per acre in lbs.’

	30 July.	14 Aug.	11-17 Aug.	17.26 Aug.	about 27 Aug.	28-29 Aug.	11 Sept.
Singles 9"	2709	3478	3197	2813	3205	3483	2244
Doubles 9"	2773	3099	3681	2554	3433	3691	2319
Trebles 9"	2813	2905	3297	3236	2599	2843	2508

From the foregoing table it can be inferred in a way that up to the middle of August or even a little earlier singles seem to give a better outturn. About the middle of August the doubles give good result. But during the third or the fourth week of

August transplanting in trebles seems to be preferable to singles or doubles.

I have noted the above when I was looking after my farm before I joined the college. But I have no figures to give. All the same my early planted paddy gave very good outturn while the crop that had to be planted a month late gave a poor return. Both the early and the late crops were planted in singles.

These experiments and experience refer only to main crop paddy. It may be that the results are of local value and perhaps the results may not hold good anywhere and everywhere, but still this gives us a basis for future accurate trials to substantiate the truth of the fact in different localities for both the main and the second crop.

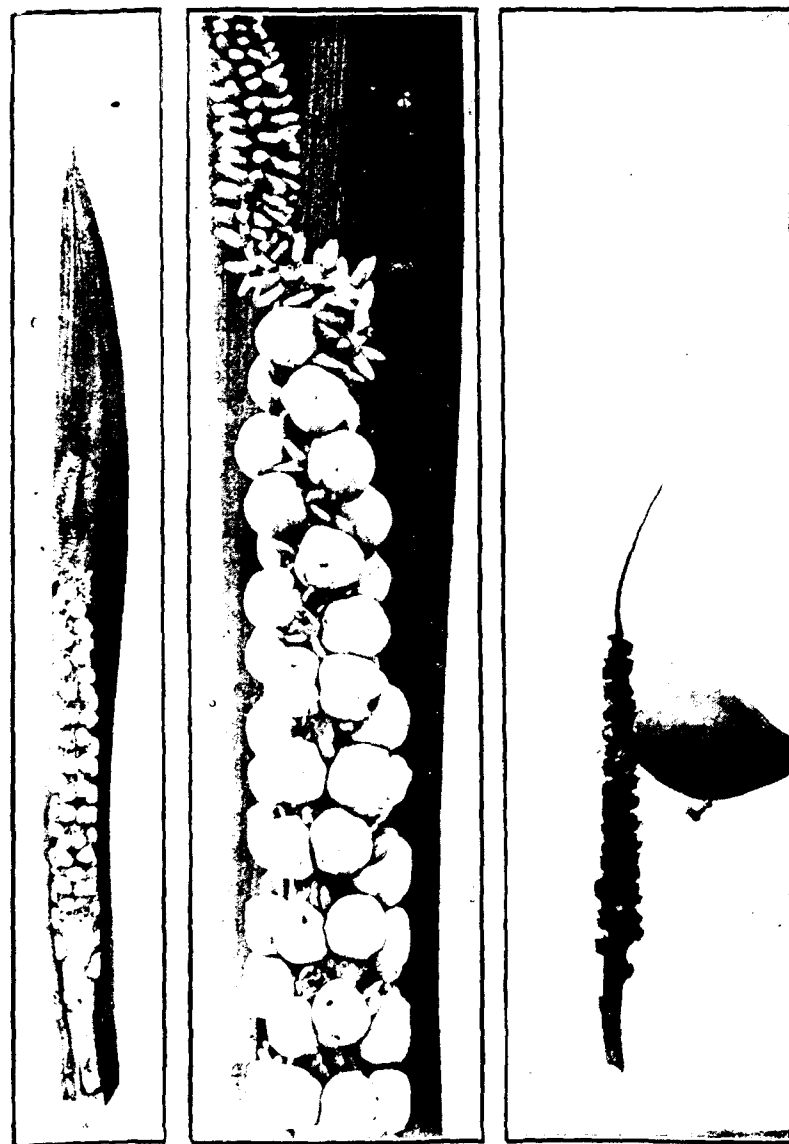
C. R. Srinivasan.

Notes.

A peculiar Coconut tree :—As a frontispiece to this issue of the Journal is published a picture of a coconut palm noticed by me growing in a friend's house in Triplicane, Madras.

The peculiarity about it is in its inflorescence, which, unlike the ordinary palm, (*Cocos nucifera*, Linn.) is unbranched, but consists of a fairly thick stalk to which the coconuts are as it were stuck up. I examined about a dozen inflorescences of this tree and noticed from 90 to 130 little coconuts in the early stages and in no case did more than three remain to mature. Enquiry about the origin of this plant elicited no more than the bare fact of its introduction as a novelty by a mahomedan merchant from South Arcot.

I shall be glad to learn if any of the readers of this journal have come across a similar tree. Such information may go to



1. Young inflorescence
2. The same magnified.
3. Spadix with one coconut.

strengthen my suspicions as to this "freak" being a distinct species of *Cocos*.

C. Tadulingam,

Agricultural College, Coimbatore.

The Agricultural Advisor to the Government of India writes thus in the book "Agriculture in India" 1915-16:—"The Poona College Magazine was started in 1909 and the Journal of the Madras Agricultural Students' Union in 1913 and both of these are serving a very useful purpose in bringing the whole of the past and present students into touch with the present day efforts at Agricultural development. As the material published in them is intended to relate directly or indirectly to Agriculture and consist of actual experiences of the students and of accounts of what is being done by the Agricultural Departments, these magazines are useful not only to students but also to others interested in the improvement of Indian Agriculture."

*Pollination and cross fertilization in Chulam—"Andropogon Sorghum":—*This is the subject of a Pusa memoir by Mr. Graham, Economic Botanist, Central Provinces. Working at it for a number of years he has got the following results:—

*Flowering:—*The flowers in the panicle open in a regular order commencing from the top and gradually proceeding down. It takes about a week on the average for the whole panicle to finish flowering. The time when it is most active is between 2 and 4 A. M.

*Pollination:—*Cross pollination between flowers of the same panicle is the rule, the pollen from the higher flowers pollinating the stigmas of the lower ones. There does occur a certain amount of cross pollination, the chief agency for which being insects like bees and this is more common in the looser types of head than in the compact ones. The amount of cross fertilization taking place varies from 0.6% in the compact ones to 6% in the loose ones. Sometimes it goes even as high as 20%.

Grain colour.—Several natural crosses have been selected, grown and ratios analysed with the following results:—Red and yellow colour of the grain behave as simple allelomorphs, so also red and white and in both the cases red is the dominant. Similarly yellow and white behave as simple allelomorphs with yellow as dominant. There also occurred some red heterozygotes behaving as a dihybrid giving 9 reds, 3 yellows and 4 whites. This means that some whites are undeveloped reds requiring the presence of yellow to develop the red, which has been proved to be the case by obtaining a red by crossing artificially several whites with yellows.

Glumes.—The long and the short character behave as simple allelomorphs, short being the dominant. (*Pusa Memoir Vol. VIII, No. 4*).

K. R.

Root pruning for fruit trees.—This operation is performed in the case of those fruit trees which make a free growth but produce little or no fruit. This operation also requires skill and experience. To do this properly, dig a trench in winter 3 feet deep around the tree and about 6 feet away from the main stem. Any root met with while digging the trench should be cut back to its inner side. If only few roots are met with at the above named distance from the main stem, then dig gradually closer to the latter all around until you reach a point where root growth is profuse. Then cut off all the main roots to be seen with a sharp knife. When this has been done, mix the turned out soil with one or two dozen baskets of manure and return it to where it was taken from. (*From 'The Fruit Garden in India'*).

W. R.

Experiments with coconuts.—Experiments have been in progress on a small scale in Travancore since 1909. A plot of 10 trees which only yielded 44 nuts in 1909 showed a steady increase after manuring and yielded 573 nuts in 1913 in which year it was

manured with 10 lbs. of poonac, 20 lbs. of ashes, 2 lbs. of bone-meal and 1 lb. of salt per tree, the cost of manuring is small and it is estimated that a profit of Rs. 2 per tree should be obtained. A plot of about 250 trees at the Trivandrum Experimental Farm was not well cared for and only yielded 3998 nuts in 1912; after manuring however it yielded 9857 nuts in 1913. A similar experiment carried out by the native owner of a plantation of 263 trees increased the yield from 11,300 nuts in 1911 to 19,400 in 1913. Root disease is the most serious pest of coconut palms in Travancore. Destruction of diseased trees is generally necessary but experiments in segregation and manuring show that there is hope of saving some of the affected trees in certain cases. Stem bleeding disease has also appeared in Travancore and the remedial measures recommended by Petch viz., cutting out and burning the diseased material and singeing and tarring the damaged stems have been demonstrated to owners of diseased trees. Bud rot is rarely seen in Travancore. Twelve year old trees grown in Ceylon from Java seed have yielded large nuts each giving 9 oz. of copra. A plantation of these is being made for future supply of seed nuts. (*From Tropical Agriculturist*).

W. R.

Measures against Plant pests and Diseases.—It has been indicated that a Rhinoceros beetle (*Oryctes Rhinoceros*) is the chief enemy of coconut cultivation in Samoa. The chief measures adopted against the pest have been (a) the destruction of old coconut wood and shells lying about the cultivation (b) the use of this material as traps, which were burnt after 6 or 8 weeks. (c) the promulgation of a "duty day" in which all Samoan males had to make a thorough search in the native plantations for pests with a view to their destruction. In addition to these measures there has been an attempt to introduce a natural enemy of the beetle. The pest attacks especially groups of young palms and

extends in the direction of the prevailing winds. The want of labour hinders the proper control of the insect and it is hoped that the importation of Chinese may help to meet this difficulty. (From the Bulletin of the Imperial Institute). W. R.

Estate Notes.

Well boring demonstration :—A demonstration on the use of the hand well boring appliances was held on the Central Farm for a number of days for the benefit of students. A supervisor of the pumping and boring section of the department had been specially deputed to explain to the students the method of working with the tools. The four mhoie well in the Southern block was the first well to be dealt with and a bore hole was made to a depth of 82 feet with some success. Similar work is contemplated in other wells of the farm.

Conference of the Deputy Directors :—There was a conference of all the Deputy Directors of the Department on the 2nd April. Our Director of Agriculture was also present.

A Foot-ball Match :—A friendly match at foot-ball was played between the Forest College and our team. The match was well contested. Our offence did not fare well in the beginning owing to some changes made. Some of our forwards had to defend and so the front line was weak. To the credit of the Foresters they put in 1 goal before the close of the first half. During the second half three of our players made a very good combination. They were skilful in dribbling combined with passing, so much so that they scored 2 goals amidst loud cheers. Thus the Agriculturists won the day by 2 goals to 1.

A prize for gardening :—With a view to stimulate the taste for gardening among students, Mr. C. Tadulingam Mudaliar the late Warden of the Students' Hostel, offered a prize of Rs. 20 to the students who maintained the best garden in their blocks. We understand that the prizes two in number and amounting to Rs. 14 and Rs. 6 were won by the students of Block V and Block I respectively.

Plague :—The Principal, his Colleagues and Staff, in fact, the whole colony, may be congratulated on the success in their attempts to keep the out dire disease this year. With the experience of last year, very early precautions were taken and the result is that we were quite safe, though cases did occur all round the estate in the neighbouring villages and in Coimbatore. No anxiety need be felt on account of this till next rainy weather.

The Terminal Examination for the I year students and the Certificate Examination for the II year students were completed on the 31st March and the College closed for mid-summer vacation on that day and will be re-opened on the 6th June.

There was a lantern lecture for the benefit of students on the night of the 28th March, when selected slides on Botany, Mycology, Entomology and General Agriculture were put on the screen.

Students Club Social Gathering :—The terminal Social gathering of the Students' Club came off on the 29th March. The function took place near the Tennis Court grounds of the College and advantage was taken of this to open the newly laid third Tennis Court. After a few games of Tennis in which all the members took part, light refreshments were served round.

**List of Students who have obtained
the Certificate of Proficiency in Agriculture
in the Order of Merit.**

- *1. Ananthan, M.
2. Chellam Aiyangar, D. P.
3. Subbanna Achar, V.
4. Vasudeva Shenoi, K.
5. Avudainayakam Pillai, K. }
6. Ramasami Aiyar, A. }
7. Mangesa Rao, B.
8. Gaurisankara Aiyar, M. P.
9. Abishekanatham Pillai, P.
10. Krishna Rao Nayudu, M.
11. Muthusami Aiyar, T. G.
12. Kesavunni Nambiar, P.
13. Balaji Rao, K.
14. Kamachandra Aiyar, S.
15. Srinivasa Aiyangar, S. R.
16. Kondayya Sarma, A.
17. Ramanna Raj, K. S.
18. Sundaram Aiyar, C. V.
19. Maria Susai, A.
20. Chinnasami, N.
21. Vaidyanatha Aiyar, M.
21. Fernando, S. P.
23. Kannappa Pillai, P.

*Winner of the Ologstoun Medal.

Departmental Notes.

1. Mr. A. Ramalinga Ayyar is appointed Assistant Farm Manager on probation, at Central Farm, Coimbatore.
2. Privilege leave for one month in continuation of Easter holidays is granted to Assistant Farm Manager, L. S. Netese Ayyar.
3. M. R. Ry. P. A. Subramania Ayyar, Assistant in Chemistry is granted privilege leave for two months. It is presumed that no substitute is necessary.
4. M. R. Ry. G. N. Rangaswami Ayyangar, Assistant in Economic Botany is granted privilege leave for six weeks from 23rd March 1917.
5. Mr. T. G. Anantarama Ayyar is appointed Assistant Agricultural Demonstrator on probation on Rs. 35-24-7½ and is posted to training in district work in Coimbatore District under Assistant Agricultural Demonstrator W. Raghavachari.
6. Mr. K. Vasudeva Shenoi is appointed Assistant Farm Manager on probation and posted to the Coconut Station, Nilleshwar.
7. On relief by Mr. K. Vasudeva Shenoi and Mr. A. Gopal Nair is to be in charge of Taliparamba Farm.
8. Mr. A. Maria Susai is appointed Assistant Farm Manager on probation and is posted to Manganallur.
9. On relief by No. 8 A. F. M., M. A. Balakrishna Ayyar is posted to VI Circle to be trained in green manure work under Mr. T. A. Krishna Ayyar.
10. Privilege leave for 6 weeks from 28th April 1917, is granted to M. R. Ry. S. Subramanya Ayyar, Farm Manager, Central Farm. M. R. Ry. V. S. Narayanasami Ayyar will be in charge during this leave. A. F. M., M. P. Kunnikutti will take charge of the work of the latter. Mr. A. Ramalinga Ayyar will take charge of cattle vice A. F. M., M. P. Kunni Kutti.
11. M. R. Ry. S. Ramasami Pillai is granted 5 weeks privilege leave from date of relief.
12. M. R. Ry., K. Sankara Ayyar is transferred from green manure work Madura, to relieve No. 11. A. F. M., T. A. Krishna Ayyar will take charge of both green manure circles, in Madura.
13. On return of M. R. Ry., S. Ramasami Pillai from privilege leave; M. R. Ry. K. Sankara Ayyar will be posted to Kollipatti Farm.
14. Mr. K. Balaji Rao is appointed Assistant Farm Manager on probation. To join at Hagari at an early date.
15. Privilege leave for 2½ months is granted to Farm Manager M. R. Ry. A. V. Tirumuruganatham Pillai from date of relief.

16. M. R. Ry. V. S. Ramasami Ayyar is transferred from Hagari to Nandyal in relief of No. 15 on relief by Mr. K. Balaji Rao the newly appointed Assistant Farm Manager.

17. Messrs. M. K. Nambyar and G. V. Seshachari are confirmed in the Upper division with effect from 1st April 1917.

18. The following are promoted from the Lower Division to Upper Division.

Messrs. K. Sankara Ayyar, V. J. Dhanakoti Raju, W. Raghavachari, G. R. Venkatachelopati, C. S. Madhaya, K. T. Bhandari, A. Chinnathambi Pillai, B. Siva Rao, M. U. Vellodi, N. V. Viswanatha Ayyar, M. Viraraghava Rao, S. Sitarama Patrudu. The last eight will be on probation for one year.

The following transfers of officers in the Agricultural section are ordered:—

19. M. R. Ry., K. Ramanatha Ayyar, Assistant Agricultural Demonstrator, IV Circle, to Central Farm, Coimbatore. To join at the expiry of privilege leave for 6 weeks to M. R. Ry., S. Subramanya Ayyar i. e. on 7-6-17.

20. M. R. Ry., V. S. Narayanasami Ayyar, Assistant Farm Manager, Central Farm to District work in the Tanjore District. To join on relief by No. 19.

21. M. R. Ry., K. Sankara Ayyar, Agricultural Demonstrator, (now under orders of transfer temporarily to Hagari to relieve Agricultural Demonstrator, M. R. Ry., S. Ramasami Pillai granted leave) to Managanallur Farm. To join on return of M. R. Ry., S. Ramasami Pillai from leave.

22. V. Ramanatha Ayyar from Palur to Hagari Farm. To join on 1-8-17.

23. Privilege leave for one month is granted to M. R. Ry., P. V. Isaac Sub proteum Assistant in Entomology from or after 16th April 1917.

24. M. R. Ry. K. Raghavachari, Agricultural Demonstrator, College of Agriculture, Coimbatore is granted privilege leave for 20 days from or after 14th May 1917.

25. The privilege leave granted to Agricultural Demonstrator M. R. Ry., S. Ramasami Pillai for five weeks and the arrangements made consequent thereon are cancelled. (Refer to No. 11 above).

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No. 5.

Editorial Notes.

Many of our readers will remember the "Water Hyacinth" which was on view at the Agricultural section of the Exhibition held in Madras in January and February 1916 and some may even recollect the placard which ran under it "A bad weed-kill it."

It has now proved to be such a serious pest in parts of Burma that Government has found it necessary to legislate against it by passing an Act called "The Burma Water Hyacinth Act No. I, 1917.

The passing of the above act bears testimony to the foresight of our permanent Director, Mr. D. T. Chadwick, I. C. S., who as early as 1915 brought out an illustrated leaflet (No. V of 1915) urging the public to take arms against it and kill it. Acts of a similar nature against various insect and fungus pests are in force in most of the advanced countries of the world and we shall not be surprised if ere long similar acts come to be passed in our

country as well. Some may be inclined to look upon these as a curtailment of individual liberties but let us remember that the subordination of the individual to the interests of the state is one of the real tests of civilization.

We understand that on the 18th of June there is to be a conference at Simla to consider certain important questions relating to Agricultural Education. Our Principal, Mr. R. C. Wood, has been invited to the above conference. At present the conditions of Agricultural Education in the various Provinces are different. We are not able to understand, for instance, why there should exist a University degree for Agriculture in Bombay and not one in Madras. We hope that this conference may go some way towards a standardisation of Agricultural Education in our country.

We commend to our readers the article on the Domestication of the Indian Honey Bee by Rev. L. V. Newton S. J. in the January issue of "The Agricultural Journal of India." The author and Rev. Father Bertram S. J. have studied the question as a hobby and have shown remarkable ability in the handling of it. A hobby like the above, trains the intellect, enlarges powers of observation, keeps enthusiasm alive and forms a very good recreation after the routine toils of the day. We hope that in the near future many of the students of our college will take to such hobbies as the training they receive gives them special facilities in this direction.

The value of
a Hobby.

Note on the Marketing of Tinnevelly Cotton.

Introduction.

What is known as Tinnevelly Cotton on the World's market consists of two distinct species identified by Gammie as *Gossypium obtusifolium* locally known as *Karunganni* cotton and *Gossypium Herbaceum* known as *Uppam* cotton. Of these, *Karunganni* cotton is the finer, longer, and stronger, but *Uppam* cotton is the whiter of the two. These cottons are grown under unirrigated conditions on deep black soils which enjoy an average rainfall of about 30 inches.

The average area grown under Tinnevelly cottons for the past five years is 674,100 acres and the average aggregate outturn marketed 97,339 bales of 400 lbs each. During the last few years an American cotton known as Cambodia has been grown in this tract on a fair scale; but it is mostly confined to the foot of the Western Ghats where it grows luxuriantly and yields heavily under unirrigated conditions. It is not infrequently found mixed with Tinnevellies on unirrigated black soils. Cambodia has the advantage of being a heavier yielder than the local cottons but is not well adapted to unirrigated conditions except on good soils where the rainfall exceeds 30 inches and is well distributed. The staple is also finer and the lint outturn higher than in the case of Tinnies.

Local practices in vogue for marketing Cotton.

For the greater part the holdings in this tract are small and the ryot cultivates his own land, except in the case of Zemindari lands which, when they are not leased out in small lots to tenants, are cultivated as "*pannai*" or home farms by estate employees. It is only in very rare cases that the ryot sells his cotton direct to the local spinners or exporting firms. There are two causes which would prevent him from doing so:—(1) Because the firms generally refuse to deal in small lots of cotton and (2) because the dealer, unlike the firms, will advance him money on the standing crop on condition that the produce is sold to him. It is only the wealthier ryots, in addition to the dealers, that can afford to hold up their stocks of cotton in anticipation of a rising

market. The ryot may sell by forward contract to the dealer or he may sell at the market rate ruling on the date of delivery.

Originally all the cotton grown locally was hand-ginned. In the course of time hand gins were replaced by machine gins owned by the local spinning mills or by exporting firms. More recently small ginning factories owned by Indians have sprung up throughout the tract and their number is rapidly increasing. It is now the common practice to lease out these small gins to exporting firms. Though these small ginneries bring in handsome profits to their owners who frequently are not in the least interested in cotton, it is the experience of this Department that they act as an impediment to cotton improvement work.

As a rule, each purchasing firm has its favourite dealer who can be relied upon to deliver a specified quantity of cotton every year. But there are many dealers who supply purchasing firms indiscriminately. These latter keep in touch with the brokers of each firm and sell their stock to the highest bidder.

At the commencement of the season contracts are made with a dealer by the broker of a firm for relatively small quantities of cotton at a fixed rate. The quantity of cotton contracted for in one and the same contract averages about 10 candies of 500 lbs. Before this contract has been fulfilled a fresh contract may be made, at the same or at a different rate according to the market fluctuations. Over-deliveries on the first contract are carried on to the second contract. Allowances are frequently made for inferior quality but premiums are seldom given for superior quality.

The purchasing firms deal only in cotton, as distinguished from seed cotton. Most of these firms have their own ginning mills. A stipulated charge is made for ginning the cotton delivered against contracts made, and this charge is deducted from the value of the cotton delivered. The dealer takes possession of the seed obtained and removes it from the yards immediately after the ginning is completed. This seed is sold in retail for local consumption as cattle food or ex-

ported to other tracts for the same purpose. Though each firm prefers ginning its own seed cotton,—for clean ginning is thus ensured and profits made by charging for the ginning are thereby realised,—yet all the exporting firms will readily purchase cotton ginned elsewhere irrespective as to whether it is machine-ginned or hand-ginned. Machine-ginned cotton as a rule commands a higher price than the hand-ginned material because the latter generally contains a much higher percentage of seed. A feature of the small village ginneries is that in the absence of expert supervision the gins are seldom set properly and as a result the fibre is bruised and broken and its value materially depreciated.

Mixing of different grades of cotton is practised by all dealers, but this is only resorted to (i) in grading up cotton which would not otherwise be accepted by any firm owing to its inferior colour, or (ii) in palming off an inferior strain under the guise of "Tinnevellies." This latter practice has become very common since measures have been adopted by the Agricultural Department to eradicate "Pulichai" cotton—an inferior strain—which all firms have refused to handle.

Improvements effected by the Agricultural Department in the Local Practices of Marketing Cotton.

This Department has now been working at the Improvement of Tinnevelly cotton for some eight years. It was realised from the start that there were two key-stones, either of which would ensure the partial success of this improvement work. The one is the complement of the other. The more important of these entailed the selection and propagation of an improved strain of cotton of the local variety; and secondly, the institution of direct sales of cotton by the grower, thereby dispensing with the services of the dealer, or middleman, and assisting the dealer in appropriating the middleman's profits. It takes some 7 or 8 years to propagate a variety of cotton, originally obtained from a single plant, to such an extent that it will command the attention of exporting firms and outside markets. When this stage has been reached the profits that would be reaped by the growers of such a cotton would depend on three factors:—

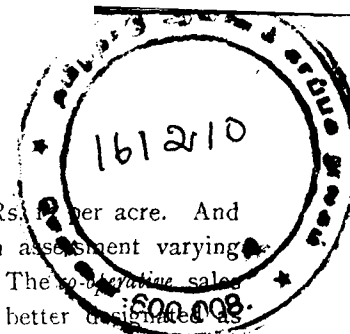
- (a) Its acre-yield relative to that of ordinary country cotton;
- (b) Its relative lint outturn;
- (c) Its relative value;

These three factors are noted in the order of their relative importance. Before the grower can realise the maximum profits to be made by cultivating an improved strain, arrangements have to be made by which he can market it direct to the local spinners or to exporting firms. In the case of the Tinnevely tract, this branch of the work was undertaken a few years previous to the time when the improved strains were ready for being marketed on a commercial scale. A start in joint sales by the growers was made with bulk selection Karunganni cotton. The firms are quite prepared to deal directly with the grower as long as he can bring in his produce in fair sized lots. This end can only be attained by inducing growers to co-operate by pooling their seed cotton and selling it direct to the firm under the supervision of an officer of the Agricultural Department. Having once realised the additional profits to be made from direct sales these ryots have since readily adhered to this practice which is now becoming more common every year and is about to assume large proportions. When, therefore, improved strains were placed on the market on a commercial scale (that is, to the extent of about 2,500 candies of lint of 500 lbs. in 1916), the delivery of a considerable portion of this cotton to the firms in its pure form direct by the grower was practically guaranteed. In the case of direct sales of bulk selection Karunganni cotton the excess profits realised by the grower were only those normally made by the middleman as this cotton neither commanded a premium nor was its lint outturn appreciably higher than that of ordinary Tinnies. But when he was supplied with an improved strain his excess profits included the profits made from (a) the high acre-yield, (b) the high lint outturn, (c) the premium obtained for this class and quality of cotton, (d) the premium obtained for superior quality seed to be sold for sowing purposes, and (e) the middleman's other profits which may be regarded as commission. It has been calculated that ryots who grew these improved strains of cotton last year realised

excess profits averaging between Rs. 10 and Rs. 12 per acre. And this, it must be remembered, on land paying an assessment varying from Rs. 1-4-0 to Rs. 2-8-0 per acre only. The ~~co-operative~~ sales of cotton as instituted locally would perhaps be better designated as *joint sales*. The transaction is exceedingly simple. A number of ryots are induced to deliver their seed cotton at a specified mill on a specified day. The weight of seed cotton delivered by each ryot is previously noted; the consignment is ginned in one lot; the weight of the cotton obtained is noted by the firm and payment is made at the ruling market rate for that day plus the premium offered by that firm, or at the contract rate previously arranged. Payment is made in one lump sum for the pooled consignment to a ryot who acts as spokesman for his friends. He distributes this money amongst them in direct proportion to the weight of seed cotton delivered by each. The same system of distribution is adopted with the seed obtained from the seed cotton, each ryot taking his proportionate share.

When once an improved strain of cotton was placed on the market some means had to be devised for ensuring its being delivered at the mills in a pure unadulterated state. It was only when the purity of the cotton could be guaranteed that the firms interested could be expected to pay the maximum premium offered by each. The necessary end was attained by instituting a system of certificates which would guarantee the purity of each consignment offered for sale. Details regarding the system of certifying cotton have appeared in a previous issue of this journal.

In 1916 the maximum premium offered was Rs. 16 per candy of 500 lbs. in excess of the ruling market rate for Tinnies on the date of delivery. The maximum premium was paid for the major portion of the cotton delivered under certificate last year. In the present season the premium has fluctuated considerably and the amount of premium now paid is invariably based on the colour and quality of the staple but mostly on colour. This year the colour and quality of practically all Tinnies is very much below the average for the past few years. This is entirely due to untimely rains when the



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plants were in boll resulting in the cotton becoming badly stained and depreciating considerably in value.

The experience of other provinces in the propagation and marketing of improved strains of cotton had accentuated the necessity for adopting some such procedure as certifying of selected cotton in the Tinnevely tract. It is gratifying to note that the system instituted last year for the first time was eminently successful. But it has its limits. During last season, certificates were issued to 362 ryots. About 10,00,000 lbs. of seed cotton were thus delivered at a premium to the local firms. In the present season the system has been modified so as to entail less clerical work by issuing single certificates to members of Village Seed Unions who guarantee (a) to grow no other cotton than the improved strain offered to them by this Department, (b) to harvest it and deliver it unadulterated, (c) to sell it co-operatively or jointly (d) to pool their seed and sell it co-operatively. Since last season six such seed unions have been formed and their success for the future promises well. The assistance of the Registrar of Co-operative Credit Societies has been sought to organise Co-operative Societies in those seed union villages where Co-operative Societies were not already existent. The subjoined statement shows the progress made in Co-operative sales of cotton since the work was first instituted in this tract.

Statement showing the Co-operative or joint sale of cotton during the past four years.

Year.	No. of Villages.	No. of ryots who co-operated.	Average No. of ryots per Village.	Quantity of seed of cotton so brought.	Quantity of good seed obtained.	Ample to sow about.
				lbs.	lbs.	acres.
1913	3	6	2	30,000	22,500	1,500
1914	20	63	3.1	1,32,750	97,500	6,500
1915	29	89	3.1	2,26,000	1,69,500	11,300
1916	71	362	5.0	10,04,299	7,03,002	46,900

System of Seed Unions.

Previous to the 1916 season, the propagation and distribution of seed of improved strains of cotton devolved entirely upon the Agricultural Department who grew these strains on contract and purchased the seed cotton at a price profitable to both the grower and the purchaser. In view of the fact that the area under this type of cotton can increase about 20 fold every year the work arrived eventually at a stage when it became no longer possible for the department to handle all the cotton thus grown. In order to ensure that all the seed obtained from the crop would be utilised in the following season for seed purposes, a system of seed-unions was inaugurated whose functions have been noted above. In the past season (1916), these seed unions handled about 51,623 lbs. of seed of the improved strains supplied to them by the Department. In addition about 6,51,377 lbs. of similar seed was reserved for sale by other ryots who ginned co-operatively but who were not members of Seed-Unions. Practically the whole of the seed was sold at a premium which varied from Rs. 2 to Rs. 12 per pothie of 250 lbs. Assuming that 50 per cent of this seed has been utilised for sowing purposes and calculating at the average moderate premium of Rs. 3 per pothie then these ryots profited to the extent of Rs. 4,218—on the sales of their seed alone, in excess of the profits ordinarily realised by dealing in Bazaar Seed. By the co-operative sale of their cotton it is estimated that they made an additional Rs. 22,000 making a total of approximately Rs. 25,500. This distributed amongst 362 ryots works out to an individual average profit per ryot of Rs. 70.

The organization of seed unions is receiving special attention, for these will form a distributing agency which, when perfected, should control the supply of seed throughout the cotton tract. Assuming that the area under cotton belonging to members of a seed union averages 500 acres, then that seed union will be supplied from the Agricultural Station at Koilpatti with ample fresh seed every year to sow one-twentieth of its area under cotton. This proportionate area is designated *seed union seed-farm* and is under the direct control of the seed union but cultivated by one of its members.

The produce from this is ginned separately and the seed utilised in the subsequent season for distribution to seed union members. This seed should be ample to sow the whole of the area under cotton in the seed union village in that year, that is, 500 acres. In the next year, (that is the third year) the seed union will have enough seed to sell to all-comers, but it will continue with its seed-farm by means of which fresh blood is forthcoming from Koilpatti every year. It is proposed, in the course of time, to organise these seed unions in such a way as to control the whole of the Tinnevelly tract. With the requisite organisation outlined above the supply of seed to the whole of the tract is not such a stupendous problem as it might appear at first sight. On the assumption that the area under cotton in each seed-union will average 500 acres, then each seed union would grow enough seed from this area to sow not less than 10,000 acres. And as the average area reported to have been cultivated with cotton for the past five years is 6,74,100 acres, then about 67 seed-unions should be ample to control the supply of seed for the whole of the cotton tract. This is well within the limits of practical organization provided the staff is adequate and efficient. To supply 67 seed-union seed-farms with ample seed it will be necessary for the Agricultural Department to grow improved strains of cotton on contract on its own seed-farms on an area of not less than one-twentieth of 67 times 50, or 118 acres. This is the outline of the scheme now being evolved. On paper it not only appears feasible, but relatively easy. Yet many factors have to be encountered in the villages which will make it impossible for such a scheme ever to be perfected. But though we have to work with illiterate men who mostly know the Government and its ways only through the acts of subordinate Revenue officials and who have the inherent tendency to regard all acts of a philanthropic nature with suspicion. None the less, the Tinnevelly ryot is well aware that exactly sixteen annas make one rupee and when faced with a financial proposition which materially affects his interests he is amenable to reason. Once his confidence has been won, he not only readily adopts the recommendations of the Departmental officers but goes out of his way to

seek their advice. The Tinnevelly ryot has learnt more in the past five years than he did in the previous fifty. He is beginning to realise that there is no longer any necessity for him to remain the dupe of the middleman. His main source of subsistence is cotton, and by marketing his cotton direct to the purchasing firm he is realising that he may now reap profits which were hitherto the exclusive privilege and the happy hunting ground of the cotton dealer.

R. Thomas.

A note on the preparation of Crude nitre in villages round Coimbatore.

The manufacture of Nitre in India is an old industry. Though it is mostly carried on in parts of Upper India (Bihar and the United Provinces) yet it is not uncommon in the South. In many villages in and round Coimbatore its manufacture is quite a common thing. Enquiry shows that it was once the culinary salt of the people. That the people were acquainted with its preparation long ago is proved by the record by Buchanan of the fact that "In Tipu's reign, the makers of salt-petre received advances from the Government and prepared the salt-petre from the earth."

The source of this salt is the "Salt Earth" (*Tamil* uppu mannu). The wet dirty brown appearance in the morning is a characteristic indication of its presence. Lanes, *itteries*, dilapidated houses, neglected corners, stalls, mud walls and pials of villages are mostly the places where this earth is seen accumulating. It is, however a little different from the "Village Earth" or "Patimannu" used in the circars for paddy and sugarcane, for it contains little or no phosphoric acid. The occurrence of this salt in the soil is due to the decomposition of the solid and liquid excreta of cattle and man and other vegetable matter. The decomposition is brought about by two sets of Bacteria—the putrifying bacteria and the nitrifying bacteria. The former

liberate the ammonia and the latter oxidise the ammonia, first into nitrous and then to nitric acid and then combine with the saline bases in the soil.

The preparation of this salt consists in lixiviating the earth over a bed of wood ashes and allowing the extract to crystallise after evaporation. In Vadavalli and Papanaiickenpalayam villages of this district this manufacture is carried on by a class of men known as Naiks. The "salt earth" is carefully scraped from the places mentioned above and accumulated near their "laboratory." It is then extracted with water over a bed of ashes. The apparatus concerned is simple and economical. A circular pit about 5 feet in diameter and 3 feet high is made on the margin of a raised ground, and plastered inside with fine clay and is provided with an outlet at the bottom. This serves as a funnel. A large earthen pot buried in the ground with its mouth below the outlet of the funnel, catches the filtrate.

A layer of sand or small *kankar* stones is spread over the bottom of the funnel to facilitate draining. Rice-husk is sometimes used. Above this comes a layer of wood ashes. It is this ash that supplies most of the potash in the salt. The manufacturers hold that the ashes got from Coconut or Palmyra topes where those leaves are used as fuel in the manufacture of jaggery, give them a better yield. On the top of this ash, the earth is heaped almost to the full in the pit. Usually a definite quantity of earth (30 baskets) is put in and a definite quantity of water (20 pot fulls) is poured on it gradually. This gives 6 pot fulls of the extract of which the first 5 pot fulls are used for boiling and the 6th is poured on the fresh earth which is to come for the next charge and not used for boiling, as it contains only a little of the salt.

The boiling is done in a shallow iron vessel (about 3 feet in diameter and 6 feet deep at the centre). Evaporation goes on

until the liquid becomes super-saturated. This they test by dipping a rod into the solution and drawing it out into the air when it suddenly cools out and crystallises. At this stage the vessel is removed from the fire and allowed to cool. Crystals of crude nitre separate out and these are taken off the vessel. As boiling goes on some impurities come to the surface in the shape of scum and froth, and these are constantly removed. The salt at this stage however is not quite pure. It is a bit yellowish in colour. Refining is done in factories.

Usually four people join together in this preparation. They may be either partners or coolies under a license holder. If they are partners with the license holder the total amount realized is divided into two portions one of which goes to the license holder and the other to the other three partners. If they are coolies usually a man and three women are employed and the man gets about 8 as. and the woman 3 as. each per day. They can take only one charge in a day. A charge gives on the average one maund of the salt which fetches about Re. 1—8—0. The yield at the commencement of the season is greater and it diminishes gradually because the "salt earth" which is rich in salt is exhausted. By examining a bit of the earth the Naiks can tell whether it would pay to work with it. This work is carried on during the dry weather (usually between December and April) as during the rains the salt is washed and no "salt-earth" formation occurs. From the agriculturist's point of view it is easy to realize that the crude nitre is one of the most useful substances. The rapidity and ease with which it parts with its Oxygen when heated makes it a useful constituent of gunpowder (which is a mixture of Sulphur, Charcoal and Nitre)—and the value of gunpowder the ryots readily appreciate. As a cheap drug it is invaluable. If your working animal or the milch cow is feverish, dull or uneasy, give it at once a bucket of nitrated water and spare your worry and the doctor's bill or if your fodder cholam

be troubled by *Hariali* from under the ground, raise him up by a top dressing of nitre. If it is your desire that your cigar should burn well and steadily leaving a silvery stick of ash, don't fail to give your tobacco crop a doze of nitre. Perhaps you desire to grow such good English vegetables as cabbage, cauliflower, turnip, etc., then make it a rule to feed them with nitre. In short, if you suspect any of your crops not up to your expectations, give a stimulant dose of nitre and you and they will look cheerful in a few days.

It is however a pity that the value of such a Talisman is not fully recognised by the majority of the ryots. They recognise the efficacy of cattle manure, sheep's dung and poudrette, but have a lamentable lack of understanding with regard to the value of the essential product in these.

It is the want of understanding of the value of this earth on the part of the farmer that tempts the village manufacturer to rob his stalls, and walls of such an important manure and prepare the salt for a foreign market. For, India exports as much as 20,000 tons of refined nitre to foreign countries. Imagine the consequences of this incredible thoughtlessness! The writer strongly feels that any effort which aims at inducing the ryot to make a systematic use of his "salt earth," directly contributes to his prosperity.

V. Ramachandra Ayyar.

Student Class III.

Notes.

Fish Manure :—There are one or two points of interest regarding this fish manure industry which are worth recording. Fish manure consists of beach dried sardines from which no oil has been extracted. The sardines are dried on the bare sand, and on exposure to the sun's heat an appreciable quantity of oil exudes.

This causes the sand to adhere to the fish and explains the high percentage of sand commonly found in this type of manure. The best firms collect the dried sardines with care and go to the extent of submitting them to a cleansing process so as to separate a considerable amount of the sand still adhering to the fish. Even then the percentage of sand is seldom under 10 per cent. and as a rule approximates to 15 per cent. The discarded sand is retained as it contains an appreciable quantity of fish refuse and fish oil. It is held in high esteem by tobacco cultivators and is sold to them at a price out of all proportion to the intrinsic value as calculated from its organic content relative to that of fish manure. *Fish guano*, on the other hand, is practically free from sand, but in almost all cases the price demanded for it is nearly double that of fish manure. It contains so little sand for the reason that clean fresh fish only can be handled in the oil mills. Fish guano consists of the solids remaining after the oil has been extracted. This also has to be thoroughly dried in the sun, but in this case special care is taken to dry it on matting. This procedure is not adopted in the case of beach dried sardines because of the very large quantity both in bulk and in weight that has to be handled. Fish from which the oil has not been extracted takes much longer to dry thoroughly and would necessitate an investment of no mean sum in mats only. Fish manure merchants tell me that they do not normally or readily sell on the basis of a maximum per cent of sand for the sole reason that they are not aware of any means of ascertaining the actual percentage in any sample. On being informed that this could be done by a chemical analysis of a fair average sample, some of them are seriously considering the advisability of analysing samples and selling on a percentage of sand basis.

It is of special interest to note that though fish-manure contains normally about 15 per cent of sand, yet the price demanded for fish guano is nearly twice that demanded for fish manure. I failed to discover the explanation for this

apparent anomaly. (Extract from April monthly report of Dy. Director of Agriculture VI Circle.)

Calculations of manure applications. There is often a demand for a ready reckoner by which applications of manures can be easily distributed throughout the field. This is supplied by the calendar of the "Chilean Nitrate Propaganda" and is here reproduced.

From these tables the number of plants per acre at various planting distances can readily be seen and the quantities of manure to be applied to each plant can be ascertained:—

Table for Square or Square measure.

Sq. mile.	Acre.	Sq. rood.	Sq. yard.	Sq. feet.	Sq. inches.
1	640	102,400	3,097,600	27,878,400	4,014,489,600
	1	160	4840	45,560	6,272,640
		1	30 $\frac{1}{4}$	272 $\frac{1}{4}$	39,204
			1	9	1296
				1	144

Number of plants per acre at various distances.

	3 ft.	3 ft. 6 in.	4 ft.	4 ft. 6 in.	5 ft.	5 ft. 6 in.	6 ft.
3 feet.	4840						
3 ft. 6 in.	4148	3555					
4 feet.	3630	3111	2722				
4 ft. 6 in.	3226	2765	2419	2150			
5 feet.	2904	2489	2178	1936	1742		
5 ft. 6 in.	2640	2263	1980	1760	1584	1440	
6 feet.	2420	2074	1815	1613	1452	1320	1210

For other distances multiply together the two distances in feet at which the trees or bushes stand apart and divide the product 43,560; by the quotient will be the number of plants required. Quantity of manure to be applied per plant. (in ozs.)

lb. per. acre.	3 ft. x 3 ft.	3 ft. x 3 ft. 6 in.	3 ft. x 4 ft.	3 ft. 6 in. x 3 ft. 6 in.	4 ft. x 4 ft.	4 ft. 6 in. x 4 ft. 6 in.	5 ft. x 5 ft.
350	1.15	1.35	1.54	1.58	2.07	2.60	3.21
400	1.32	1.54	1.76	1.80	2.35	2.97	3.67
450	1.49	1.73	1.98	2.02	2.65	3.34	4.13
500	1.65	1.92	2.20	2.25	2.94	3.71	4.59
550	1.82	2.11	2.42	2.48	3.23	4.07	5.05
600	1.98	2.32	2.64	2.70	3.52	4.44	5.51
650	2.15	2.51	2.86	2.93	3.82	4.81	5.97
700	2.31	2.70	3.08	3.15	4.11	5.18	6.43
750	2.49	2.89	3.31	3.37	4.41	5.54	6.89
800	2.65	3.08	3.53	3.60	4.70	5.91	7.35

Tropical Agriculturist, April 1917. C. N. A.

Green maize for milking:—Green maize if fed to milking cows before it shows the tassel, will do no injury, but it must be remembered that the greatest amount of nutriment is contained in maize when the cob is turning from the milky into the glazing stage. This however does not apply to any of the Sorghum family, such as Sorghum sacharatum, Planters Friend and Amber cane. These must on no account be fed to cattle unless in the flowering stage or unless they have been allowed to wilt; that is to say, Amber cane cut in the morning can be fed in the evening or if cut in the evening can be fed the following morning without any danger to the stock. (From the Agricultural News, Durban). W. R.

Stimulating the milk flow:—The Dairy cow can often be brought up to a high degree of efficiency by some very simple means. The persistency of the milker will pay well for all the extra time spent. Try to make the cow think she has not given enough and she will set about to make it up next time. A little milk left in the udder will make her think she is giving more than she is expected to and at the next milking she will not have quite so much for you. There is a great difference in the percentage of butter fat in the first and the last milk drawn. The first will sometimes be as low as 1 per cent and the last has been known to run as high as 12%. It pays to work for the strippings. The manipulation of the udder will often result in the increase of a pound of milk. This is usually done after the milker has secured all the milk he can by taking the teat in the hand and pushing the udder up close against the body, repeating this about round close to the body 3 times with each quarter, in turn, between the hands and rub down. The extra milk secured at the single milking may not pay for the time but it will stimulate the cow to give that much more at the next milking with extra work. Here is where the profit will come in. We all know that a cow with which the calf is allowed to run will very soon adjust the flow of milk to the needs of the calf and it is equally true that the Dairy cow can and will increase the milk flow if encouraged by the milker. Get all the strippings. It will pay. (*From the Agricultural News, Durban*). W. R.

Breeding for Atropine. The high prices paid for crude drugs, brought about by the abnormal economic conditions of the last few years, have stimulated a wide and popular interest in the cultivation of the plants yielding these products. It may be said that financial success in the cultivation of drug plants depends upon the possibility of increasing the alkaloid content of these plants by plant breeding methods. It at once becomes

evident that the work of increasing alkaloids in a plant differs from that of increasing size, changing color or form. The investigator is dealing with unseen characters. Since the characters with which we are working are unseen, the number of individuals that can be placed under observation is therefore limited, and in turn the chances of success are proportionately reduced. In establishing a system of selection of belladonna (*Atropa belladonna*) at the Mulford Drug Gardens, the effort was made to overcome this difficulty by establishing a correlation between some apparent physical character and alkaloidal content. The breeding plot contained 500 individuals which were chosen from a lot of several thousand seedlings. Some of the features of the plant were recorded on a card at the time of setting out. These included size in its first and second weeks, and when adult; the blooming date, color, size of leaf and of root, and any other facts which seemed likely to be of interest. These plants were examined once each week for the first three weeks and then as often as the date on the cards required. The leaves were gathered at the usual time—just as the flowers are opening—and enough leaves were allowed to remain to mature the fruit pods. The leaves were then air dried on drying racks in bundles corresponding to the plant from which they were taken, after which they were assayed for alkaloidal content. The error incident to this process was minimized by running the assays in duplicate. The alkaloidal content of the samples, expressed in percentages, was as follows:—

Alkaloidal content.	Number of samples.
·0—·09	4
·1—·19	8
·2—·29	26
·3—·39	83
·4—·49	94
·5—·59	65

.6—69	42
.7—79	26
.8—89	25
.9—99	6
1.0—	6

Total. 385

Mean = .507

The standard of the United States Pharmacopeia is 0.4 atropine in belladonna, and the average sample found in the markets varies from this minimum to about 0.6. It is evident, then, that nearly 7% of the plants were above the standard in chemical content, and that six of them yielded 1% or more of atropine—a remarkably high percentage. They were as follows:—

1.020
1.000
1.100
1.230
1.030
1.039

Avg. 1.07

Interest naturally centered on these plants, and a study of the records showed that every one of them was small at the time of harvest, while practically all the plants which yielded .01 or less were large and vigorous in growth. Furthermore, the six high plants all had light stems, while the plants yielding .1 or less had dark stems. These characters were the only ones found which seemed to give a clue to the chemical constitution of the plants, but they were marked enough to warrant special attention during the coming season, when a selected second generation will be grown.

In conclusion, it must be remembered that this work covers only one season and hence must be regarded as merely preliminary. It is highly encouraging to us, however, in indicating the extreme variation of atropine content in the belladonna plant and giving hope that valuable commercial results can be secured by selection. (*The Journal of Heredity*, April 1917). G. N. R.

Coconut-selection and planting. It is a common practice among Coconut planters to pick out the seed from a pile of nuts gathered from all the trees in the grove. As is commonly the case, the largest, and the best looking nuts in the pile are from trees bearing but few nuts to the bunch. The selection from the pile of these big and nice looking nuts for seeds will tend to increase the number of poorly producing trees. The farmers should focus their attention on the valuable characteristics of the coconut trees, and they should select their seeds while the nuts are still on the trees. The trees from which the seed nuts should be taken should exceptionally and regularly be productive.

* * * * *

While the Coconuts should not be planted in the seed bed before they are thoroughly ripe, it is likewise undesirable that their planting be delayed much after this time. The danger in this case is that the plumule will be fixed in its direction of growth inside the husk and that a deformed seedling will result from placing the nut in a different position. (*The Philippine Agriculturist*, January 1917). G. N. R.

Departmental Notes.

A. Ramalinga Ayyar, S. P. T. Assistant Farm Manager, will on return of the Central Farm Manager from leave on 7th June 1917, be posted to Palur,

M. R. Ry., V. R. Venkatarama Ayyar, Supervisor, Pumping and Boring Section, Trichinopoly Section is granted privilege leave for two months from the date of relief.

Privilege leave for 6 weeks from or after 15th May 1917 is granted to Agricultural Demonstrator M. R. Ry., K. T. Bhandary.

One month's privilege leave is granted to M. R. Ry., K. Unni Krishna Menon, Farm Manager, Palur, from or after 16th May 1917.

M. R. Ry., S. Subbaya, Assistant Agricultural Demonstrator, is granted privilege leave for one month from the date of relief.



McNeillai—The late Kangayam Stud Bull, Central Farm, Coimbatore.

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Editorial Notes.

We congratulate Mr. D. T. Chadwick, i. c. s., our permanent Director on his appointment as the first Indian Trade Commissioner in London. Madras sent him to Russia in June 1916 to study the trade situation arising out of the War. A few months later came a circular announcing the availability of his services to other Chambers of Commerce in India. We then heard of the extension of his sphere of work to France and then to Italy. To all of us who are familiar with his energy and keenness, this appointment would appear quite in the sequence of the above events. We wish Mr. Chadwick success in this new and wider field of activity.

The Government has approved the proposal of the Director of Agriculture that successful diplomats of the

Agricultural College should in future be placed in two classes, those passing the diploma examination with signal merit being placed in the First class. In this connection the College Board resolved that the word 'Honours' should be reserved for future extension of the curriculum. No such classification was found necessary for those gaining the 'Proficiency Certificate,' as those showing particular merit would naturally be selected for the diploma course. Such classification as the above ought to provide a sufficiently discriminatory hallmark for various degrees of merit.

The Government has ordered that Revenue Officers are in future to be allowed to visit agricultural stations on duty. If there is not one in their own district, the one nearest can be visited. They are to meet the Deputy or Assistant Directors who will show them round and they will thus have an opportunity for a free discussion over matters agricultural. This is a good arrangement. It brings us a step nearer that ideal in which every Taluq head will be a centre of strength for enlightened agriculture. It was said of the late Mr. Dharma Ranga Raju, Dewan of Pudukottah, that in his tours he invariably took an agricultural assistant with him and that a double bullock cart taking a couple of Monsoon ploughs and a few sacks of kolinji seed used to accompany him. May similar enthusiasm spread through all such officers.

The temporary expansion in the cultivation and export of Indigo which has resulted from the War, has

induced Government to appoint Dr. Marsden, the Government Dyeing Expert as special Indigo Research Officer for a period of one year in the first instance. He is to undertake the investigation of the methods of manufacture by the ryots with a view to suggest improvements and reduce adulteration. He is to work in close collaboration with Mr. W. A. Davis, the special Indigo Research Chemist with the Government of India. One of the chief factors contributing to the success of synthetic indigo in spite of its increased cost of production is the fact that it provides the dyer with an article of standard quality in a form ready for immediate use. We trust that the researches of Dr. Marsden and Mr. Davis will remedy the now existing defects of manufacture and marketing. The Government has very rightly recognised that remedying these is not by itself likely to ensure a permanent revival of the industry and has urged a systematic investigation into the conditions necessary for the successful growth of the Java plant. We hope that these efforts will convert the old factories that this War has repaired, into permanent bulwarks of this once prosperous industry.

We congratulate Mr. M. Govinda Kidavu on his appointment as Assistant Director of Agriculture. He is a native of the West Coast and has served there for most of his twenty years service. His posting to the VII Circle offers exceptional facilities for further useful work.

An Indigo
Research
Officer for
Madras.

Another
Assistant
Director.

Improvements of the relations between Landholders and their Tenants and Labourers in Madras.

"In Farm management whatever is beneficial to the landlord is beneficial to the tenant."—Taylor.

Madras, excluding Zamins, is preeminently a land of small farmers and about 9/10 of the cultivable land is owned by small farmers owning from $\frac{1}{4}$ to 10 acres. A good deal of these farmers cultivate the lands themselves, with the aid of the members of their family, and occasionally aided by their neighbours. This very large group of farmers, we may leave out of consideration, for they have not any tenants. A portion, however, of these small farmers do use outside labour in the cultivation of their lands. A ten acre dry land farmer can do all the work himself, while a ten acre garden or wetland farmer, with his present crude implements cannot do all the work himself unless he has a big family. There are others again in every village with a much smaller extent of land, who, not accustomed to manual labour, or not finding the produce from the land sufficient to maintain their family are being engaged in some more remunerative business, let the lands be cultivated by their tenants. The rest of the bigger type of land-holders farm their lands with the aid of outside labour in various forms. It is the relations of these farmers, with their tenants that I propose to deal with in detail.

The tenant labourers may be classed as follows:—

The *varam* tenant, who cultivates the land of the farmer, and shares the produce, the share varying in different localities.

The lessee, who rents the land, generally as much as he can cultivate, and makes a living out of it.

The permanent labourer or *pannial* or *padial* as he is called, who is paid monthly and engaged so long as he serves faithfully and well, or for a year. In the cases of wetland single crop paddy cultivation, he is engaged for a working season.

The casual labourer who is paid daily and engaged in busy seasons when the permanent establishment of the farm cannot adequately cope with the work.

There are also certain other classes of people who aid the landholders in their farming about whom mention has to be made, namely:—

Ryots or capitalists, who take up more land than they can cultivate and sublet it for higher rent and make much profit.

Managers of estates who as the term indicates manage the estates for the landholders. The two latter classes of people are important functionaries in the holdings of absentee landholders.

The small landholder that lets his land is generally absentee and sometimes resident and is feign to eat the fish but loath to wet his feet. The land is generally leased to a labourer in whom he has a certain amount of trust. The lease deed runs for a year, but will ordinarily continue from year to year whether the tenant has paid the dues in full or not. In the former case, because he has paid, and in the latter, because he must be given an opportunity to pay during the next year. There are of course many exceptions. Now-a-days owing to the rise in price of farm produce leases are drawn for longer periods up to five years, but never more, as the landholder does not look without suspicions over such a long period, for, he shrewdly suspects, who knows what may happen.

In certain favoured tracts such as the deltas on the East Coast, are found a class of landholders, who on the assumption of their being higher castes never do any agricultural operations themselves, however small their holdings. The constant division of the landed property splits up a big estate in a few generations into a number of small holdings. These small holders of land inert through thought of their ancestral greatness, do not work, and let the lands to tenants, who in a short time make enough money to purchase the land. This is found to be the case in all the districts. Writing about Tinnevely as long ago as 1879, Mr. A. G. Stuart said "It is not possible to foresee the result of the struggle among the castes for a rearrangement of their social position, but it will be evident that the higher castes, inheriting

the qualities developed by the system of monopoly of the land, by which they so long kept the upper hand are heavily weighted in the race, by their own habits and modes of thought and action, when their monopoly is broken up, and are less fitted for a severe competition with the hardier races below them; for having been artificially protected so long whether they will be able to adopt their national or caste character to the change is not yet clear, but upon this depends the continuance of their position." Things have not in any way changed since. The big estates of the higher castes are quickly breaking up and are gradually changing hands to the lower castes in small pieces. The position of such people in the words of Mr. (now Sir) Harold Stuart "is deplorable and shows a lamentable retrogression in the material condition of the most important class of the population." The only remedy that suggests itself is for such farmers to work the land themselves. The comparison drawn by the present Director of Agriculture of Bombay should convince every one that dignity of labour is the cause of the prosperity of the Agriculturists in other parts of the world. "A small American farmer with an irrigated holding of (say) twenty acres may be worth a lakh of rupees, but he not only works his land himself, but frequently does the whole work, his hours of work being from sunrise to sunset. And the American farmer of a somewhat smaller means will not disdain to work for hire as a navvy in any spare time that he can filch from his farm, and will thus provide with additional capital for developing his land. . . . and such instances must be very rare (in India).

The next class of landholders cultivate their lands by one or other of three main systems of cultivation usual in Madras. In the *Pannai* or home farm system of cultivation, the farmer owns a number of cattle and keeps every equipment usually supposed to be sufficient for running the farm. A few permanent labourers are engaged according to the extent of land and the nature of cultivation. Casual labourers are engaged whenever necessary. The permanent labourers are usually paid grain wages, generally once a month, but invariably it is observed that even before the end of the month the labourer has taken advance wages for the next week or more, or has borrowed money elsewhere. This cannot be said to be due to poor wages, for a permanent servant

in addition to his perquisites, and occasional feeding, gets from 45 to 50 Madras Measures of grain a month; and the family members add a good deal to this. There is a peculiar custom in parts of Salem and Coimbatore Districts of mirasidars advancing to good men from Rs. 50 to Rs. 100. called (*முதல் கடன்*) *Muthal Kadan*, first loan, free of interest. This debt is rarely ever discharged, but when the man wants to change hands, the other mirasidar who takes him discharges the debt, and when the man dies the son is bound to and invariably does discharge the debt, or continues to work for his father. This smacks of the slavish system of indentured labour, but has none of the evils of the same. It, on the other hand, means that a good servant is esteemed so much that farmers are even prepared to advance him money. Such servants are said to work very well, begin work very early in the morning and stop only late in the nights whenever such pressing work is on hand. They generally do not go home for the mid-day meal which is brought to the workspot by the servant's wife who is given a small remuneration of about four Madras Measures of grain called (*செத்தப்படி*) *chothuppadi* wages for bringing food. This system seems to work really well. But in most places where the outside demand for labour is also increasing, such as near towns, or other busy places, or where local bodies are providing constant work, the general complaint with the mirasidars is that the labourers demand more wages and do less work. To demand more wages is but quite proper but that the work should be worse is not excusable. It is here that the master who can do work himself is at an advantage over the one who simply supervises. And it is the latter class of people that complain most. So in the cause of efficiency of work, there must be a combination among the landholders of the village and some radical measures should be adopted not impelled by cruel hearts, but with a view to improve the resources of the country and to make the labouring classes a stalwart race of people. Dismissal from service of a capable cooly shirking work is the first step, and he should not be entertained by others in the community until he shows signs of improvement. If concerted action is taken this step will certainly tend to improve matters. This radical move must go hand in hand with better wages, more comforts and ultimately less hours of work. The best examples for this may be seen in the success of the planters.

It is a saying among the labourers "Don't beat me on my stomach but beat me on my back," meaning thereby—do not starve me, for I cannot then do any work, but feed me well and thrash me into work if need be. Here again there is trouble. The landholder is prepared to pay better and tries his best to get better work but only so long as there is work on the farm. How is he to pay the permanent men during the long slack season when work on the farm is at a stand still. What now takes place is that the number of permanent coolies is lessened and their wages raised. As raising of wages has not increased their efficiency, casual labourers are engaged during the busier seasons at very high rate, and these absorb the little margin of profit that the landholder gets. It is thus necessary for the farmer to provide work for the permanent men in the slack season—a work that ought to be remunerative and one that can be taken up and dropped as necessity demands. The labourers are as a rule entirely ignorant of the rudiments of mechanics and even in places where there is a variety of occupations, a cooly that does *mammatti* work in dry land is incapable of doing the same work in wet lands, and so on in every other simple work. The permanent men must therefore be trained in a variety of occupations. A few of the small industries for which there are vast opportunities are the making of flour from Bananas, Plantains or Tapioco, the extraction of fibres from plantains and other fibre crops, the making of baskets, utilitarian and ornamental, out of bamboos and rattans, the making of summer thatties and brushes out of Palmyra fibre, the making of coir rope and foot rugs and things of that sort where coconuts abound. Every youth is taught in the school of the various uses of the coconuts and its parts and his only practical demonstration is the putting of everything into fire. Practical instruction in rural schools must be of better quality. It is of course not an easy thing, but with a little organized effort can be made success.

A number of interested mirasidars should engage the services of an expert and make him train the coolies. In due course of time a good many would prove very useful and in the long run even the ladies of the biggest mirasidars of the village would find it a better

pastime, to do some useful work at home than spend idle hours. Leisure hours and off seasons are not peculiar to India, but found all the world over. It is the proper utilisation of these hours that has made the farmers of Japan, America and Switzerland so successful and so happy as they are. Such work as husking rice, shelling and milling groundnut, ginning cotton and purifying the produce to be marketed would engage the farm coolies for long periods and give more profit in addition. Very hard work during an important season, and light work during the other seasons, is what the labourers have everywhere. But the period of idleness in the black soil and paddy tracts is quite a long one. When paddy ripens as it does simultaneously, and the harvest comes suddenly there is so much hard work to be done, that a good portion of the servants get sick and as a consequence almost everyone of the labourers loses a good number of days' wages, while the landholder for want of labour has to pay yet higher wages. This condition of things can well be got over by providing work during the slack season and to a certain extent by cropping with paddies of different ages.

In order that the permanent servants may do better work, with less supervision, it would be a good inducement to offer them a small share of the total produce say about 1 to 2 per cent. extra.

It is not perhaps quite good to make them work very long hours but the present practice of their starting work late in the day and working till evening with perhaps an hour or so leisure in the middle is a very bad one and must be put an end to. In a tropical country, the sun tires out the coolies very much if they work in the day and they cannot do half the work which they will turn out if they begin work in the cool hours of the morning. Work has to be stopped at about eleven and started again at about 3 p. m. in the evening and continued till 6 or 6-30. When moonlight is available they can start work much earlier, such as the ryots of Salem and South Arcot do for water lifting. Improving the general efficiency of their work is another very important matter. This ought to follow better wages. There is however no sign of its taking place especially among the servants who are working for wages for others.

The holding of matches among the servants of the landholders, both in the Agricultural work and the domestic industry, would be a sure way of improving the quantity and quality of their work. The landholder concerned must subscribe a share of the expenses, and the amount realised by the sale value of the work done in the competition, would add to the sum. The rewards to the winners must be some efficient implement suitable to the locality and must be given away by a gentleman of local standing. If the conduct of the servant is satisfactory, the prize winner must be paid better, otherwise it would damp his spirits and by comparison he would probably do less work in the field than the rest. Better wages increases his desire to get more and so he would do much better work.

There is an enormous amount of permanent improvements such as levelling, draining, silting, fencing etc., which have to be effected in every holding which are never properly attended to and which if taken up would keep the hands fully engaged in such.

The importance of keeping the labouring class in a healthy state and free from want can never be too much exaggerated. "In every nation the welfare and contentment of the lower dominations of people are the objects of great importance and deserving continual attention. For, the bulk of every nation consists of such as must earn their daily bread. It is to the patient industry of these that the higher ranks are everywhere indebted for most of their enjoyments. It is chiefly on these that every nation depends for its population, strength and security. All reasonable persons will therefore acknowledge the equity of ensuring to them at least the necessary means of subsistence. But of all dominations of people in a state they are the most valuable for, "they provide the staff of life for the whole nation, and their wives rear those hardy broods of children, who besides supplying the country with the hands it wants, fill up voids which death is continually making in camps and cities."* He "must therefore receive at least enough to sustain his body in working condition, and he will naturally want more. He will usually want to support a family and this is essential for the future supply of labour."† The labourer does

1. *The case of labourers in husbandry. 2. †Taylor.

receive fair wages and may even be paid more, but the farmer must see that the wages received by the labourer is not wasted. The improvidence and the drinking habits of the cooly class is a thing which deserves every sort of consideration in the hands of a farmer. A farmer who redeems one of his servants from drunkenness, has done more to the cause of the labourers, than all the improvements he would have effected in them. Steps are being taken in this direction on all sides but the farmer's efforts will by far be the most effectual. The period of harvest is the busiest season for the toddy contractor, for it is then that he realises in many cases, most of his profits. During this season wages rule a 100% over the normal, and 75% of the wages invariably goes to the toddy shop. The excuse is that toddy gives relief to the over-worked body. It is time that some other cheaper remedy should be found out. That the poor labourer should spend more than half his earnings on toddy alone is too grave a condition to be left unconsidered. How can a land-lord check this? The cooly rarely uses the grain stored in the bin in his hut for this purpose, for, when once the grain enters the hut, it becomes the property of the wife who would rather part with her life than part with the grain to be taken to the toddy vendor. The cooly, therefore, parts with his wages even before it reaches home. This may then be avoided, by the master not issuing wages in the field, and thus a good deal of temptation is removed. The coolies' wives may be asked in some cases to take the wages, and then the grain is safe. The master knows very well the quality of the servant and will thus use various means such as, persuasion, threatening with dismissal, and many other ways of preventing the servant from frequenting toddyshops. This cannot be done at a stroke, but can only be gradually effected; all the same it is an urgent work in which the influence of the mirasidar can do more than anything else.

One other way in which the mirasidar can better the life of the servants is to invest in the name of the servant, a small share of his wages about 6 to 10% in a bank. Co-operative banks are springing up, where security is sound, and whose advantages every small labourer ought to reap by his becoming a member. As to their extravagance the writer can give one small instance

and the rest can be imagined. A daily labourer not having more than ten rupees (probably his years savings) spends for invitations to the forth coming marriage, on a bag of areca nuts alone not less than Rs. 16, a very modest estimate. His other expenses for the marriage may well be imagined. He is probably ensuring slavery to the mirasidar for a good many years to come or has to pack off to Singapore at the next opportunity. But on the question of extravagance in marriages it is difficult to say where the reform should begin, with the landlord or with the servant, as both spend much beyond their means. I would have it begin with the mirasidars who will be copied by the servant. The health of the labourers should be better looked after. They must be better educated, must be made to have cleaner habits, their houses should be more sanitary and they must be encouraged to have small gardens by the side of their houses. They must be made to make use of the modern dispensaries instead of trusting to quacks who destroy more lives than any of the epidemics. The absolute ignorance and the entire dependance of the labourers upon the "Poosaries," devil drivers and such others to cure their ailments is simply miserable.

● The untouchables should be better treated and made to love their master by a slackening in the strict observance of the distance at which they should stand from their master, for they seem to move too far from their masters. Except a few among them who are acquiring property, the whole mass of them are sunk in ignorance, improvidence, poverty and their allied evils. It is high time for the mirasidars to see that their relations with these people are improved. They must be lifted up if they want to benefit themselves.

The relation between the landlord and the tenant, at any rate, the identification of the interest on the land ought to be greater in the share system of cultivation, where the share increases, with the increased expenditure either of labour or money or both. Generally, in this system of cultivation the tenant is a man of little means, and the landholder is generally resident in the village and the prime object of this system then is for the landholder to get more income by making the labourer devote greater attention on the land with

a prospect of his getting a greater share, while the landless labourer instead of having an uncertain life, tries to get a fair return for the exertion he bestows upon another's land in whose produce he will have a fair share. The capital necessary for farming in this way is usually advanced by the landholder, by way of seeds, manure and advance of labour charges. All or some of these are taken with or without interest after harvest from the tenants' share. Sometimes a portion of these expenses is shared by the mirasidar also. The share of the proceeds varies in different localities, from one-fourth of the grain as is the case with paddy in Tanjore, to half the produce either in wet, garden or dry lands as in Coimbatore. In Coimbatore the most expensive and profitable crop of sugarcane is raised on the share system both the parties spending almost equally, and both sharing the produce equally. The tenant has to do all the lifting of water himself which is to some extent compensated by the owner not deducting the rent of the land and allowing grass to be cut and fed to the tenant's cattle. The average cost of raising canes (excluding irrigation) would come to about Rs. 150 per acre, and the average outturn would be about Rs. 450 per acre. Thus the landlord and tenant sharing equally, get each a profit of Rs. 150. The tenant thus gets about Rs. 12 a month to which there are various additions and is thus better off than the cooly labourer who does not get more than Rs. 7 a month. It is not uncommon for such labourers to own in two years a pair of good cattle, and in the course of time to lay by something substantial. Thus the share which the tenant gets is higher than the wages he would get if he worked as a cooly labourer, and it is necessary that he should get it because he works much harder and with greater interest on the land. An instance of the share system not put to quite a successful use is seen in the Tanjore district where there is no identity of interest on the land, on the part of the tenant, on account of the very low share he receives. "The payment of a share does not tend to increase the intensity of culture" so says a famous American economist. A fourth of the paddy and half the straw is the general rule. The landlord is to manure the land but manure as a rule is never applied, the land gives the minimum returns and the tenant is a pauper and the very little advance he

receives from the farmer for expending upon cooly labour and seeds is frequently used up for his own living. Here then is improvement necessary. But if the share is to be greater to the tenant the landlord complains that he is losing more of his dues while possibly the land may not give a greater return. This would naturally happen if the land is not better cultivated. "Share tenancy is more profitable to the landlord only when the farm is under his immediate supervision."* He must therefore advance money for all the operations and see that that they are carried out effectually. More manure must be purchased, better implements and bullocks must be provided, and better work must be exacted from the tenant, and a better sympathy must be created between them. "For it is only the landlord who is willing to give his tenant a fair chance, and then insists on good farming and honest business, that will get a good income from the land,"† while "a grasping landlord drives the tenant to dishonest means in order to make both ends meet."‡

A very good system of share tendency practised in Salem and Coimbatore is that the landholder sends in one of his servants to work under the tenant. The servant is made to work better because the tenant is a labourer, and the servant must keep the same hours and do as much work as the tenant. This is something like joint cultivation, where the sleeping partner is represented by a labourer. This is worth trying in other places.

The people who cultivate the lands for a cash rent, are mostly poor, owning perhaps a pair of cattle and a few implements. Being poor, they borrow a small amount of money either from the money lender, or from a ryot in the village. Very rarely the landlord advances money to his tenant, for he has to risk his land and capital. The sum bears in most cases 18% interest, and he will have to pay the rent in certain periods, just before the Government kist is due or when the tenant has either just harvested the crop or is about to do it. The result is that on account of pressure, he has to sell the produce at a lower rate, to pay off the landlord. He thus loses much in selling, has to pay interest on the investment and the rent

*Agricultural Economics Taylor.

†Ibid.

‡Ibid.

on the land and no wonder the land hardly gives a margin of profit. The rate of interest that these people have to pay is high and the land is not generally so very fertile or is made so by the farmer that it may give heavy yields. To add to the poverty of the tenant, the period of lease is short so that he hardly utilises all his labour power in the general improvement of the farm. Arthur Young, one of the older economists of England says that "In general it may be held for sound doctrine that an estate can neither be improved, nor even held to its former state of improvement without long leases." The tenant cannot apply large quantities of manure or silt or anyhow improve fertility of the land if he is not guaranteed possession of the land for a sufficiently long period, so that he may reap the benefits of the improvements. The tenants being generally poor, cannot very much improve the land even if the leases are effected for longer periods, unless the mirasidar takes the initiative. He must first of all spend some money to improve the estate and then bring in the best type of tenants and give the land on a long lease of, say, at least 10 years. The tenant must be made to get a fair profit, a portion of which he will be induced to invest on the land in better manuring. Otherwise the tenant who lives on borrowed capital and heavily handicapped in the race, by not being able to secure the best value for the produce in the market, cannot effect improvement on the land. The landlord foreseeing the ultimate good must at first sacrifice a share of the profits by investing more money in the land. Frequent troubles have arisen about the "tenant's right" for unexhausted improvements. This is a long story, and various enactments have been made to bring about amicable relations between the landlord and the tenant in England. The Agricultural Holdings Act, enables the tenant to obtain compensation for the improvements effected on the land, for which full return has not been obtained. Disputed questions as to the value of improvements are settled by arbitration. The American Economist, H. C. Taylor, reviewing the whole question says: "that accompanying the gradual perfecting of the Agricultural Holdings Act, there has been the growth of a sense of justice in the minds of both landlords and tenants. This sense of justice is all the more effective because it is accompanied by the belief that in farm

mangement whatever is beneficial to the farmer is likewise advantageous to the landlord. It is this maxim that has to be realised by every landlord in India.

In most cases the mamool decides the cropping, and no definite clauses are added in the lease deed, as to the cropping of the land during the period of lease. In some places varagu is prohibited, just before the lease expires. A crop of paddy is enforced after plantains, sugarcane or betel in order that the tenant will leave the land level. The short leases and the indifferent manuring does not necessitate any such restrictions which may be necessary when longer leases and the greater use of fertilizers come into vogue. One clause, however, must find a place, namely that the tenant shall not raise any crop without manuring, and the landlord finding the means for it if need be. The tenant shall not also sell away his farm yard manure. It is not possible within this short article to detail the various conditions which the farmers and tenants abide by, and any book on Agricultural Economics or Farm Management will give an idea of how complicated things have become in other countries.

In the garden lands of Coimbatore, it is the custom to provide the tenant with a hut near the well, where the tenant frequently lives and keeps the cattle. The petty repairs to the shed are done by the tenant himself and the more substantial ones the farmer does at his cost. Such a system is exceedingly beneficial and should be adopted by all farmers, wherever possible. It is beneficial to the landlord, because the tenant living on the land, however, indifferent he may be, will yet devote more attention to the land than when he lives away. It will attract better tenants and command more rent. It is helpful to the tenant who can economise his time, labour and manure. One drawback to effecting this system is the scattered nature of the small holdings. This has got to be remedied by every right thinking farmer at a very early opportunity, by a system of mutual exchange. The village panchayats that are being created may have given to them some more powers to enable them to effect permanent good to the landholders.

The writer knows of an instance in Coimbatore where a tenant had leased the lands of an individual which were scattered in a few places of which three sites were close enough, with only a few yards distance between each other. The tenant had raised sugar cane in all the three pieces, and had fitted up the mill in one field, where the canes from the other fields had to be brought. While he was taking a few bundles from one field to the other, along the bund of a neighbour's field, the latter refused the right of way, and the tenant had thus to take all the cans circuitously along the bed of an irrigation channel paying as much as four times the normal wages for transport. This extra expense in cultivation and other troubles need not be incurred if the plots are consolidated.

The relations between the landholder and the tenants must be more intimate and more direct especially in the case of big estate holders, where the tenants rarely ever have an opportunity of representing their grievances to the landlord. It is here that the managers of estates are doing more harm than good to the landlord and the tenants. Where managers are appointed the landlord never cares to see to the cultivation, the requirements of the tenants and of the land. So long as the rent is duly collected, he thinks that there is nothing to be done by him in his estate. This is exactly what ought not to be. The landlord must visit the land as frequently as possible in the absence of the manager, see to the condition of the land, listen to the requirements of the tenants and find out how the income from the land can be increased without unduly taxing the poor tenants. This the poorly paid manager cannot be expected to do. Nor has he ever done very much in this way "Neither the assiduity and the experience of a hired manager, nor the power and willingness of the master to lay out improvements are so effectual as this one thing, the presence of the master."* The pay of the manager is

* "Adam Dickson" Husbandry of Ancients from Taylor.

in most cases quite nominal, while his income is quite ample. Why not pay him better and make things get on more straight forward? In smaller farms where the landholder can manage the lands himself it is a suicidal policy to employ a manager.

The system of leasing the lands to a capitalist is equally bad. It is done because the landlord finds it convenient to deal with one individual and have better security than a number of poor tenants and be worried about collection, remission of rent and a hundred other difficulties. Generally he sublets the land to poor tenants at a higher rent, a rent which would cover up his investment with 12% interest, and bad debts and also to get the lion's share of the profit. It is the honest type of the tenants that are thus taxed heavily. Why pay a middleman so heavily for the easiness in collecting rent? It is better to deal directly with the cultivators, individually and where security is uncertain to bind him with another of better security. The profit of the middleman may either go to the landlord, or in the first instance to the tenants who in the course of time will farm better.

The rent is paid either in cash or in kind. Kind payment is advantageous in that it is more convenient for the tenants to measure out a portion of the produce than that they should deal with the traders, who do not deal fairly with poor tenants.

The general economic condition of the agriculturists and the labourers of Madras is and has been far from satisfactory and a thorough study of the Madras Agriculturists that was made by Sir Fredrick Nicholson more than a decade ago in connection with the establishment of land banks in Madras, reveals, that the labourers are sunk in poverty and the landholders are in debt. The Land Improvement and Agricultural Loans Act so graciously passed make them avail of the cheap credit. The village organisation, so ancient and so firmly established, is yet

a living force, though not powerful, and the present activity of the Co-operative Department is giving a fresh lease of life to the villages. 'Back to the village'—the common cry for the labourers in industrial countries is not necessary, but the retired officials must certainly go back to the village if ever they have any spark of patriotism. It is these and other better class of landholders that must begin to improve their relations with their tenants, and the rest will follow their lead. Co-operative societies must be established everywhere, where the landlord and the labourer must sit as equals and conduct the business of the society. To go into the possibilities of co-operation would be to go astray. But I will quote a few sentences from an address of the Hon. Dewan Bahadur L. D. Swamikannu Pillai at the 3rd Agricultural Conference of the Union. A resident landlord "can best help his tenant by establishing a co-operative society, where they as well as he will be members. There is another way in which a landlord can do good to his tenants through co-operative societies, that is by investing his money in the societies, to which his tenants belong." It is by co-operation that most of the foregoing improvements will be thoroughly effected. "For the indirect and immediate effects of co-operation, its diffusion of knowledge, its remarkable educational capacity, its powerful stimulation of thought and which among them teach men to cultivate better, to select the most paying crops for each particular use, to turn their produce to more profitable account, to settle in groups, promoting well-being all round; to make the country prosperous and happier, and its immeasurable value as enabling us at length to make the rural social reform, so long fondly dreamt of, so often attempted, a palpable reality, by producing once more a peasantry comfortably and permanently settled on the soil, ought certainly not to be left out of account,"†

K. Raghavachari.

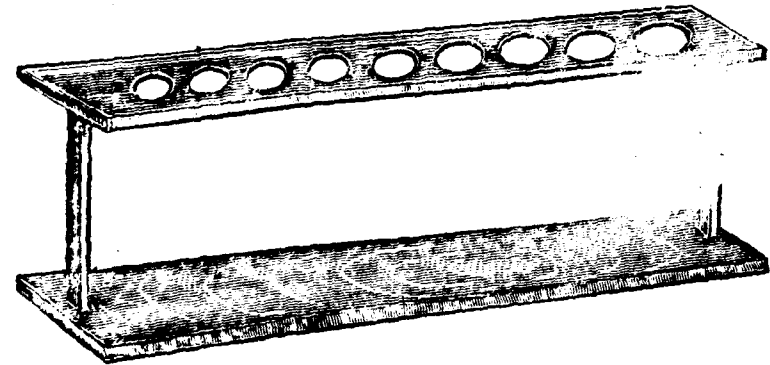
Eggs and Egg-grading

Egg as we all know is an important article of food. It contains albumen and yolk—commonly called the white and the yellow—and forms the chief ingredient of food for a greater population of the world. It often makes a good sick-diet, in some form or other, for all classes of animals. The kind, quality and size of an egg are factors which have to be borne in mind in marketing it. Similar to edible fruits of any kind that are marketed according to their quality and size, eggs for what they are worth, are worth for their kind, quality and size. There are eggs of various kinds of domestic birds, as for instance, turkeys' geese's ducks' and hens' and it is the ordinary hens' eggs, especially of the Leghorn and the country that we shall confine our attention to in this article.

The following is the brief anatomy of an egg. It contains an outer shell which is porous and formed mostly of lime-salts. Inside this shell is a thin membrane which is double and forms a protective covering for the albumen and the yolk. There is a space between the two membranes at the thick pole which is known as an air-chamber or air-space that is observed even in a fresh egg however small it may be. It is only when there has been much evaporation within, this space is much augmented and it then makes an egg a 'floater.' The albumen surrounds the yolk which is kept *in situ* by twists of albuminous bands of different densities running towards both the poles and getting attached there, and on one side of the yolk is an opaque spot—called the germ-spot—which always keeps itself on the superior surface of the yolk when an egg is placed flat. In the case of eggs that have been in transit for sometime and that are intended for setting it is highly necessary that they should be rested for about 24 hours before a hen is made to sit on them, as it is only then that the yolk with the germ-spot settles in its place, the shake caused by

the transit having slightly disturbed the contents in spite of the albuminous bands—'Chalazae' that bind the yolk in its place and tend to lessen movement within.

The value of an egg is greatly dependent on its freshness or reasonable freshness. Bad eggs, viz., 'floaters', 'stinkers', 'blood-rings', etc. etc. etc. in the poultry-language would only spell failure in egg-trade and ruin to the egg-merchant, they being good only for manure or for painters and absolutely unfit for the table. Granting freshness or a reasonable freshness, eggs may be valued most accurately by weight. Experience has shown at the Central Farm, Coimbatore, that the weight and size of an egg have a proportionate ratio. An egg-grading stand as per illustration has been made with holes of different diameters bored in a thin wooden board—a zinc or any metallic sheet will be better. The holes vary from the smallest that no egg will go through to the largest which no egg has been known to stick at.



The first hole is $1\frac{1}{4}$ " in diameter, the second is $1\frac{5}{16}$ ", the third is $1\frac{9}{16}$ ", and the fourth $1\frac{3}{8}$ ", the succeeding holes increasing in size by $\frac{1}{8}$ th of an inch in diameter. And over 400 eggs have been weighed—and these have been found to be of various weights and sizes, and it must be mentioned, of shapes too, as some were

narrower than the average-egg and would not allow of any comparison between weight and size, but these formed only a very poor minority which might be overlooked to the advantage of the buyer. Calculating only by weight which is the most accurate method of grading, where there is fair play for the buyer and the seller, the average country egg that is available from the Egg-woman for 4 pies. a piece was found to be weighing from 9 drs. to 11 drs. and this was fixed as the standard and by weight, price and size the following grades were tabulated.

Weight.		Price.	Size or No. of hole in the stand.
7	to 9 drams.	3 ps.	3
9	" 11 "	4 "	4
11	" 13 "	5 "	5
13	" 15 "	6 "	6
15	" 17 "	7 "	7
17	" 22 "	8 "	8

When eggs are handled on a large scale commercially, this system of grading by size through the help of the egg-grading stand will be much appreciated. Sometimes they can also be graded according to weight and sold as so many for the Rupee. The above system of grading by size is now in vogue at the Central Farm, and when our egg baskets are full, it will save lot of time in grading eggs, as the hole through which an egg just passes through will indicate the average weight and the number of the hole and hence the price.

A. J. Wilson.

Tiruppur Cattle Show.

The Cattle Show this year at Tiruppur was on the whole a success. The Show was opened by the Hon. L. E. Buckley, on the 6th instant, and the prizes were given away by His Excellency Lord Pentland, on the 9th instant. The cattle were well represented and the prizes were numerous. The exhibition stalls were almost empty and showed lack

of competition. The Tahsildars of some of the taluks had collected the local agricultural products, but as these were mostly common place, they attracted but little attention. Unless the committee takes pains to secure greater competition, the money spent on this branch of the exhibition would not be fully justified.

The Agricultural College did not send any of its cattle to the show on account of the outbreak of rinderpest in that locality. The "Monsoon" ploughs were however exhibited, and their working demonstrated in a plot of ground near the shandy. Ryots accustomed to the use of light wooden ploughs, after inspecting the various parts of the "Monsoon plough" passed on with the remark, that the plough was all right but required big animals, such as the Government alone can keep and feed. They were informed that ploughing with these ploughs was going on near the shandy and were requested to see them working. Half-a-dozen of these ploughs were kept ready for use, while one was actually ploughing, drawn by a pair of cattle from the Agricultural College, Coimbatore. The plough went 6 inches deep and took a broad furrow, and completely inverted the soil, turning under all the litter and dung of the animals that were tethered there. The ploughed soil was 9 inches deep and this excited the admiration of all the ryots there, and attracted big crowds, who all began to declare with one voice that ploughing 4 times with the country plough drawn by the same pair cannot produce such excellent tilth. Even for the tobacco stubble they said one ploughing was sufficient. The ryots began one after another to handle the plough, and they found it easy to work. There was no need to press the handle continuously, and the workman walked conveniently on the unploughed land. The work was thorough and no odd piece was left unploughed. But one man said "The ordinary cattle cannot draw it." After many refusals one pair—a small one—was brought from the shandy just for trying 2 or 3 furrows. One, two, three furrows were ploughed by the ryot himself who said that the work was very light and in the course of 15 minutes, all the 6 ploughs were at work drawn by the local cattle; and worked by the ryots themselves. The plough was declared by them all to be a great improvement over the wooden one, and the steep, straight edge on one side, and the mould-board inverting the soil on

the other side were found to make the work of the cattle much lighter than in the country plough where the broad body offers comparatively greater resistance to draught. The demonstration was on the whole a very great success. Demonstrations in pumping and boring were also held by the Agricultural Department. Popular lectures on "Manuring," "Thin-planting of Paddy" and "Hints to Engine and Pump owners" were delivered by the staff of the Agricultural College illustrated by lantern slides.

K. Raghavachari.

Extracts.

Loss of weight in crop after harvesting:—Mr. Evans, Deputy Director of Agriculture, Central Provinces, writes— "There is a good deal of loss in weight due to driage in the grains soon after harvest. It is probable that in some cases the very high yields reported from some of the Agricultural Stations do not represent the true marketable weights. When calculating outturn per acre, allowance will have to be made for this. This point is also of interest to the Revenue authorities who conduct crop cutting experiments on which the crop forecasts are made. A series of experiments were started, to have an idea of the amount of loss due to driage in some of the important crops. The results show that the loss in weight, in the case of early light paddies varied from 11 to 13 per cent. in the course of 3 days. In the case of late paddies the loss went down to 9.5% and in very late paddies it was still less, about 6.5%. Thus the loss is greatest in the light rices which are cut and harvested in the cold weather. The practice of harvesting and weighing paddies for the purpose of crop experiment returns in the space of three hours, may easily lead to an error of 10% over the true outturn.

In the case of groundnuts the loss was above 40% in the course of 6 days.

In cholam the loss was 15% in three days, and more than 22% in two months.

The loss in weight in dry weather crops is practically negligible as they are usually cut dead ripe at the beginning of the hot weather. Further experiments are being conducted as it may be possible to arrive at some rough factors which will allow of suitable deductions being made for driage for the different staple crops." (Agricultural Journal of India). K. R.

Mango Grafting:—Experts in graft mango cultivation have found out by experience that the qualities of the stock play an important part on the graft, influencing the quality, size, and flavour of the fruit, prolificness or otherwise and the time of flowering. In preparing the stocks, the gardeners are cutting off the tap roots to facilitate potting, thereby forcing the plant to develop more surface roots. This is the chief reason why graft mango gardens have short life of 25 to 30 years in Alamanda and the neighbourhood. To improve the qualities and the longevity of the grafts, experts are now planting seeds of superior varieties by the side of the grafts, while starting fresh gardens. After the plant from the seed makes sufficient growth, the graft is then transferred to it and the original stock without tap roots gradually removed. For grafting, the trees are planted very close, about six feet apart and the branches forced to creep on the ground, so that the stocks for grafting are placed on the ground and formed into small beds by raising small bunds round them, rendering watering easier.

(Monthly Report, Assistant of Agriculture, I. Circle).

3rd List of Subscriptions to The D'Silva Memorial Fund.

1. Amount already subscribed	...	Rs.	245—0—0
2. Mr. K. Cherian Jacob	...	"	2—0—0
3. " S. Subramania Aiyar	...	"	1—0—0
4. " P. V. Raghavendra Rao	...	"	1—0—0

5.	„	J. Chelvaranga Raju	...	„	5—0—0
6.	„	J. Ranga Raju	...	„	3—0—0
7.	„	P. G. Krishnan	...	„	5—0—0
8.	„	D. Panakala Rao	...	„	1—0—0
9.	„	K. Gopalakrishna Raju	...	„	2—0—0
10.	„	C. N. Subramania Aiyar	...	„	1—0—0
11.	„	M. V. Raghava Rao	...	„	2—0—0
12.	„	C. Narayana Aiyar	...	„	2—0—0
13.	„	M. Muthia	...	„	3—0—0
14.	„	An old Student	...	„	3—0—0
					Total 276—0—0

It has been arranged with the present collections to get a bromide enlargement of Mr. D'Silva's portrait, which it is proposed to be unveiled during the College Day. As the committee will meet to make arrangements to start the annual prizes, they will feel thankful, if the intending subscribers would either send in their contributions or their names with the amount they wish to contribute, to the joint secretary before the College Day.

K. Raghavachari,
Joint Secretary.

Estate Notes.

Mappillai—The Stud Bull of the Central Farm, Coimbatore:—As a frontispiece to this issue we are giving the picture of Mappillai—the well-known Stud Bull. We very much regret to have to announce his death on account of old age. He is of the famous Kangayam breed and was purchased in 1910 from the Pattagar of Palayakottai, by Mr. C. J. W. Shepperson, then Principal of the College. Till 2 years ago, he was the head of

the College herd and was noted for his extraordinary prepotency. We understand that the Principal is arranging to have the skeleton of his head placed in the museum.

His Excellency's Visit:—His Excellency the Governor visited the College for a few hours on his way to the hills from Tiruppur whither he had been to distribute prizes at the Cattle-show. He saw the students at work in the workshop, and the Farm-yard and went round to have a look at the Games Pavilion now nearing completion. Photographs of this as well as of a few selected Livestock were taken by His Excellency.

Re-opening of the College:—The College opened after the summer recess, on the 6th instant. The twelve students selected for the Diploma course and the new admissions for the first year class, including those selected by the Principal at Bellary and Anakapalle, have joined.

Poultry Show at Ootacamund:—There was a Poultry Show at Ootacamund under the auspices of the South Indian Poultry Association in connection with the Nilgiri Agri-horticultural society's show. The College sent only 8 exhibits selected by the Veterinary Assistant who was also deputed to attend the Show. We are glad to learn that the College was awarded 5 silver medals and 1 silver cup. It is encouraging to note that the College Poultry though only in its infancy has deserved such recognition.

Departmental Notes.

1. Privilege leave for 6 weeks is granted to M. R. Ry., W. Raghavachari Agricultural Demonstrator, from or after 24th May 1917. Assistant Agricultural Demonstrator, T. G. Anantarama Ayyar will be in charge during his absence.
2. One month's privilege leave is granted to M. R. Ry., P. A. Raghunathasami Ayyangar, Assistant in Chemistry, from or after 1st June 1917.
3. S. Pranatarthiharan, Assistant Farm Manager, Samalkota is granted a further extension of 5 days' privilege leave.

4. The following appointments and postings of Assistant Farm Managers are made. All will be on probation for one year.

- (1) A. S. Nilakanta Ayyar posted to Nandiyal.
- (2) A. Kondayya Sarma posted to Anakapalle.
- (3) A. Ramaswami Ayyar posted to Palur.
- (4) M. Chinnasami Nayudu posted to Palur.

Assistant Farm Manager A. Ramalinga Ayyar, on relief at Central Farm is posted to Koilpatti. This cancels order posting him to Palur.

5. The privilege leave for 2 months granted to M. R. Ry., V. G. Dhanakotti Raju, Agricultural Demonstrator from 17th February 1917 is extended by 3 months sick leave on medical certificate.

6. Privilege leave for one month from 2nd June 1917 is granted to C. R. Srinivasa Ayyangar, Assistant Farm Manager on deputation for training under the Government Economic Botanist.

7. Assistant Farm Manager, A. Ramalinga Ayyar is granted leave on loss of pay for 13 days from 26th May 1917.

8. M. R. Ry., M. Govinda Kidaru Avergal has been appointed to the post of the Assistant Director of Agriculture, VII Circle, with Head Quarters at Tellicherry, Malabar.

9. Farm Manager C. S. Madiah is granted 1 year's leave on loss of pay with effect from 3rd June 1917.

10. Assistant Farm Manager E. K. Nambiyar is transferred from Nandiyal to the Coconut Station, Kasaragod, Vice No. 9.

11. K. P. Sankuni Menon is appointed Assistant Farm Manager on probation and is posted to the Coconut Station, Nileshwar, to join at an early date.

12. Vasudeva Shenoi, Assistant Farm Manager, Coconut Station is transferred to Hagari.

13. One month's privilege leave is granted to M. R. Ry., R. Subramania Ayyar, Supervisor in charge of power drills, Pumping and Boring Section from date of relief.

14. The leave on loss of pay for one month granted to Assistant Farm Manager G. Sitaramasastri is cancelled.

The following sub-promotion promotions are made with effect from 1st June 1917.

15. M. R. Ry. B. Viswanath, Assistant in Chemistry, 4th grade to be 3rd grade on Rs. 150 sub-promotion vice M. R. Ry. T. S. Venkataraman seconded.

16. M. R. Ry. G. N. Rangasamy Ayyangar, Assistant in Economic Botany, 4th grade, to be 3rd grade on Rs. 150 sub-promotion vice M. R. Ry. Y. Ramachandra Rao on deputation.

THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. V.

July 1917.

No. 7.

Editorial Notes.

The College Day and Conference.

The year's College Day and Conference were celebrated on the 14th, 15th and 16th July and were attended with the usual success. The guests began to arrive even as early as the 13th and a new block of quarters on the estate, just completed but not yet occupied, came in handy to lodge the guests in. The sports commenced on the 14th punctually at 3 p. m. and were very largely attended—the pick of Coimbatore being present. The weather was quite pleasant, a heavy rain the previous day alleviating the rather oppressive heat prevalent at the period. The Obstacle Race and the Tug of War were as usual the most interesting items on the programme. We congratulate S. Dharmalingam of Class IV for winning both the Nayanar Championship Cup for the best athlete and the Parlakimidi Cup recently instituted by the Zamindar of Parlakimidi for the best all round sportsman.

during the whole year. The prizes were kindly given away by the Hon'ble Sir Alexander Gordon Cardew, K. C. S. I., amidst loud applause. The function closed with the Hon'ble Member calling for cheers for the Principal and Mr. G. A. D. Stuart for the Hon'ble Member both of which were vociferously responded to.

The various arrangements left nothing to be desired and we take this opportunity to offer our heartfelt thanks to Mrs. Barber and Messrs. A. J. Wilson, J. Muliya, C. Tadulingamudaliar, P. A. Raghunathaswami Ayyangar and C. Narayana Ayyar for the reception of the European and Indian guests, to Mrs. T. Lakshmana Rao for the tastefully executed rosettes, to the Hostel Warden for arrangements in connection with the boarding of guests and last but not least to Mr. A. J. Wilson and his enthusiastic band of volunteers for the excellent arrangements throughout.

Out thanks are also due to Dr. C. A. Barber and Messrs. F. L. C. Cowley Brown, Roger Thomas, F. A. Hamilton and K. S. Vaidynatha Ayyar for acting as Judges, to Messrs. H. C. Bennett and E. E. Berry for acting as Time-keepers, to Messrs. L. B. Gasson, D. Balakrishnamurthi and M. R. Ramaswami Sivan for acting as starters and to Messrs. F. R. Parnell and K. Kamiah for organising and conducting the sports with such success.

The Agricultural Conference began its first sitting on the morning of the 15th July at 8 A. M. with the Hon'ble Sir Alexander Gordon Cardew, K. C. S. I., I. C. S., in the chair; and was well attended. After an

address of welcome by the President of the Union and the reading of the Annual Report by the General Secretary, a report which showed an all round progress during the year, the Hon'ble Sir A. G. Cardew opened the Conference with a learned and thought-compelling speech. He briefly contrasted the conditions now prevalent in India with those in the pre-British days and drew the attention of the audience to the various difficulties that inevitably impeded the progress of Agriculture in the Presidency. He, however, assured the audience that the conditions are steadily becoming more favourable and guaranteed on behalf of the Madras Government the fullest sympathy in the progress of Agriculture in this Presidency. On behalf of the Union and the cause of Agriculture in this Presidency with which this Union is inextricably bound up, we beg to express our appreciation of this assurance and all that it may imply. We propose to print this speech *in extenso* in the August issue of the Journal.

At the request of Mr. Vengail K. Krishna Nayanar, the President of the D'Silva Memorial Fund, a bromide enlargement of Mr. S. L. D'Silva executed by The Carnatic Studio was unveiled by The Hon'ble Sir Alexander Gordon Cardew.

The Mungala and the Nayanar gold medals, for the best essays on (1) The Present condition of the supply to South Indian towns of Milk and its products and (2) The possibilities of Consolidation of Holdings in the Madras Presidency, were bestowed on Messrs K. S. Sankaram Pillai, L. Ag., and K. Raghavachari, L. Ag., respectively.

Three papers were then read (1) by Mr. F. R. Parnell on "Probable error in field experiments, (2) by Mr. T. A. Ramalingam Chettiar on "Some pressing problems the Coimbatore ryot has to solve" and (3) by Mr. F. R. Hemingway on "Agricultural Co-operation." The first paper was highly technical and is said to throw a new light on the method of conducting Field experiments. The second and third papers were more popular and were eagerly followed by some interesting discussions.

At this stage the President of the Union read a letter from Messrs: J. Ranga Raju, Bros., announcing the institution of a prize of the value of Rs. 250. Details regarding the prize will be found elsewhere in this Journal and we commend it to the Members of the Union.

Pressure of more important work prevented the worthy President from being present at the second day's Conference and the session closed with a hearty vote of thanks to the President.

An informal meeting of the Members of the Union and some of the staff of the Institute, partly to talk about the affairs of the Union and partly to exchange views and talk of "old times" with a 'Tea,' was arranged, by kind permission, at the Officers' Club on the afternoon of the 15th and latter in the day it was followed by a dinner, the resident officers on the estate playing the hosts.

The second session of the Conference began on the 16th July at 8 A. M. with F. R. Hemingway Esq., I. C. S., Registrar of Co-operative Societies, in the chair.

Four papers were read—(1) "Adulteration" by Dr. Marsden, (2) "The Coconut and its importance to Malabar" by Mr. Vengail K. Krishnan Nayanar, (3) "The milling of rice" by Mr. L. B. Green and (4) "How to spread Agricultural education among the masses" written by Dr. N. Kunjam Pillai and read by Mr. D. Ananda Rao.

Each of the papers was followed by interesting discussions and we propose to publish the papers in the August issue of the Journal with as much of the discussion as possible. In bringing the proceedings to a close, the President felt sorry that because of considerations of time he had reluctantly to apply the brake on the discussions and suggested that in future the Union would do well to have less of papers and more of discussion.

A General Body Meeting of the Union was held at 1 P. M. to consider ways and means for a better utilization of the Union Funds and, certain changes in the rules. The former was left to the Working Committee to work out and the rules as altered are printed in this issue. (outer cover).

On almost all the evenings Foot-ball, Tennis or Hockey matches were played. The huge bonfire was lit on the ~~maidan~~ on the night of Monday the 16th and the celebrations were brought to a close by a students' drama entertainment on the same night. The success of the entertainment was greatly due once again to Mr. B. Viswanath.

During the entertainment, our indefatigable War Fete Secretary, Mr. R. C. Wood, came round for a silver

collection in aid of the War Fund and this was gladly responded to.

As the years roll by, it is found that the Conference is getting to be more and more counted on as an annual function of no small importance or usefulness. The Press, the Public, and the Government are getting interested in it; and if only the past progress is maintained, the Union may soon have reason to be proud of this little venture.

Because of the abnormal rise in the cost of paper the Editorial Board has decided not to publish a separate Conference Number this year. It is proposed to publish all the Conference papers in the August issue of the Journal as a Conference Number. We hope that our subscribers will generously agree to the above arrangement.

We invite the attention of our readers to the two Agricultural Competitions the details of which will be found elsewhere in the issue. Both are magnificent offers and we hope that there will be a keen competition from among the members of the Union. Mr. Ranga Raju has always been an enthusiastic member of our Union and the offer is just the kind to be expected from the brother Rajus. We thank them heartily for making our journal the medium for publishing the results of the interesting experiments with the 'Avasara Samba' paddy. A note on this interesting paddy from the pen of M. R. Ry., J. Cheluvaranga Raju Avergal will be found elsewhere in this issue.

Conference
Number.

Agricultural
Competitions

We deeply regret to record the death of Mr. J H Barnes, B. Sc., F. I. C., F. C. S., Imperial Agricultural Chemist at Pusa on the 2nd of June 17. We offer our heartfelt condolences to his bereaved family.

Some Suggestions to Tanjore Mirasdars.*

As paddy is the most important cereal in this Presidency and the District of Tanjore possesses the largest area devoted to the cultivation of this crop, the Department of Agriculture recognised the necessity of starting enquiries, in 1908, about the condition and the practices under which the crop is raised and soon found out that there was a reasonable scope for introducing improvements calculated to increase the yield for the benefit of the ryots whose sole concern is to grow paddy which gives them food and all requirements of life.

Ultimately in 1902, an Experimental Station was started at Manganallur near Mayavaram chiefly for the trial of various manures and methods in order to enable the Departmental Officers to give correct and definite advice on the various important points from the results obtained at Manganallur where the soil and other conditions are the average of those generally prevailing in the Tanjore Delta. It is necessary to work for several years and watch the results to be certain of the advice offered. We will now consider our subject in some detail under the following heads:—

Manuring.

You all know that this involves a great problem in our district where the area is large and the sources of manure supply are extremely inadequate. The small quantity of cattle dung that is produced is also burnt up as fuel. The only manures that are therefore available

*A paper read before the Kumbakonam Agricultural Association in May 1910 with Mr. D. T. Chadwick I. C. S. in the chair.

are the ashes and the sweepings of the household and those are hardly sufficient to manure the nurseries and the Kuruvai or the double crop fields which form only a sixth of 10,83,000 acres of wet area of the district. In other words, 9,02,500 acres of Samba or single crop land are cultivated year after year without manure and if this goes on unchecked a time must come at which the annual yields will become constant and that a low general average. Yet the population of the district and Presidency is increasing steadily, which means a steady increase in the demand for our food grains chief amongst which comes rice. We cannot therefore stand by and see the yield of our land fall to a low dull level. To avert such a mischance, we must use every endeavour to increase the yield, and to do this we must find means and methods by which suitable manures can be produced, or obtained at a reasonable cost.

Green manures.

Of all the methods, the growing of green manure crops on the land itself, is of prime importance and it costs the ryot only the price of the seed. The Agricultural Department has already succeeded in introducing this practice to a fair extent in this district. For instance, in the northern portion of the Shiyali Taluq where the soil is loamy, about 800 acres of wet land were grown last year with wild Indigo for green manure and this was, of course, during the period the land had otherwise to lie idle and be full of noxious weeds, and these lands bore a better crop of paddy than similar lands not so manured in the neighbourhood, and it is a matter for gratification to know that about 100 acres of this land have become self-sown with seed of last years' wild Indigo crop.

As wild Indigo does not grow on stiff delta soils which form the main portion of the district, the Department has introduced from Bengal a green manure crop known there as daincha, and this is found to grow well on these soils. About 200 acres to our own knowledge have been grown with this crop for manuring this year.

The seed is simply sown in the standing crop of paddy just at the time of draining the fields, three weeks before the harvest of the crop.

so that the seed may get a good amount of moisture for satisfactory germination. The draining of the fields should however be, thorough, as the seed that lies in the standing water even for a single night will rot away. At Manganallur the daincha seed that was sown immediately before draining the fields germinated better than that sown afterwards. Daincha stands drought though it is greatly benefited by occasional rains during its growth. Though there was not even a drop of rain after sowing daincha in January last at Manganallur, the crop lived on till the middle of May when it was cut being 4 to 5 feet high and stacked or pitted to be used later for manure.

I may here mention that in the manurial experiments conducted at Manganallur, the plots where daincha was applied as green manure, yielded from 80 to 360 Madras Measures of paddy per acre more than the unmanured plot. The total cost of daincha was about Rs. 2 an acre. Speaking of the advantages of green and other bulky manures we must not neglect their use in improving the physical texture of the stiff soils which become hard lumpy and too impervious for the free movement of water and air when they once get wet and again dry during the heavy rains which occasionally occur before the receipt of water in the channels. In this case any amount of ploughing cannot render the soil sufficiently loose and free for the healthy growth of the crop during the season. During such adverse years as these the crops grown on unmanured single crop lands look pale and sickly while those grown on the double crop area are little affected. The reason for this is quite obvious. The land which is regularly manured allows the soil particles to be loosened and separated easily by ploughing and enables the crop to send its roots more freely into the soil and grow under healthier conditions.

It therefore behoves every Mirasidar to grow green manure crops suited to his soil on an adequate scale and improve his lands.

Phosphatic manures.

Of the various phosphatic manures that are being tried at Manganallur, superphosphate and Fish manure have so far been found useful for these delta soils which are generally deficient in phosphoric acid.

Superphosphate can be applied at the rate of 2 cwts. per acre either alone or in combination with green manures. In the latter case a cwt. is generally enough. Last year it was also tried in about 40 private holdings with profits varying in most cases from Rs. 2—8—0 to Rs. 18—0—0 per acre after paying for the manure. When the catch of fish on the West Coast is plentiful, which unfortunately for the last two years has not been the case, fish manure costs about Rs. 3 per cwt. and about 3 cwts. per acre are found to be a good application. Last year at Manganallur a plot manured with fish manure at 400 lbs. per acre gave 226 Madras measures of paddy more than the unmanured plot or an extra profit of Rs. 10 per acre after paying for the manure.

Farm yard manure.

As cattle dung is the first of all manures, the oldest employed and the most general in use in every country, it should not be neglected, though we are now bowing to the inevitable, as regards wasteful practice of burning the dung for fuel. The remedy consists in increasing the fuel supply by growing live fences and fuel trees along the bunds which are sufficiently broad and extensive in most holdings. We have got the babul tree which grows luxuriantly everywhere in the district and this has simply to be propagated in regular lines on the broader bunds. If fencing wire is attached to these trees by means of staples, a cheap fence is formed and it will serve to protect the land against stray cattle which destroy the crops, and the prunings and loppings will be useful for fuel. The babul pods form a valuable food for cattle in dry months.

In the district of Chingleput we meet with very effective korkapulli fences which answer the purpose equally well.

Returning to the subject of cattle manure the box system of preserving the manure is found most advantageous at the Manganallur Farm. In this system both the liquid and the solid excreta of cattle are preserved and a manure which is twice as good as the dung ordinarily heaped in the open, is obtained because the urine of cattle

contains as much manurial matter as the dung itself, not to speak of the much increased quantity obtained.

Under this simple system, the cattle sheds are sunk two feet below the surrounding level and the manure is allowed to accumulate to that depth under the bullocks which are given a bedding of waste straw or other rubbish every day. This absorbs the urine and keeps the standing dry.

Economical planting.

The ordinary seed rate of paddy in this district has been 36 Madras measures per acre which is unnecessarily heavy. But through the Departmental propaganda for these 8 years the seed rate has been reduced to 8 to 20 Madras measures in many parts of the district especially in Nannilam, Negapatam and Mannargudi Taluks. Though the average for the district has come to half the original rate there is even then saving of Rs. 1—8—0 per acre and this amounts to Rs. 16,25,500 on 10,83,000 acres which is about the total wet area in the district. There is every scope for further reduction as the seed rate at the Farm comes to about 7 Madras measures per acre. But the great thing is not to overcrowd the seed-bed. We use one cent for one Madras measure. It must not be supposed that mere planting with single seedling is all that is necessary for getting increased yields. But it must be remembered, that planting with single seedling or in bunches without manuring only tends to impoverish the soil, though in bunch planting the soil is ruined quicker owing to the large number of plants, each yielding a few earheads, drawing their plantfood from the already exhausted soil. In other words it should not be supposed that a bunch, say, of 6 seedlings altogether producing 12 earheads, is better than a single plant producing 6 earheads in an unmanured field as each plant has its own demands to make on the soil. If you plant single seedling sufficiently close even in starved lands you get a better income, but starving the land under any circumstances is not advisable.

But when your soils are naturally poor and when you cannot manure your lands under unavoidable circumstances, you must plant

your single seedling sufficiently close so that no space is wasted without being utilised by the plants.

Seed selection.

Seed is selected for some desirable points in a crop such as purity, power to produce large number of tillers throwing out earheads in quick succession, general vigour, uniform ripening, strength of straw etc. But for all practical purposes it is enough to select seed from single plant true to variety with largest number of ears all ripening at one and the same time and to sow the seed and transplant the seedlings separately in a patch of good soil. From this "seed patch" the best plants should be again selected and their seed sown in the seed patch of the following year and the seed from the remaining plants used and multiplied for general sowing. In this way a good strain of seed can be established in a few years and with such seed it is quite reasonable to expect our crops to yield better than is ordinarily the case. The Manganallur Farm has sold about 14,500 Madras measures of pure seeds for this year's sowing, as there were good reports of the seeds sold last year.

A. Rama Rao.

Pumping Installations.

In order to study the economic conditions under which the pumping installations that have already come into existence were working, I visited 89 installations in Chingleput and South Arcot Districts. The main feature that I noticed about these installations was that they were a success in most cases wherever the owners were capitalists. Non-capitalists did not generally fare well. Besides capital various other causes contributed to the success or failure of the installations. They are:—

1. Adequate water supply.
2. Proper care in the selection of the machinery and its subsequent careful up-keep.
3. The provision of a working capital for running the engine.

4. A carefully planned programme of crop.
5. Execution of timely repairs to the engine
6. Efficient Management.

2. The first point to be attended to in the successful working of a pumping installation is an adequate supply of water. Without it the installation of an engine is practically a waste of money. Several of the wells wherein installations have been put up by private agency were not tested in regard to their capacity to supply water. On account of this, several of the ryots have had to dig inner wells to supplement the supply in the major wells. In one or two cases the installations themselves had to be removed resulting in loss to the owners. Ryots should therefore before launching on a pumping scheme ascertain by careful observation whether the supply would be adequate. To avoid any possible mistakes in calculation by the ordinary ryots they are advised to seek the assistance of the Agricultural Department who on payment of an initial fee of Rs. 10 will arrange to have the locality inspected by an officer of the Department and advise the applicant on the feasibility of the project. If the project is a big one it is always desirable to have the source of water supply tested by means of a pumping set. There are instances in which parties applied for loans for pumping installations but who were reluctant to pay this initial fee of Rs. 10. This evidently shows that they do not understand the importance of the preliminary inspection on the result on which depends the success or failure of the installation.

3. The next point is the exercise of proper care in the selection and erection of the machinery and its subsequent careful up-keep. It is only by chance that the ordinary ryot is able without professional aid to instal an engine of required Horse Power with the appropriate size of the pump. An instance was noticed by me in which a ryot (of Anichambalayam Villupuram Taluk) installed an engine of 6 Horse Power with a 4" pump without professional advice. The engine did not supply water properly and even then the owner did not choose to ask for professional assistance to find out the defect but seeing that his installation was not a success he sold the engine which he

originally bought for nearly Rs. 2000 for Rs. 900 subjecting himself to a heavy loss. This engine was purchased by a ryot of Valavanur and is now working well with a 3" pump. The man expressed great regret that he did not know when he sold it that it could be worked satisfactorily with a 3" pump. If he had only consulted professional men then and there, he might not, perhaps, have been in need of disposing of it and instead of incurring a loss he might have gained considerably by it.

4. The selection of the machinery is very important especially in the case of second hand plants. To all external appearances second hand plants appear to be good but after a short time they get into disorder frequently. A good deal of expenditure has to be incurred to set them right and then there is the worry and delay in securing the required parts. There are several instances in which second hand plants gave a good deal of trouble to the ryots and in one or two cases have even cost them more than a new engine. I found a tendency among ryots who own second hand plants to ask what is to be done if the new engine gets out of order similarly but they entirely ignore that the chances of a new engine getting into disorder are very few and in most cases there have been no complaints regarding them.

5. Having ensured a good water supply and having put up an installation, the next point is its up-keep. In many installations no trained man has been employed to run the engine. This is a very important fact which ryots generally ignore. Persons with no technical knowledge but who only learnt to start and stop the engine have been engaged as drivers on very low pay. These are mostly the farm servants of the owners and they are able to run the engine only so long as it gives no trouble. But no sooner it gets into disorder than the owner has to run for professional aid and this does not always come in right time. Some ryots complain that they do not get good drivers and even if they do they do not stay long. The solution of this difficulty lies in them only. Ryots who choose to invest so much on machinery grudge to pay good wages to the

drivers with the result that bad wages secure only bad men and even if by chance they secure good workmen they are always on their tip-toe looking for better wages. Persons who have engaged whole timed drivers certify to their usefulness and in the end this course is more economical. Under their care the engine is always kept neat and tidy and this means that it will work for some more years. In an installation in Valavanur I actually noticed that crude oil was being used in place of lubricating oil and it needs no saying how long the engine will work under such circumstances.

6. The next thing is the provision of a working capital for running the engine. Persons who go in for an installation should realize the fact that it requires now Rs. 3 to 4 per day to run the engine and they must provide a sufficient capital beforehand for this purpose and this should be renewed every year as soon as the crops are harvested and converted into money. There are several instances in which the absence of such a provision contributed to the failure of the installation. The question of providing enough working capital is therefore very important. A ryot should exercise the same foresight in this respect as he does in regard to the storage of fodder for his cattle. It is therefore advisable to store up the requirements for a full year in advance so that he may be free from anxiety later. By buying in a lot he gets the oil etc., at a cheaper rate and this compensates for the loss of interest on the money invested in the purchase of a year's requirements. This is actually being done by some ryots.

7. One of the chief reasons attributed to the failure of several of the installations is the difficulty in getting timely repairs executed to the engine. I have heard this complaint mostly from those who have not engaged trained drivers. The raw unprofessional man who looks after the engine is the cause of several of the disorders in them and the difficulty experienced in getting timely repairs done, all the more speaks in favour of the entertainment of trained men as drivers. Under the latter the engine very rarely gets out of order and even if it does they would be able to make temporary arrangements until professional aid could be got and the owners can thus be safe about their crops. To provide against contingencies the owner should also

arrange to have spare parts of those portions of the engine which wear out soon. The ryots are also advised to compound their installations.

8. The next thing that a ryot is to attend to is an efficient programme of crop. Having installed an engine at a heavy cost the aim of the ryot should always be to get as much out of the land as possible. The ryots may seek the advice of the Deputy Directors of Agriculture in this matter. An instance is quoted on page 26 of the Madras Agricultural Calendar for 1917-18 in which a certain gentleman is employing a $3\frac{1}{2}$ Horse Power Engine and a 3" pump for the irrigation of only 3 acres. But the crop raised is tobacco and he is reported to get a gross income of Rs. 3,000. Another instance was noticed by me in Seruvadadu of Villupuram Taluq. There a gentleman has about 40 acres in one block with no irrigation facilities. He started an installation 4 years ago of a 14 Horse Power Engine with a 6" pump and he is now cultivating about 30 acres of paddy and 10 acres of sugarcane. Last year from sugarcane alone he is said to have realised a profit of Rs. 3,000. He said that he expected to get Rs. 5,000, but some damage occurred to the crop by the cyclone of November last. Before the installation, the lands could not even fetch a rental of 10 Rs. per cawni but now the same lands fetch a rental of Rs. 50 per cawni.

10. Lastly there is the question of efficient management. To efficiently manage a business the master should know the details of it. He ought to be able to learn enough about the engine so as to be able to teach or advise the driver and he can then be sure that his driver will attend to the work with greater care. I noticed several engines lying idle and when asked why, I was informed that the owners do not take any interest in them. The engines when they are left uncared for soon deteriorate in value. Several installations had to be removed owing to inefficient management. To quote an instance there was an installation at Sennirkuppam in Saidapet Taluq. There the area cultivated with a 4" pump was only 4 to 5 acres when actually 15 to 16 acres can be irrigated under it and the owner was a non-resident. There are several other cases in which the maximum area of crops that can be raised under

the engine was not cultivated which means so much increased profit was lost to the owner. The following may be cited as instances of efficient management. A gentleman in Pettai, Saidapet Taluk, is successfully cultivating wet paddy in about 25 acres solely with the aid of a pumping installation and he is realizing a net annual profit of not less than Rs. 1,000. In another case a Muhammadan gentleman of Yemminganur, Bellary District hired an engine from this Department with the object of baling out water from a well and deepening it. Last year he raised sugarcane in about 2 acres and the profits therefrom were enough to pay up all the engine charges and in addition he realized very good profit by making use of the engine water for indigo vats. Seeing the paying nature of the concern he has applied for a loan from Government for the purchase of an oil engine and pump for himself.

10. The engines that are used solely for cultivation purposes are idle from 4 to 6 months in the year. The ryot does not realize that for every day on which the engine is idle he is losing something in the shape of interest and depreciation of machinery. It is therefore desirable that some industrial plant suited to the locality should, wherever circumstances permit, be attached to the engines for work when they have no pumping to do.

K. R. Sundaram Aiyar.

Loans Tashildar.

A Peep into the cultivation of paddy in (Theri) lands (sand dunes) of Tiruchandur Taluk, Tinnevely District.

While I was returning from Kulasekarapatnam during my holiday trip I halted for a day at Ammapuram and during my evening ramble my attention was drawn to a greenish patch of about 20 acres at a distance of about a quarter mile amidst an area of a couple of hundred acres devoid of crops and other trees except a few palmyras scattered over here and there. As it was

the month of May—a period in which crops are not ordinarily raised in this locality—my curiosity was all the more aroused to find out what this greenish patch could be and I therefore proceeded to the spot. Here to my surprise I found paddy growing in theri lands and irrigated by lift irrigation from shallow wells containing abundant supply of water. Each acre more or less contained a well and the bailing of water was done by picotas erected on both sides of the wells one opposite to other each worked by a single person. Small canoe shaped baskets made of Palmyra leaves each holding about four Madras measures of water were the buckets used in lifting the water. Both husband and wife stood on opposite directions and were lifting water for the paddy crop. The field was divided into narrow long beds just as it is done for Ragi cultivation to minimise flooding, and irrigation was given as it is ordinarily given to Ragi crop. When questioned, the cultivator gave out that he irrigated the crop thrice a week and never flood the land. The crop was nearing ripening stage and was quite good. As the name of the variety was quite unfamiliar to me I had to make further inquiries about the crop which revealed the fact that the name “Avasara Samba” அவசரம் சம்பா was quite appropriate as the crop came to maturity within 75 days from the date of sowing. The variety is a coarse one having brownish coloured husk with reddish coloured rice inside. A few rogues containing whitish rice inside were noticed in the field but these appeared to mature a week later, according to the ryot himself. Not having come in contact till now in this Presidency with a variety of paddy which could mature in 75 days and that too without flooding the fields, I wanted to verify about the age and questioned him the exact date of sowing but to my surprise I found that the Tamil date given by him showed that the crop was then 60 days old. As the grains in the ear-heads did not exude any milky juice on pressing between fingers, the crop will surely be ready for the sickle in another ten days' time. Further enquiry revealed that this was being grown even

in the adjacent villages where I also proceeded and satisfied myself that it was really a 70 to 75 days' variety. This is reported to take the same length of time when grown in different parts of the year. But I doubt this. The present crop was however grown during the last week of April.

As the Departmental Officers engaged on district work are almost daily receiving enquiries regarding short duration variety of paddy which could mature in 80 days, arrangements have been made by Messrs. Rangaraju & Bros. 5 Mount Road, Madras to procure 60 measures of seeds of this variety with a view to distribute at the rate of not more than one measure, free to such of the members of the Union who have passed out of the College and who can directly experiment and record the results for being published in the organ of the Union.—The Madras Agricultural Students' Union Journal. The seeds will be available by the 15th of August and those who are anxious to experiment may apply to the Managing Proprietor, Messrs. Rangaraju & Bros. 5 Mount Road, Madras.

J. Chelvaranga Raju.

Notes and News.

Working of Cows:—In the District of Coimbatore round Palayakottai, it is the common practice amongst the poorer ryots to use only cows for tillage and mhothe work. Only the richer ryots keep bullocks for these purposes. Cows are worked right up to the time of calving and are put in the yoke very soon thereafter. Thus one sees in the fields calves of all ages accompanying their dams at work. Some of the cows when 4 or 5 months calved, yield $\frac{1}{2}$ to $\frac{1}{4}$ M. M. of milk per day while still doing draught work. Ryots say that they adopt this practice so as to be able to get along, on less capital and save the fodder. The cows, noticed in the yoke were doing quite effective work and were in fair condition.

Note on Silage Making:—The value of silage in Great Britain and India cannot be compared as the conditions are so very different. In the former country the introduction of turnips mangels and other succulent foods practically did away with the need for silage, as these crops could be stored for use during winter, when grass is not available. In India there are no succulent food crops which may be stored like the turnips, for use during the hot weather, when there is no grass. Therefore silage is of much more importance here than in Great Britain. Without succulent foods, stock farming in Great Britain would be a practical impossibility; indeed the introduction of these has had a most important effect on stock improvement and the development of the live-stock industry. In districts with garden lands in India, succulent crops for cattle may be grown all the year round; thus silage in these localities is of less importance than where the land is all dry. The relation of a supply of succulent cattle foods all the year round to the development and the health of stock, has still to be studied in Madras. I am of opinion that succulent foods during the hot weather will be even more valuable here than the turnips etc., during the cold weather at home. For these reasons I think silage experiments should be made and continued until a definite process suitable for local conditions has been worked out.

(Monthly Report, Dy. Director of Agriculture, Live Stock).

Increased food production in the United Kingdom:—Lord Selbourne, President of the Board of Agriculture, and his secretary, Lord Middleton, issued sometime last year an important memorandum pointing out that Germany was producing more foodstuffs than England did and recommending that great efforts must be made to increase crop production in Great Britain. A number of special committees have been appointed and it was hitherto considered that more pasture land must be broken up and put under cereal crops. The expert opinion of the majority of

United Kingdom Agriculturists is, however, not for wholesale or indiscriminate breaking up of pasture lands without due regard to the availability of labour, machinery, capital &c., available, but tends to the view that more intensive cultivation will solve the question quicker, provided there is an adequate supply of fertilisers.

If intensive culture is demanded in Great Britain where the average yield of wheat is 3 times as much as in India, how much more necessary is it in India?

From the Chemical News. M. R. R.

On the 17th Forenoon there was a Farm Managers Conference under the Presidentship of Mr. H. C. Sampson. The Deputy Directors of the I, II, VI and VII Circles, the Assistant Directors I and VII Circles, the Principal, the Inspector of Agricultural offices and many Farm and Assistant Farm Managers were present. Many questions relating to Farm outline were discussed and Farm Managers were invited to give their experience in connection with the eradication of bulb grass. Ways and means were also discussed for maintaining a more permanent record of demonstration work done by the different Agricultural Demonstrators. In bringing the proceedings to a close the Chairman hoped that in future more time would be devoted to Agricultural problems proper.

A Conference of Agricultural and Co-operative Officers was held on the 17th afternoon to discuss various methods for bringing about a closer understanding between the two departments. The Director, the Principal and the Deputy and the Assistant Directors of Agriculture represented Agriculture while Co-operation was represented by Mr. Hemingway, the Registrar and Messers. Vedachala Iyer, Srinivasa Rao, Nageswara Rao, and Kunhunni Menon, the Assistant Registrars.

The fifth meeting of the Indian Science Congress will be held in Lahore on January 9th, 10th, 11th and 12th 1918. His Honour, the Lieutenant Governor of the Panjab has consented to be the Patron of the meeting and Dr. G. T. Walker, C. S. I. will be the President. The following sectional presidents have been appointed:—Agriculture, Dr. L. Coleman (Bangalore); Physics and Mathematics, Dr. Wali Mahomed (Aligarh); Chemistry Dr. G. J. Fowler (Bangalore); Zoology and Ethnology, Dr. Chowdhuri (Calcutta); Botany Mr. R. S. Hole (Dehra Dun); Geology Mr. E. S. Pinfold, (Rangoon); Dr. J. L. Simonsen, of the Presidency College, Madras, will be the General Secretary and Mr. A. S. Hemmy and Rai Saheb Ruhi Ram, of the Government College, Lahore, will be local Secretaries.

Departmental Notes.

1. Mechanic J. A. D. Williams, to take charge of No. 1 Circle, comprising Ganjam, Vizagapatam, and Godavari Districts, head-quarters at Vizagapatam.
2. Supervisor, M. R. Ry., A. Viswanatha Ayyar, on relief by No. 1. is transferred to the Department of Industries.
3. Mechanic J. Babu Rao, to take charge of No. II Circle, comprising Kristna, Guntur and Nellore Districts.
4. Supervisor, M. R. Ry., P. V. S. Ramanujam Pillai, remains in charge of No. III Circle, comprising Bellary, Karnool, Cuddapah and Anantapur Districts. But his head-quarters will be moved to Bellary in place of Gooty.
5. Supervisor, M. R. Ry., S. Rajagopal Nayudu, on relief by No. 3 is posted to take charge of No. IV(a) Circle, comprising Madras, Chingleput and south Arcot Districts, head-quarters at Madras.
6. On relief by No. 5, Mechanic, M. R. Ry., P. S. Ranganatham Pillai, now, in charge of Cuddalore Circle, is transferred to the Department of Industries.
7. On return from leave on 1st July 1917 Supervisor, M. R. Ry., A. V. Varadaraja Mudaliar, will take charge of No. IV(b) Circle, comprising Note Arcot and Chittoor Districts with head-quarters at Vellore from Mechanic G. R. Venkateswara Ayyar who will remain in No. IV(b) Circle.

8. On relief by M. R. Ry., H. Venkataramaniah, Engineering Assistant, Agricultural College, Coimbatore, who returns from leave on 1st July 1917, Supervisor, M. R. Ry., Y. Jananarayana Sastri is posted to No. V Circle, comprising Trichinopoly, Tanjore and Salem Districts with head-quarters at Trichinopoly.

9. On relief by No. 7 Supervisor, M. R. Ry., C. Sundaram Ayyar (Tanjore) and M. R. Ry., V. R. Venkatarma Ayyar (Trichinopoly) are transferred to the Department of Industries.

10. Supervisor, M. R. Ry., K. Govinda Menon will remain in charge of No. VI Circle comprising Madura, Rannad and Tinnevely Districts, but his head-quarters will be moved to Madura in place of Tinnevely.

11. On relief by No. 5, Supervisor, M. R. Ry., A. K. Subrahmanya Ayyar is posted to No. VII Circle comprising of Coimbatore, Nilgiris, Malabar and South Kanara Districts. Mechanic A. Sachitanandam at present in charge of Coimbatore Circle will continue as Mechanic in No. VII Circle.

12. In addition to Mechanic M. R. Ry., P. S. Ranganatham Pillai, vide No. 6 above, the following Mechanics are transferred to the Department of Industries:—

S. Rajagopala Ayyar from Tanjore,
V. Kanakiah Nayudu from Bezwada,
S. Kasthuriranga Ayyar, from Trichinopoly,
G. Ramamurthi from Gooty,
and K. Ramachandra Ayyar from Tanjore.

13. With effect from 1st July 1917 the control of all industrial plants such as cotton gins (except the gins on the Agricultural sections) rice hullers, oil presses, groundnut decorticators, will be transferred to the Department of Industries. Jaggery making plants will continue under the control of the Agricultural Department for the present.

14. Farm Manager M. R. Ry., A. V. Thirumuruganatham Pillai, is granted an extension of privilege leave up to 20th July 1917.

15. M. R. Ry., T. S. Ramasubrahmanya Ayyar, is appointed 4th grade Assistant under the Government Agricultural Chemist, Coimbatore in the Upper Division Science Section on Rs. 75, 75, 75—5—125. Subprotem to fill an existing vacancy.

16. M. R. Ry., T. Lakshminath Rao, is appointed Assistant Farm Manager, 4th grade on probation and is posted to Samalkota for training.

17. Extension of sick leave for 2 months is granted to M. R. Ry. T. Ranganath, Assistant in Mycology from 4th June 1917.

The following promotions are made in the Agricultural Section, Upper Division.

18. M. R. Ry., O. Narayana Ayyar, 3rd grade Farm Manager to be 2nd grade on Rs. 175 vice M. H. Ry., M. Goinda Kidavu promoted to Gazetted rank.

19. M. R. Ry., S. Ramasami Pillai, Agricultural Demonstrator, 4th grade to be 3rd grade vice No. 18.

20. M. R. Ry., N. S. Kolandasami Pillai, Farm Manager, 4th grade to be 3rd grade to fill an existing vacancy.

Numbers 18 and 19 will take effect from 12th June 1917 and No. 20 from 26th June 1917.

21. The six weeks' privilege leave granted to M. R. Ry., K. T. Bhandary, Agricultural Demonstrator, from 24th May 1917 in this office B. Dis. No. 144, dated 2nd May 1917 is extended by 14 days.

22. Farm Manager, M. R. Ry., A. V. Thirumuruganatham Pillai, on return from leave is posted to charge of District Work in the Salem, Trichinopoly and Coimbatore Districts with Headquarters at Salem.

23. M. R. Ry., S. Narayana Ayyar, is transferred from District Work in the VI Circle to be in charge of Nandyal Farm.

Advertisement Rates.

This Journal is an excellent medium for advertising Agricultural and kindred subjects (Agricultural machinery, manures, seeds, plants, books etc.). The following is the schedule of rates:—

	Single insertion.	per annum.
	Rs.	Rs.
For full page ...	5	20
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For quarter page ...	2	8

The rates of Advertisements of Trade, other than Agricultural subjects, will be one and a half times the above. Preparation of blocks, unless supplied by firms, extra.

N.B.—All advertisements are subject to the approval of the M. A. S. U. Working Committee before insertion, and the charges are payable in advance.

All business communications should be addressed to:—

The Manager, M. A. S. U. Journal,
Agricultural College, Lawley Road, P. O., Coimbatore.



S. L. D'Sylva
Veterinary Assistant at the Agricultural Colleges Saidapet and
Coimbatore 1888-1915. Facsimile of a portrait unveiled
at the Agricultural Conference 15th July 1917.

THE JOURNAL
OF
The Madras Agricultural Students'
Union.

Vol. V.

August 1917.

No. 8.

As promised in the July issue we have great pleasure in presenting to our readers this, the Conference and August number of our Journal in which will be found all the papers read at the Conference together with the main features of the discussions which followed the papers. Other details in connection with the College Day and Conference are published as appendices :—

The Conference.

The first session of the Conference began its sitting on July the 15th at 8 A. M. with the Hon'ble Sir A. G. Cardew, K. C. S. I., I. C. S., in the chair.

This was attended by a large number of visitors, among those present being Mr. N. Macmicheal, Mr. F. R. Hemingway, Mr. G. A. D. Stuart, Mr. H. C. Sampson, Mr. R. Thomas, Mr. F. Newland, Mr. R. D. Ansted, Mr. F. R. Parnell, Rao Bahadur T. S. Balakrishna Iyer, Mr. M. S. Mascarenhas, Mr. T. A.

Ramalingam Chettiar, Mr. V. S. Aswatha Iyer, Mr. K. Narayana Sastri, Mr. Velliyangiri Gowder, and Mr. Vengayil K. Krishnan Nayanar.

The proceedings commenced with the following welcome address from Mr. R. C. Wood the President of the Union :—

“ When I realised that I was again due to make a welcome address,—and the number of such past addresses, I have had the honour of making, is mounting up—I took the most natural step, namely, to look up my last year’s address and see what I had said there. I found to my distress that it had not been printed. It was perhaps considered not worth it (laughter). But after all gentlemen, what is the harm of repetition. Even if one could find fresh phrases each year, one’s sentiments would be the same,—One of welcome to all our visitors coupled with pleasure at the sight of so many old friends. It is indeed a liberal policy which permits so many old students, to meet here each year—partly for the direct benefit of the Conferences and meetings, that are to be held, but partly and, perhaps quite as much for the benefit of the informal discussions and private talks which take place between all. Though a small Department we are, thanks largely to those who control our destinies, a rapidly expanding one, and the necessity for keeping us united is great and greater every year, and I am glad and proud to think that it is on Coimbatore and this Agricultural College that such a feeling of unity is based.

The year’s report is in your hands, and all, whether members or not, can judge of the success which has up to now, attended our efforts. One of the most important subjects which will be discussed at the session this afternoon, is a consideration of the objects on which the funds of the Union can be usefully spent. I am one of those who think that our best reserves are in the good-will of our friends and the consciousness of good work to our credit, rather than in funds lying idle in the Bank, and I have

little doubt, that to a greater or less extent that will be found to be the general opinion of the majority.

I will keep you no longer, but must remind the Union of the debt that they owe to Sir Alexander Gordon Cardew, K. C. S. I., for his kindness in attending our College Day celebrations. We much regret that his many duties do not permit of his being here for our second day’s Conference. Finally I can only assure you all that I voice the opinion of the Estate, when I tell you that we have looked forward to this day, and prepared for it, with much pleasure. In the name of the Students’ Union, I bid you warm welcome. (*Cheers*).

The General Secretary of the Union Mr. K. Krishnamurthy Rao read the report of the Working Committee of the Union for the year 1916—17.

Sir Alexander Gordon Cardew then delivered the following interesting and thought compelling speech :—

You were fortunate last year in securing as your President a practical man of business, and he gave you an address which contained the best of all kinds of advice, that is, advice based on experience. I am afraid that I have no similar claim on your attention, and my presence here to-day must be taken not as indicating the possession of any special information to be laid before you, but as evidence of the very deep and sincere interest which the Madras Government, of which I am a member, feel in the welfare and development of this College. It would indeed be unnatural if the Madras Government did not feel a strong interest in the Agricultural College for, the prosperity and progress of this Presidency are indissolubly bound up with the interests of agriculture, and this College has been created to advance those interests. Agriculture is, as you all know, the leading industry of the Presidency, and out of forty-two millions of people in Madras over twenty eight millions depend either as workers or as dependents on agriculture for their support. You also know that through various causes the agriculturist

of South India, though industrious and hardworking, does not derive from his labour the reward, that he might under more favourable circumstances and with improved conditions, receive.

The object of the Government in creating this College was, to help this great population to increase the result that its labour produces, to make that labour more efficient, to enable it to produce larger profits, and so to leave a larger margin of comfort and a greater chance of progress and prosperity for South India. Those who are studying here are being trained to be the agents of this advance, and I am here to-day to say how keenly interested the Government are in the work of the College and to show that the work which is being done here both by the students and by the Principal and his whole staff of Professors and Assistants is watched with sympathy and interest and warmly appreciated by the Government. These magnificent buildings which have cost altogether some nine lakhs of rupees prove that at last the importance of agriculture has been recognised by Government. The annual report of the **Students' Union** which has just been read bears witness to the steady progress of **that useful adjunct of the College**, and, I congratulate you all on the share which you are taking in the great work of aiding the advancement of South Indian Agriculture. The work which is being carried on in this College and the Research Institute attached to it is, I take it, the application of

Modern scientific methods and principles and modern scientific knowledge and results to Indian conditions. Before this can be successfully carried out a very careful study of those conditions is essential. There was an idea prevalent some thirty years ago that Indian agriculture could be easily improved by the introduction of western implements, western strains of cattle and western ideals without any reference to the conditions of the country. That idea has now been abandoned. It is recognised that Indian agriculture which is the result of countless centuries of experience is not to be improved by the hasty generalizations drawn from entirely different surroundings. It is essential to take into account the climate, the soils and

character of the people. In order to improve Indian agriculture **something more** is necessary than to condemn indigenous methods. But it is equally true that the indiscriminate eulogy of everything Indian which is so common in certain circles at the present day is equally unlikely to produce any useful result. The Indian agriculturist has achieved progress in the past two thousand years and his rule of thumb methods will never carry things much further than they have been carried already. If the average outturn of wheat for instance per acre in India is twelve bushels against thirty three bushels in England it is clear that something should be done to improve the Indian average. The new Agricultural Department which has been created in the last fifteen or twenty years is hard at work all over India trying to deal with this and similar problems and with no mean promise of success. Undoubtly there are

Great difficulties in the way. The first of these is, it seems to me, the illiteracy of the peasantry. A population of illiterate ryots, however large a measure of national shrewdness it may possess, and shrewdness and ingenuity of the Indian ryot are undoubted, it is nevertheless at a great disadvantage when placed in competition with a thoroughly well educated body of agriculturists like that of Germany, Belgium or Japan. It is handicapped by inability to learn of experiments or new methods through the written word. It is entirely dependent on oral instruction and even then lack of general knowledge prevents the instruction from being fully appreciated. Results may be recognised but their cases are not understood.

Our first task should therefore be to educate the agricultural community. How that is to be done with the funds at our disposal remains a problem. As we have already seen we have in this Presidency a population of forty-two millions, a population which is increasing at the rate of three millions in each decade and which probably already numbers forty-four millions. How is it to be possible to provide elementary education for the six or seven millions of children in this Presidency without some prodigious increase of revenue. People perhaps hardly realise that the total Provincial

Revenues of the Madras Government for all Provincial purposes hardly amount to five millions a year. This is one of the cruxes of Indian administration of which no one has yet indicated a solution. But until education is provided the South Indian ryot must remain at a considerable disadvantage.

It has, I know, been suggested that education is not the first essential for South Indian Agriculture. The idea has been thrown out that the prior step should be to increase the wealth of the Agriculturist and let education follow. This idea is fascinating, but it may be doubted whether experience will show that it is a sound one. Nor is the lack of education the only difficulty that the Agricultural Department has to face there are even more.

Formidable dragons in the path. The Indian social system and the Indian Law of property have not been devised with a view to agricultural or industrial efficiency but have grown up under the influence of deep seated religious ideas most difficult of change or removal. The scheme of family property which makes every son who is born into the family a co-owner in the family property and which gives to such co-owner or co-parcener a right to demand partition at any moment presents elements of great economic difficulty. Under the influence of western Individualistic ideas and the growth of population it has lead and is leading every day to more and more minute Sub-Divisions of the land until a point has been reached which is most injurious to the interests of agriculture. I heard lately of a village in which one survey field measuring only seven acres was divided into nineteen separate pieces or properties, owned by six different pattadars, one of these pattadars held nine separate pieces of land ranging in size from nearly half an acre down to one hundredth of an acre. In another village a survey field measuring only 1.66 acres of land and paying altogether a revenue of Rs. 4 As. 10 was cut up into thirty-seven minute properties. It is easy to see what a hindrance to sound agriculture such minute sub-divisions present. Mr. D. T. Chadwick, whose appointment to be the first Indian Commissioner for trade in London we

have lately heard of with so much pleasure has pointed out clearly the evils of this system. It renders supervision of labour more difficult. It means that implements have frequently to be moved from one small patch of cultivation to another, thus wasting time and rendering the use of any but light and portable tools difficult. It makes it almost impossible for a farmer to fence his land for pasturage. It places special difficulties in the way of any farmer who wishes to cultivate a different system of cropping from his neighbours and it greatly hinders any improvement of breeding stock. A man who owns such minute fragments of land cannot go in for agricultural improvements, such as sinking a well. He has to put down the same crop at the same time as his neighbours for if he attempts a crop which remains on the ground longer than those around him, the village cattle will come in and eat it after the rest of the fields are reaped. This minute sub-division also leads to frequent disputes regarding the passage of water channels, rights of access and so on, and involves much loss of actual land in sub-dividing ridges.

An Economic Evil of this sort, arising as it does out of the social customs of the people is peculiarly difficult to deal with and real improvement can hardly be effected without some drastic change in the Hindu Law of property and for that there is no doubt the Indian public is not prepared. Until however some such change is made, agriculture in India must continue to be at a grave disadvantage. Other causes are at work in India which tell against the improvement of agriculture. The long centuries of turmoil which preceeded British rule have left an unhappy legacy even to the present day. It is the fashion to paint glowing pictures of the peace and plenty of Hindu times, but history shows a picture of internecine war during which the agriculturist was constantly the prey of contending armies. A South Indian inscription describing the proceedings of a conqueror in one of these wars says. "In the countries of hostile kings he drove into the rice fields his chariots drawn by restive horses. Into the fresh water tanks of the territories of his enemies he forced his angry elephants with broad feet and stout neck." It is small wonder that a population exposed for centuries to such treatment

as this cannot readily shake off its effects. For the sake of protection the agriculturist learnt to live in a village on a common village site often far removed from his fields with the result that the fields are deprived not only of the manure that would otherwise reach them but also of the constant minute attention which the resident farmer gives naturally to his holding. Moreover the old insecurity and uncertainty as to the future have left their mark on the cultivator's character. Improvements are not always immediately profitable and the Indian agriculturist is still inclined to look too much to the present and too little to the future. He is too apt to spend the capital which ought to be put into his land on marriages and other social ceremonies. You all know we have all heard of extravagant sums which are expended on such occasions and far too large a proportion of the great increase in agricultural profits which recent years have brought has been wasted in this way.

These are some of the formidable difficulties in the way of agricultural advance to deal with. It is not easy to exaggerate them or state the obstacles which the pioneers of agricultural progress have to face. On the otherhand there are

Some hopeful symptoms which must not be overlooked. Education is spreading surely and steadily. Chief of these is, I think, the surprising success of the **co-operative movement** which has undoubtedly opened a new vista of improvement. If co-operation continues to progress as it has done in the last ten years, its influence on the development of agriculture will be incalculable. It places within the reach of the ryot the means of raising the capital which is required for the improvement of his land without having recourse either to the too rigid system of State loans or to the usurious hands of the money-lender. It has been found in other countries to facilitate enormously the supply and distribution of agricultural implements. There are many directions in which co-operation will come to the aid of the agriculturist and relieve him of his present difficulties; and the enthusiastic way in which the co-operative idea has been taken up by the people of India is one of the best auguries for further advance.

The future therefore is not without hope and it belongs to those who are young like you and who are the students of this College to realise it. I feel quite sure that the work which is being done here is of the greatest potential value to the country, the money which is being spent on this College is well spent and I hope that each year it will be increased and that as the Department of Agriculture is able to extend its operations more and more funds will be placed for its usage. It will certainly be my endeavour so long as I am in charge of the Financial Department to help forward the cause of the Agricultural Department as far as it lies in my power and I feel sure that I am only expressing the sentiments of all members of the Government in wishing the Agricultural College, its officers and students continued success and prosperity. (Loud and prolonged cheers)

Unveiling of Mr. D'Silva's Portrait.

At this stage Mr. Vengail K. Krishna Nayanar in his capacity as President of the D'Silva Memorial Committee requested Sir Alexander Cardew to unveil a bromide enlargement of Mr. D'Silva. In unveiling the portrait, Sir Alexander said, that he was glad to find the memory of Mr. D'Silva so much cherished by his old Students and hoped that in the future there will be several such additions to the picture gallery at the College (cheers). A facsimile of the enlargement is put in as a frontispiece in this issue and details about the D'Silva Memorial Fund are published as an appendix.

Probable error in field Experiments.

Every member of this Department is working, more or less directly, to bring about improvements in Indian Agriculture. All improvements, whatever their nature, must be worked out by actual experiments. In the great majority of cases these experiments finally resolve themselves into field trials in which different *manures, methods of culture, varieties of plant* etc., are compared to decide which gives the greatest crop or monetary return. Thus practically the whole work of the Department is bound up, in the end, in field experiments.

It is very commonly thought, by those who have not tried, that to carry out a field experiment is a very simple matter. Many of you have had experience of such work and have no doubt begun to realize, how difficult it is to obtain definite reliable results, in all cases, except those in which the differences to be measured are distinctly large. This is purely a matter of the relative magnitude of the experimental error on the one hand and the difference to be measured on the other.

It would appear natural that, before setting out to make comparisons by means of field trials, some attempt should be made to estimate the error that may be expected in the type of experiment contemplated. This error is a constant factor in all field experiments and yet I have seen no reference to any attempt at its estimation in any of the many reports on Agricultural experiments in India.*

My main object in this paper is to call attention to the importance of this subject and to show the value of work definitely designed to throw light on it, for I feel that no experimenter is justified in drawing conclusions from his results, and using these as a basis for practical advice, unless he has a definite idea of the degree of accuracy of his methods.

I will now try to give, very briefly, some idea of what is meant by *probable error*. You are all no doubt familiar with the use of what is called a *frequency curve* for showing the variations of a number of different determinations of any given value. Figure 1 shows such a

*Dobbs (Agricultural Journal of India Vol. VI Part I page 59) gives a method of reducing the error due to variation in fertility of the land.

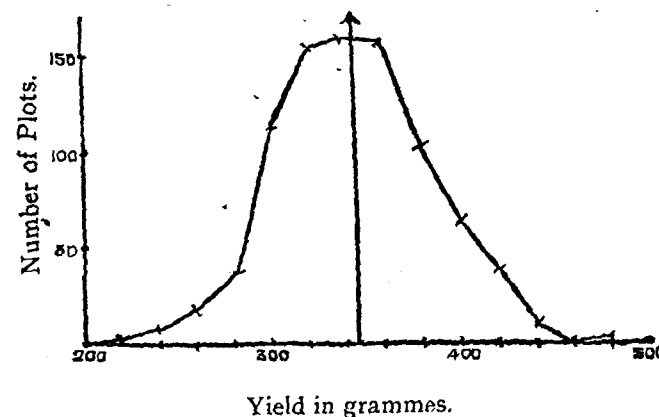


Fig 1.—Variation in yield of 900 small plots of paddy.

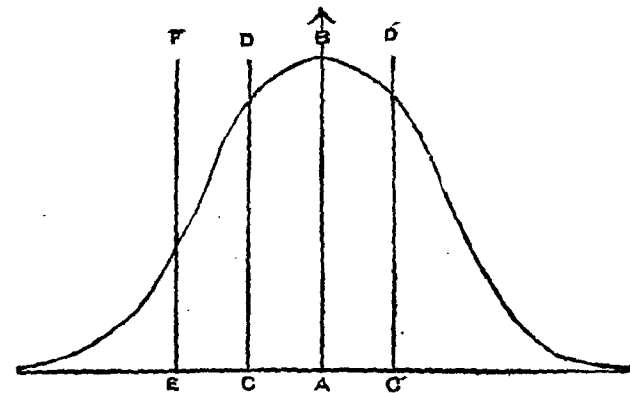


Fig 2.—Typical frequency curve.

curve for the variations in yield of grain from about 900 very small plots of paddy of equal area. The horizontal line shows yield in grammes and the vertical height of any point on the curve represents the number of plots giving that particular yield. You will notice that there are comparatively few plots of very low yield, that as the yield increases the number of plots increases to a maximum, at about the average, from which point it decreases as the yield increases beyond the average. In other words, the nearer the yield approaches the average the greater will be the number of plots and *vice versa*.

This is the ordinary type of simple variation curve that is obtained where the same set of conditions affects all the determinations. If a very large number of determinations are made, and in the absence of any disturbing factor, the curve will be symmetrical about a vertical line through the average. Such a symmetrical curve is shown diagrammatically in Figure 2. The vertical height of any point on the curve represents the number of individuals for that particular value; therefore the area between the curve and the base line, which is proportional to the sum of all the vertical heights, may be taken to represent the total number of individuals. Similarly the areas falling on either side of any vertical line will represent the numbers of individuals falling on either side of whatever value that line represents. Thus the median line AB, through the average, separates those which are less than the average from those greater. These two groups are equal in number and the respective areas are equal. Now suppose a line CD is drawn dividing the left half of the area into equal parts; as the curve is symmetrical a corresponding line C'D', at the same distance from the median, will divide the right half into equal parts in the same manner. The area between CD and C'D' is then half the total area, and is equal to the sum of the two triangular areas outside these two lines. In other words half the total number of individuals will give values lying between two points C and C', at equal distances below and above the average respectively, and the remaining half will be further removed from the average. It is thus an even chance that any individual will fall inside or outside the area between CD and

C'D', or in other words that it will differ from the average by less or more than the value represented by CA. This value CA is called the *probable error* of the experiment; it has nothing to do with the average error but simply means that, on the whole, half the individuals will differ from the average by more and half by less than that amount.

It must be noted that the difference from the average may be on either side. If we consider the individuals which are *greater* than the average by more than the probable error we see that they occupy only the triangular area on the right, cut off by C'D', that is one-fourth of the total numbering as compared with three-fourths for the remainder. Thus the odds are 3:1 that any result will not *exceed* the average by more than the probable error. Similarly the odds are 3:1 that any result will not be less than the average by more than the probable error.

Since this is a well-known type of curve, represented by a definite mathematical formula, it is possible to calculate the relative areas of the two parts cut off by a vertical line in any given position. This means that it is possible to determine the chances of obtaining any degree of variation from the average. If the variation from the average is put into terms of the probable error the odds will be the same for all curves of this type irrespective of the actual value of the probable error in each case. In Figure 2 the distance EA is twice CA, *i. e.*, twice the **probable error**. It is found mathematically that the small triangle to the left of EF is one-tenth of the remainder, thus the odds are **10:1** that any result will not be less than the average by more than **twice the probable error**. Table I shows the odds against any result being **less or greater** than the average by various multiples of the probable error. It will be noticed that the odds increase very rapidly as the factor increases. A glance at the curve will show this since the triangular area obviously decreases rapidly as the vertical line recedes from the average.

Table I.

Difference from average in terms of PE.	Odds against such difference occurring.
1.00	3 to 1
2.00	10 „ 1
2.48	20 „ 1
2.70	30 „ 1
3.00	44 „ 1
3.44	100 „ 1
4.00	290 „ 1
5.00	2,700 „ 1

Thus if the probable error of a given type of experiment is known the results can be worked out in definite probabilities. For determining the probable error definite experiments are necessary, except in cases where the type of experiment has been carried out many times before and the results obtained from duplicates are available. The method is fully described in a paper by Wood and Stratton¹ but for the convenience of those who have not read this paper I will give, very briefly, an account of the method with an example.

Suppose a number of varieties, or strains, are to be compared on 5 cent plots and it is required to find the probable error of the experiment. A number of plots are put down with any one variety, under the conditions that will be maintained in the experiment. The yields, though they are all from the same variety, show variation due to the experimental error involved. The yields are averaged and the difference of each plot from the average is noted. The differences are squared and from the sum of the squares, $\sum d^2$, the probable error is calculated by the following formula:—

$$PE = 0.67 \sqrt{\frac{\sum d^2}{n-1}}$$

where 'n' is the number of plots taken and PE is the probable error of one plot compared with average. This is a well-known formula, embodying what is known as the method of *least squares*, and it is unnecessary here to go into the mathematical principles involved.

¹ Wood, T. B., and Stratton, F. J. M., *Jl. Agr. Science*, Vol. III [1915], P. 415.

As an example of the method I will give last year's yields of paddy from the standardization plots on block N of the Central Farm. These plots were laid down for another purpose but they are also useful for this estimation of PE. There were 20 plots, varying in area from 3.4—7.9 cents, planted and treated uniformly. The yield per acre of the average is put at 100 and the individual plots calculated accordingly. The figures, together with the calculation of the PE, are given below:—

Plot No.	Yield.	Difference from average.	d ²
1 a	116.4	16.4	269
„ b	97.8	2.2	5
„ c	84.2	15.8	250
„ d	89.0	11.0	121
„ e	83.7	16.3	266
2 a	111.5	11.5	132
„ b	97.1	2.9	8
„ c	113.7	13.7	188
„ d	87.0	13.0	169
„ e	96.0	4.0	16
3 a	115.1	15.1	228
„ b	84.5	15.5	240
4 a	138.5	38.5	1482
„ b	104.1	4.1	17
5 a	101.1	1.1	1
„ b	97.7	2.3	5
6 a	104.0	4.0	16
„ b	96.6	3.4	12
7 a	93.1	6.9	48
„ b	88.5	11.5	132
average.	100	d ² =	3605

$$PE = 0.67 \sqrt{\frac{3605}{19}}$$

$$= 9.2$$

The PE works out at ± 9.2 on an average of 100, i. e., $\pm 9.2\%$. As already explained this means that it is an even chance that any plot, taken at random, will differ from the average by more or less, respectively, than 9.2% . A glance at the figures shows that out of 20 plots 11 differ by more than 9.2 per cent and 9 by less. This is as nearly equal as could be expected from so small a number as 20 plots. The larger the number of plots the greater will be the accuracy of the result: about 50 plots will give a result sufficiently accurate for ordinary purposes.

In an ordinary field experiment the comparison made is between two plots and for this the PE is $\sqrt{2}$ times that for comparing any one plot with the average. Thus the PE of comparing any two of the above plots is $\sqrt{2} \times 9.2$ or 13 per cent. That is to say, that, if plots similar to these are used to compare different treatments or varieties, a difference of 13 per cent. between any two plots is just as likely as not to be due to experimental error and is absolutely no indication of difference due to treatment or variety. If a difference of twice the PE is obtained, i. e., 26 per cent., the chances are 10:1 that this means a real difference. It might be thought at first sight that a 10:1 chance is good enough to rely on but it is undoubtedly too low if final conclusions are to be drawn. I would recommend to anyone interested in this subject the paper, already referred to, by Professor Wood of the Cambridge School of Agriculture. He puts a probability of 30:1 as about the least that can reasonably be relied on. In this series of plots it would be necessary to obtain a difference of 35 per cent. for a probability of 30:1. Now 35 per cent. is a very big difference, that could only be expected in exceptional cases, and it would be the height of folly to lay down experiments that would not show a difference of less than this. It is true that such a large difference does sometimes occur but, unless it occurs very often, and the result of laying down experiments with a high PE is, that no definite conclusions can be drawn, as may be seen from many of the Farm reports.

In order to make use of the above plots it would be necessary to repeat each variety over several plots, not in one block but alternating,

so that the different varieties might be spread evenly over the whole area. Such repetition reduces the PE; the PE of the average of n plots equals the PE of one plot divided by $\sqrt{n}$, thus four repetitions would halve the PE. It would need about nine repetitions, giving one-third of the PE, i. e., about 12% , to make the above plots of any practical value for experimental work.

Repetition of the same experiment for several years reduces the PE in the same way as repetition over several plots. It has the advantage of avoiding results that might be due to special weather conditions in any one year. The time taken to arrive at definite conclusions is correspondingly longer as a general rule, it is desirable to rely as little as possible on such repetition.

I will now give a few examples of the PE shown by actual experiments on paddy of which the results are given in various Farm reports. The figures which are given in Table II are based on the differences between duplicate plots. In addition to these are included the results from the Central Farm standardization plots and the special PE plots that were put down at Manganallur last year in connexion with my selection work.

Table II shows the area of the plots, the percentage PE of comparing any two plots, and the percentage difference that is necessary to ensure a 30:1 chance that the difference is not due to experimental error.

Table II.

Farm.	Experiment.	Area of plot in cents.	%P. E. difference between two.	% difference for 30:1 odds.
Central Farm	Varieties	10-15	10.0	27.0
"	Patti mannu	6-11	13.4	36.2
"	Age seedlings	7.3-11	13.6	36.7
Palur.	Manurials	12.5	11.3	30.5
Manganallur	Phosphates	5-7.5	12.6	34.5
"	Ottadan in Udu	4	13.1	35.3
	Manurials			

Samalkota	Cyanamide	5-8	13.9	37.4
"	Spacing	6-12	7.7	20.8
Central Farm	N. block standardi- zation.	3.4-7.9	13.0	35.0
"	B. block	10-15	6.0	16.2
Manganallur	P. E. strips	0.6	5.8	15.7
"	"	1.2	5.3	14.3
"	"	2.4	5.7	15.4
"	"	4 x 0.6	2.3	6.2

It will be seen from the figures that there is a fairly close agreement between the values of the PE for ordinary farm plots. It varies from about 11-14 percent for comparing two plots, corresponding to a difference of 30-40 per cent for 30:1 odds. The Central Farm varieties experiment, which gives a PE of 10 per cent., no doubt, owes its increased accuracy to the fact that the plots were in the form of long strips across several fields. The Samalkota spacing experiment giving 7.7 per cent. PE, is the most accurate Farm experiment that has yet been worked out. There is no clear indication that the size of the plots, in so far as they vary in these experiments, has any appreciable influence on the PE.

Of the standardization plots on the Central Farm those on N. Block, which are ordinary farm plots, give about the same PE as such plots in actual experiments. The plots in B block give the very low figure of 6 per cent. and this is undoubtedly due to the fact that they are very long narrow plots on specially even land that has been uniformly cropped for many years.

The PE plots at Manganallur were specially laid down with a view to determining the best type of plot for comparing large numbers of strains arising from my selection work there.

The first three series were in the form of narrow strips 120 links long and 5, 10 and 20 links wide respectively, their areas being 0.6, 1.2 and 2.4 cents. It will be seen that the PE is less than half that of the majority of the ordinary Farm experiments and is about the same

as that of the B block standardization plots which were in the form of long narrow plots though of much larger area. The three widths have all given about the same PE showing that it is unnecessary to increase the area by widening the strips. In the last series, however, where the area is increased by the *répétition* of 5 link strips a great reduction of the PE is seen. The area 4×0.6 indicates that four strips of 5 links were taken together by repeating a set of strips four times.

These plots show very clearly the increase in accuracy obtained by using very narrow strips as compared with ordinary plots that are more nearly square in shape. They also illustrate the value of repeating such small strips in an alternating manner instead of increasing the area by making the strips wider. Using only 2.4 cents of land for each strain or variety it is possible to reduce the PE to about one-fifth of that which is usual for ordinary plots of 5-10 cents. This system has now been adopted on the Paddy Breeding Station where it is specially suitable for comparing large numbers of strains and varieties. It cannot, of course, be adopted without modification for such work as manurial experiments where extremely narrow strips are impracticable.

There is a special point to be noticed in connexion with trials of various manures. Not only is it necessary to decide which gives the best crop; there is also the question of the cost of manuring. Thus it is necessary to decide whether any given manure gives a sufficiently large increase to more than pay for the cost of the manure. This requires a very much more accurate experiment than in a case where it is only necessary to decide which is the best of several strains or varieties.

Now it is possible that some of you may say that all this merely shows that a certain amount of common sense and judgment are required in interpreting results. They are required to the degree of being absolutely necessary, but, in addition, a knowledge of the probable error of the experiment is also an absolute necessity. Suppose in any experiment the duplicates accidentally disagree markedly:

common sense says the results are useless since the treatment cannot be responsible. Suppose again that the duplicates agree moderately well but the treatments show a fair amount of difference: common sense will probably say that this difference is obviously due to the treatment, though an actual knowledge of the PE might show that the difference is just as likely to be accidental as the difference between duplicates is certain to be. In other words common sense alone may show that a result is uncertain, but, without accurate knowledge, it cannot show that a result is certain.

F. R. Parnell.

Discussion:—

This paper was freely illustrated by diagrams and charts which greatly helped the audience in following the paper. Mr. G. A. D. Sturat said that the paper threw a new light on the method of conducting Field experiments. In his capacity as the Director of Agriculture he often had to prepare short popular summaries of the Scientific reports from the various Agricultural Stations and he used to find difficulties in presenting results which were not sufficiently conclusive. He asked the audience to remember that even if a small but real increase could be made in the out turn of a crop like paddy the benefits accruing therefrom will be great. He recently made a calculation and found that in paddy an increase in yield of even 1% will put into the pockets of the ryots an additional sum of 50 lakhs of Rupees for this Presidency alone. Mr. R. Thomas remarked that it will take a very long time indeed if they were to wait for the experimental error to be worked out for each individual crop. All that was needed was to select strains which showed fairly large differences and the value of the method is amply vindicated by the success which has attended Mr. Howard's work in Wheat and Mr. Clouston's work in cottons. In the District Farms some work is done on the standardization of plots but the results are not published. The cotton strains at Koilpatti were selected for differences of over 30 per cent.

Some pressing problems the Coimbatore ryot has to solve.

The term 'Unchanging East' has become classical and it is trotted out at every turn whenever no better reason can be given for the failure of a new idea. It has been said that the ryot in the village is the most irresponsible to a new idea and he lives the same life and adopts the same methods his forefathers lived and adopted generations back. In my humble opinion the statements are not true and they are misleading. It may be the ryot is not a very speculative being. The ryot of South India is not a very rich man who can afford to lose in speculations. Like all practical men with scanty purses he is slow to run the risk of losing the little he has. But within his means and occasionally even beyond these he does speculate. Take for instance the case of ryots who have recently gone in for the cultivation of indigo or turmeric. When the ryot is convinced that there is a tolerably good chance of improving his position by cultivating a new crop or adopting a new method he goes in for it. He will no doubt be slow to suit the enthusiasm of the idealist.

Time was, not very long ago, when every village was almost self-contained with regard to the agricultural produce that was required for local consumption. There was very little interchange of products. The roads were not good and were in addition pestered with thieves. The local magnates were in several cases the culprits and engaged the services of retainers whose duty it was to rob all the passengers in the roads including traders and bring all the spoils to their employers and receive a small portion of the same for their labours. Even when these conditions changed the villagers knew nothing about the demands of other places and went on cultivating the crops they used to cultivate. Slowly other crops were introduced and other methods of cultivation. The changes introduced have become so many

that now the least change in the market in America sends its vibration to a village in the remote corners of an agricultural district like Coimbatore. In the old days it was quite common to find one part of the presidency steeped in unprecedented famine when another part did not know how to dispose of its superabundance, while now such a thing is an impossibility.

Only 25 years back the agricultural system of the country was somewhat like this. Every ryot had his *thottam* and his *kadu*. The former was irrigated from wells by picottahs. The *kadu* was partly used as a *Korai* or grazing ground and partly to raise the cereals or kumbu as a dry crop. The *korai* was a necessary adjunct of every *thottam*. In the *thottam* the lands were cultivated in portions, one portion was always left fallow. The cattle and sheep were penned in the portion left fallow and the excreta of these animals were in some cases all the manure these *thottams* had. The cattle and the sheep, grazed in the *korai* during the day and were penned in the night as stated above. The cattle were given for the night the cholam stalks grown in the garden and kept stored for the purpose. Every ryot had a large number of cattle and sheep. There was practically no market for the cholam and ragi stalks and cholam and ragi were the chief crops grown. So the ryots used to keep as many cattle as their fodder would maintain. Thus the ryot was in every case a cattle-breeder also. He kept the cattle necessary for ploughing and water-lifting and sold some of the rest every year. The only manure he used to get for his land was the sweepings of houses etc. and the tank silt where available. I remember the price of a cart load of sweepings in Tiruppur was about 6 annas when I was a boy. That would show, the demand for the sweepings was not very large. There were only two crops in garden lands and as the land was always left fallow for a season, the land recuperated itself and there was generally a good crop. The cattle were available in large numbers and the prices

were comparatively very low. The ryot stored his grains in his own *cholakuli* and depended on it to pull him through lean years. This was roughly the condition of our district some 25 years ago. The only problems he had to solve were, how to meet the vagaries of the rain—god who was neither regular nor considerate, how to provide for his growing family with the right of partition and other troublesome rights of the joint—family system which led to the division into ever diminishing quantities, of the lands under his control and how to meet any extraordinary expenditure in the shape of marriages and such like. Conditions of life in villages have changed very much and the life of the ryot is something different from what it was before. The problems he has now to solve are very different from what they were before.

In wet lands, paddy was the chief crop, grown. There was raised only one crop in the year and in some places two. Sugarcane and plantains were raised in some places in very small patches. Now sugarcane and plantains are raised wherever they can be raised. Two crops of paddy is the rule wherever water is available and in some places like Erode even three crops are raised. The result of all these is, that land is never given rest and the manure that is necessary is something enormous. I have seen Erode ryots going to the Dharmapuri taluk of the Salem district for green leaves for manure. The cost of manure alone for each acre of wet land in Erode comes to about 25 or 30 Rs. per year. The ryots also find great difficulty in getting the manure they want. In garden lands, the cholam and the ragi are very rarely raised. Wherever possible, the sugarcane, the tobacco and the betel are raised. Cambodia cotton is fast becoming an irrigated crop in the District. No portion of the garden is left fallow. One crop is cultivated on the land after another. In one land tobacco is grown first, then follows ragi and then cotton. These three crops account for 2 years, of which the land is vacant for only two

months. When cotton or sugarcane is cultivated the land can have very little rest. So the ryot has to manure the land very heavily. He naturally looks for the sweepings of houses etc. which he used to get in the old days. These are not available in the quantity required. As the land is almost always under cultivation; he cannot utilise the cattle and sheep manure which he used to depend on. Further as he does not raise the chelam and ragi as before he is not in a position to maintain the cattle. For even the cattle he is absolutely in need of, for purposes of water lifting and ploughing, he has to get the fodder elsewhere. I have seen ryots of Kangayam going to Bolampatty a distance of over 50 miles for cholam stalks. The result of this is, the ryots are no longer cattle breeders. They have to depend on the professional cattle breeders who are not many and consequently the prices of cattle have gone up very high. As the ryot resorts to intensive cultivation his need for labour also increases. The price of cattle has increased and the cost of maintenance of cattle on account of the want of fodder has grown to a very high item in the budget of the ryot. The cattle have now to be better-fed as the work required of them now has increased very largely while the number of cattle possessed by the ryot has decreased. If the present line of progress should continue he will have very seriously to consider whether some labour-saving appliances at less cost cannot be utilised. For this there is one great objection at present. The holdings are very small and under the Hindu Law they are apt to become smaller. So no individual ryot, except the big ones who are very few in the district, can afford to go in for these labour-saving appliances. It is necessary for me to say here that those who pay large kists to Government are not generally cultivators of their own lands and even when they are cultivators, they cultivate only a portion of their lands and lease out the rest to cultivating ryots. So either a capitalist will have to step in and hire out labour-saving appliances to the ryots or the ryots themselves

should combine and purchase what they want. Here is room for the officers of the *co-operative department* to step in and do something. But it should be stated that the labour saving appliances so far suggested for adoption by the ryots are not many. There is the oil engine recommended for water-lifting. This will be of use only in places where wells capable of supplying water in quantities requisite, are available. Hitherto only individual ryots who have got big estates, have gone in for the oil engines for this purpose. In some cases the purchase of oil engine was with a view to get the right of taking water from a river or channel, which the land had not before. I have heard that in some places there is not sufficient water for oil engine and the ryots want to sell their engines. Then there are sugarcane crushers and sugar makers. The Government has started recently a sugarcane crushing station near Singanallur and I am very glad to hear that ryots are resorting to the station in large numbers. A co-operative society may be formed of the ryots of the locality to purchase the plant and work it for the common benefit of the ryots. This would relieve the Government to start a similar station in some other place.

In dry lands groundnuts and cotton have begun to have the monopoly. Cotton is gaining ground in the last two years. The output of cotton this year has been unprecedented and it bids fair to increase. Kumbu and cereals have suffered in consequence. The *korai* has practically disappeared. Every available inch of ground is being brought under cultivation. There are now 8 ginning factories at Tirupur alone and arrangements are being matured for the opening of two more. Cotton and groundnut are exported to other countries for manufacture while we get back enormous quantities of finished products. Whether we should not arrange for the manufacture of these raw products in our own country instead of sending them out, is a question for serious consideration but does not arise for discussion here. But

one point may be stated viz., that in sending groundnut outside we lose the cake which can be used as manure or as food for the cattle. The Coimbatore ryot now depends for his food supply on other districts. Erode and Tirupur get in the season 10 to 20 waggons of paddy every day. A taluk like Palladam which used to send out cholam gets cholam from the Telugu Districts.

The ordinary ryot is a man of various needs and he has to sell his crops as soon as they are harvested. The harvest season is also the kist season. The money market is very tight and the poor ryot suffers in consequence. In a few months the prices rise and all the benefit goes to the middleman who has purchased the goods in season and waited. Taking the case of only one crop, the horse gram, its price in the harvest season is about Rs. 5 per bag of 24 vallams while the price is Rs. 7 at the end of July or in August. The ryot also suffers in some cases because he is not in touch with the market. Cotton dealers generally go to villages to purchase the kappas and they being professional men get the upper hand in dealing with the villagers and score high when the poor ryot is in need. It has been suggested that co-operative selling, with a fund for advancing to the needy, might meet the difficulties. But there are other objections to this proposal. The ryots want to sell the goods at different times. One does not want to speculate and wait, while another wants to wait and take the chance of a rise in price. Secondly the crops raised are not all of the same quality and joint selling is difficult.

These are some of the problems that are pressing and need to be tackled by people who want to be of use to the ryot. In many cases he suffers because he does not know. Education and credit are two of the essentials he requires and if these are supplied the ryot will be in a position to see for himself and take advantage of all that is sought to be done for him. In the absence of these he cannot appreciate what is done by others for him,

nor can he take advantage of those improvements necessitated by the change in the agricultural conditions of the time. The ordinary ryot is a very shrewd individual. He has adopted himself to the obliteration of the old order of things and the introduction of the new and he may be depended on to change still further wherever it is to his interest to do so. The change to the new order of things requires in him a wider outlook and understanding of the world conditions, while the old order of things required only an understanding of the conditions of his village. So the ryot has to be equipped to take full advantage of the changed conditions and to this intent he has to be educated properly and treated with sympathy.

T. A. Ramalingam Chettiar.

Discussion :—

Mr. S. Subrahmanya Ayyar led the discussion by pointing out the great benefits that are conferred on the Public at large by the Department of Agriculture and deplored the conservatism of the ryot which he had frequently noticed in his work as Farm Manager. He mentioned that very few of the members of the District Agricultural Association at Coimbatore ever visited the Central Farm in spite of its proximity and the assured benefit of such visits. Mr. S. Sundararamayyar said that his experience about the ryot was different and in the conduct of the spraying operations on the Palmyra and the Arecanut he found the ryot eager to take up an improvement when once he is fully convinced of its utility. It looked as if the discussion was likely to get prolonged and the President brought it to a close by remarking that there are likely to be differences of opinion in the matter according to the class of ryots with which the officers happen to come into contact. He pithily remarked that according to Mr. S. Subrahmanya Ayyar "The country expected every ryot to consult the Agricultural Department just as England expects every man to do his duty."

A paper on Co-operation.

The attention of many people has been directed to the growth of co-operation in recent years. As we all know, there has been a great development of co-operative credit in this Presidency and throughout India, in the course of the last ten years. In European countries, co-operation has been found allied with Agriculture in many different forms other than the production of credit, and the desire has been widely felt and widely expressed, that similar activities should be inaugurated in India. It has occurred to me, and Mr. Stuart and the secretary of your association have agreed with me, that it may be interesting and helpful to consider what precisely has been done for Agriculture by co-operative methods in England and in Ireland. It will be interesting to speculate whether similar activities can or cannot be undertaken in this country with advantage. It does not, of course, necessarily follow that what has been done elsewhere can be copied forthwith and exactly in India. The conditions of one country differ from those of another and human nature presents similar differences. But it is, at any rate, highly probable that some day after the necessary study and the necessary modification, enterprises will be possible in India, analogous to most of those in which we find co-operation and Agriculture allied in other countries. And, in any case, 'Building castles in the air' is often a profitable as well as an interesting employment. I ought to preface however that these notes are the reproduction of general impressions and do not pretend to exact accuracy.

The credit side of co-operation does not, at present, bulk very large in England or in Ireland. No doubt in the early days of Irish co-operation, Sir Horace Plunkett's Credit Banks did most important work. But now-a-days other branches of co-operation have largely eclipsed the credit work even in Ireland. In England co-operative credit among Farmers seems hardly to exist at all.

In the first place, credit is much easier to get in England and in Ireland than in India owing to the wide development of the Joint Stock Banks, and hence the need for co-operative Credit is not so great. In the second place, the Englishman has a great dislike to inquisitive enquiries into his own affairs; and, for purposes of co-operative credit, it is absolutely necessary to make searching enquiries into the condition and circumstances of applicants for loans. And lastly, as far as Ireland is concerned, the Law under which the original co-operative Credit Societies work forbids any form of trade. And the interest of co-operators in Ireland seems now to be mainly devoted to co-operative buying and selling. These forms of co-operation are more continuously interesting, as well as, far more profitable than co-operative Banking and so naturally tend to be also far better managed.

After all, most of the profits of rich men in this world have been made out of wise buying and wise selling. It is just as well to remember, at the same time, that most of the serious losses and financial disasters in this world have resulted from unwise buying and unwise selling. But, still, it appears true that with reasonable skill, honesty and foresight, considerable profits can be made by farmers, by joint buying and selling, as well as under certain conditions, by the joint treatment of their raw produce so as to produce a finished marketable article. I propose to describe briefly in turn each kind of such activity that is found among farmers in England and in Ireland. Types of Society differ and a good many societies undertake more than one kind of activity. Indeed, the opinion seems to be held by not a few co-operators, that the ideal Society is one for general purposes which undertakes every conceivable activity, including credit, and in which joint action will be for the benefit of its Members. But for purposes of clearness it is better to take the activities one by one.

We might first consider joint-purchases societies. These seem to take two main forms, namely, the General Store and the Society for joint purchases of agricultural requirements. The General Store is very common in Ireland. Farmers in England have not found the same necessity to create General co-operative stores owing to the development of such institutions throughout the country by the co-operative whole-sale society which is mainly industrial and not agricultural in nature and origin. The Industrial co-operative movement had however made very little progress in Ireland outside the big towns when the Irish Agricultural Organisation Society commenced its work, and the ordinary Irish farmer in the villages was very much at the mercy of the small retail trader, or as he is called in Ireland, the *Gombeen* man: The *Gombeen* man frequently bought the farmer's produce, besides supplying him with his requirements; and it seems to be generally agreed, he cheated him abominably over both transactions. The articles supplied were often of a bad quality, the prices charged were exorbitantly high, enormous rates of interest were concealed under so-called credit rates, payment was sometimes taken in kind and the prices given to the farmer for his produce were grossly unfair. There seems to have been little competition in such villages, and the petty shop-keeper had matters entirely his own way. Now, obviously, if a number of such farmers combine together, order all their requirements jointly, and distribute them among themselves, they ought to be able to secure great advantages. In the first place, they get into the open market where competition will disclose the real value of the articles they want to buy. Secondly, they buy on whole-sale terms, instead of buying on retail terms, and there is a very large margin, indeed, between these two, as it is this margin, in fact, which pays the profits of most merchants and dealers in the world. Thirdly, owing to the fact, that the quantity ordered by them is large and is therefore important to the dealer, the farmers making a joint order

for goods, will command respect and attention, and can insist on good quality. Finally, they will be able to secure great economy in freight, whether by rail or sea, but, especially by rail. One has only to consider the difference in rates, for, shall we say, a whole truck load and for a small consignment. These advantages are secured even if the middleman, whom you displace, is a good middleman; and, of course, there are many good middlemen in this world who give very good service to the public for the profits they make. But these advantages are enormously enhanced if the middleman displaced happens to be a bad and dishonest one.

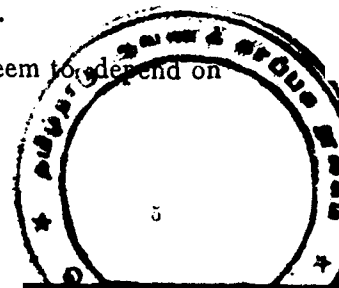
The machinery of such a society need not be very complicated. You must have enough capital or enough credit to tide over the interval between the time when you pay the wholesale dealers, and the time you dispose of the goods to your Members. Discounts are generally given by wholesale dealers for prompt payments and it is essential for such Societies to earn their discounts. For a large business, a good deal of capital is necessary for these purposes. But even this can be dispensed with if the members are prompt in paying up their debts to the Societies. Of course, when things grow, it is necessary to pay rent and establishment and perhaps to buy or build houses and shops for which again money is required. But such stores may begin, and generally do, in a very small way indeed. The beginning can even be made by merely bulking orders periodically. Thus, if each member can estimate his own requirements for the next few weeks or the next few months, all that is necessary is for the Manager of the society to classify the various requirements and to send a joint order to the wholesale dealer or dealers for the wants of all his members and he thus gets all the advantages, which I described just now. But, as a matter of fact, the articles which are required in European countries for daily use are very multifarious and it is rather tedious for members to estimate their requirements of every kind. Hence it is generally a practice for General Purchase Store even at the very outset,

to lay in a small stock of the most ordinary non-perishable requirements of the farmer. In practice, there seems to be very little danger or loss in such ventures. Supposing reasonable foresight and sense are shown by the manager, he ought to be able, so to frame his order that nothing will be left on his hands unsold; and in this he is helped by the fact that the things are of good quality and can be sold cheap and by the fact that the members are generally extremely loyal to the Society and prefer to buy from it rather than buy anywhere else. Such Societies moreover seem to have had very little difficulty in securing efficient management. Some managers are, of course, far more efficient than others, but generally speaking, the standard of management of such stores seems to be very high. A permanent paid Manager becomes necessary at a fairly early stage. But good men appear to be available at very reasonable salaries. Such men are generally enthusiastic Co-operators, and work more zealously and for less pay than they would, in any ordinary appointment of a non-co-operative kind. Indeed, the enthusiasm of Co-operators for Co-operation, as a whole, is a very striking feature in England and in Ireland. Perhaps, I should say that in such Stores, the goods are not generally sold at cost price to the members. It has been found that by selling at cost price, great hostility is aroused among merchants and traders of all kinds. And, in business, it is always desirable to secure the good will of traders. It has been found therefore convenient to sell to members at, or near the current market rates, and to distribute the very large margin of profit secured, in the form of bonus to the members at stated intervals, the bonus being proportionate to the amount of each man's dealings with the Society. At the same time, the opening of a Co-operative Store generally has the result of reducing market retail prices in the neighbourhood, so that both advantages are secured. One sometimes hears it disputed, whether, such Societies should sell to non-members as well as to

members. I believe the general practice is to sell to non-members also. They too secure the advantage of a good quality; but they do not, of course, get the bonus. And, of course, the profits made out of the trade go to the members only. This seems reasonable, provided the Society is always willing to admit men of good character as members, and this, I think, they generally are. These Stores are a great feature of rural life in Ireland. You find them all over the country and they are generally very prosperous. Their aim is to supply the farmer with every thing he wants to buy for his household or his farm and they often undertake other Co-operative activities including credit.

The purchase of agricultural requirements is the main function of many English Societies. In Ireland, such business is combined with the general stores. And such societies necessarily have much in common with the Store. Here also you buy wholesale and sell retail; and you want capital or credit or both to enable you to earn your discounts. And this is to be supplemented by reasonably prompt payments by the members. But in such societies it is easier to bulk orders since such orders are received more periodically. Generally speaking, for instance, everyone wants his seed and his manure at the same time and at not very frequent intervals. This is, of course, very convenient as the society can do a great deal of business without locking up its capital in a large stock of articles kept for sale. It is ordinarily without much capital such societies secure all the advantages described above and, indeed, the success of some of them is perfectly astounding. There is one society in the west of England which, last year, with a capital of £ 700, made a profit of over £ 6000. I believe it dealt chiefly in seeds, fertilisers and agricultural implements.

Societies, such as those described above, seem to depend on the following conditions for their success:—



Firstly, there must be a large margin between wholesale and retail prices of the articles dealt with. This, I should imagine, is generally the case.

Secondly, there must be intelligent management which knows when, where and what to buy—and the management must be honest.

Thirdly, there must be punctual payment which avoids the need of high capital or high prices to members, or a smaller bonus. Since, obviously, if you have got to wait for your money, you must pay the interest, either out of the Societies' capital or else out of the interest charged to your defaulting members ; or you must forego some of your profit.

Again it is essential that the members should be loyal to the Society, and should buy their requirements from it and from nowhere else. This guarantees a regular flow of business, and therefore a regular flow of profits. Such loyalty sometimes demands a certain amount of self-sacrifice, since a local shop man is often anxious to break up the society and get the members back into his own clutches. He is thus prepared to submit to a temporary loss in the hope of future gain, and is apt to try to undersell the society in one or other branch of business even at a loss. Of course, it is very important that members should not give him this opportunity.

Another purchasing function of co-operative societies found in England and in Ireland is the joint purchase of expensive implements for joint use. This can be done either by General-purpose societies or by societies created for the purpose, and both forms are found. The advantages of such purchase are easily intelligible. Such expensive implements as Reapers and Binders, Threshing machines, Power-propelled cultivators are out of the reach of the average small farmer but it is possible for a society

of such kind to buy the machines and ultimately pay for them, and for the cost of running them, by letting out the machine for use to its members. Such machines can be bought out of share capital, or on credit, or both. Societies of this kind are of a most useful type and I understand they do a lot of useful work. Of course, there are certain dangers connected with them. In the first place, you have got to choose the right kind of implement. It would be obviously disastrous to buy an expensive implement which ultimately proves to be unsuited to the locality. Fortunately a knowledge of scientific farming is becoming yearly more widely spread. Secondly, you must have a competent man in charge of the machine. And thirdly, you must have facilities for getting the machine put right when anything goes wrong.

And great success has been attained in some directions by the joint sale of agricultural produce. As far as England and Ireland are concerned, this has been most marked in dairy produce. A number of farmers form a society to handle and market their milk. The undertaking is necessarily a big one because, expensive building and machinery are necessary for the proper treatment of milk ; and for this purpose either a good deal of capital or else a good deal of credit is wanted. This requisite being provided, the milk is all brought to the central building and there manufactured into butter by the latest scientific methods and eventually sold wholesale to the merchants. Sometimes the produce is sold as milk or butter,—milk or cheese as occasion requires. But the greatest profits seem to be made from the butter. Indeed, the success of the Creameries in Ireland has been phenomenal, where some years ago, the trade in butter was in a very bad way. The elements of success seem to be as follows :—

In the first place, and quite obviously, no individual farmer can possibly produce anything like such good butter in his own

home, as can be produced by the Creamery with the up-to-date machinery and skilled supervision. The quality of the butter is therefore better. And what is far more important it is much more uniform. I understood that without scientific supervision and appliances it is very difficult to produce a uniform quality of butter.

Secondly, the society eliminates the large body of the middlemen or collecting agents whose work it would be, otherwise, to collect the produce of the individual farmer and hand it over to the wholesale-dealer. This margin appears to be a pretty large one. And, generally, it seems to be the case that contracts for large quantities continuously and reliably supplied are more advantageous to both parties than small dealings. Again, by joint sale, you eliminate the great danger of competition among individual farmers over the market thus unduly lowering the prices for the benefit of the dealers and to their own disadvantage. This is an important matter since the individual farmer is at a disadvantage in such transactions when he knows neither what he ought to take nor what his neighbour is taking. You also save the individual farmer a great deal of time and trouble which he would otherwise have to waste in marketing his own produce. Unfortunately, many farmers take a considerable pride in their skill in marketing, to the great joy of the merchant who makes his profit out of their ignorance. As the same time if the society is to be a success, the marketing has to be done with considerable skill and the managers have to possess a large knowledge of the wholesale trade. Here also it appears to be the case that in England and Ireland highly skilled men are easily and cheaply secured. Finally you secure the same advantage in freight charges as are secured by joint purchase and you can put your produce into the market at a minimum of cost.

The same sort of advantages are secured by the joint sale of eggs which are collected, classified, packed and sold wholesale by

the society on behalf of its members. Little technical skill is required here and the advantage is to be secured out of the elimination of the middlemen, the elimination of competition among members, great economy in freight and intelligent marketing on a wholesale scale.

Market garden produce is sometimes sold co-operatively by a system of auction. This is the method adopted by the large Pershore Fruit Growers society in Worcestershire. Every week the farmers bring their produce to the societies' auction premises, and every week dealers come from all over England to buy the produce. And by these joint sales, the farmer has been able to secure greatly improved prices. Here also the middleman has been eliminated and here also the farmers have been saved from the danger of spoiling their market by competing among each other for the buyers. In the case of the market garden produce the articles are of so great a variety and are ready for market at such irregular intervals that it is a difficult matter to arrange regular contracts for regular supply. They are also very perishable and cannot therefore be kept. This seems to be the reason why the auction system has been adopted. There has been little joint dealing in wheat or other grains in England or in Ireland as far as I can make out. And I do not know, why it is, that the same advantages are not secured by co-operation in this department as are secured in others. Two other classes of co-operative societies may be briefly mentioned. The Small—holding societies are chiefly designed to get land on reasonable rates for their members. Land is difficult for the small man to get. County Councils in England are prepared to lease land to such societies on very reasonable terms. The land is leased jointly by the society and let in portions to the individual members. Shares are taken up by the members in proportion to their holdings. The rule is that the nominal share capital should equal three times the nominal annual rent. Ordinarily, the shares are £ 1

shares and only 1 sh. is paid up. Such societies also perform other services for their members, such as the joint buying of agricultural requirements and implements and even a joint sale of members' produce. They do not ordinarily keep any extra capital for these purposes and use an overdraft on the bank if necessary.

Finally, a certain amount of co-operative Insurance is done. There is in London a large Co-operative Insurance Society by which insurance is effected for all agricultural purposes. This works hand in hand with the other agricultural co-operative Societies which act as Agents for their members. There are also, I am told, a fair number of small Pig Societies, as they are called, up and down the country, by which the Pigs of Members are insured. Every member makes a monthly payment for each pig and the profits are divided after providing for a reserve, among the members. The animals have to be carefully inspected and a good deal of experience is necessary in fixing a fair rate of premium.

It will be interesting to consider whether any, or all these branches of activity can be usefully started in India and that question will no doubt command very great attention in the future both from co-operators and agriculturists. I do not propose to try to answer it now. But perhaps you will forgive a few desultory speculations. Taking the question of General Purchase Store which has been found so successful in Ireland, are conditions in the Indian villages at all analogous to those in Ireland before the stores were adopted? Does the Indian villager buy things at a shop at all? Does he buy much? How far is the market—a substitute for shop? Is the villager much swindled over what he buys at the market and at the shop? Is there the same variation in India between wholesale and retail prices of the villagers' daily requirements? Again can you get prompt

payment so as to enable you to earn your discount? Will you get efficient management? Will you get honest management? These questions will no doubt be answered by time.

Taking again the Societies for purchasing agricultural requirements—Do villagers purchase agricultural requirements at all? Can such requirements be bought whole-sale? Furthermore is there any scope for the joint purchase of expensive machinery? Can our agriculturists tell us of types of machinery that will certainly be so beneficial as to justify the expenditure of large sums of money on their purchase? And so on.

Further more can the ryot pay sufficient capital or credit to finance such operations? Again is there in India much scope for the elimination of middlemen and the securing of better prices and the reduction of charges by the joint sale of the ryots' produce; Shall we ever create scientifically managed Co-operative Creameries near our large towns? Are there other products which could profitably be purchased for market in a Co-operative way? Can Co-operation be usefully employed e.g. on the hulling of rice, the ginning of cotton, the cleaning of groundnut, the Extraction of jaggary;

F. R. Hemingway.

Discussion :—

The hour was already late and consequently the discussion was rather limited. Mr. Kolanadaswami Pillai said, that two Agricultural Co-operative Societies were already working near the Koilpatti Agricultural Station at Vadamalaipuram and they were engaged in the Co-operative purchase of cotton seed and ropes, and that much benefit accrued thereby to the surrounding ryots. They recently purchased a Disc plough which they are hiring out to the members of the Association.

The second session of the Conference began its sitting on the 16th July at 8 A. M. with Mr. F. R. Henningway, I. C. S., in the chair. This session was as well attended as that on the previous day.

Talk on Adulteration.

Shortness of notice and absence from the station prevented me from promising to do more than talk upon this subject, making no pretence to deal with it at all fully, as this would require reference to the steps taken in other countries to combat the evil and to the legislation which has there been found necessary.

In general, adulteration may be taken as the admixture of foreign substances with one of specific characteristics, with the object of illicit gain by the sale.

It is most commonly practised in the case of natural products and we may differentiate broadly between such products as are mainly used as foods and those which find their market for industrial purposes. The practice is to be condemned in whichever class the product falls, but with food-stuffs especially the effect may be so far-reaching that unless some check can be devised, the mass of the population, least able to bear any lowering of quality owing to their economic condition, may seriously suffer and in its own interest the state will be compelled to protect the people, as has been attempted in most progressive countries, by special legislation defining the offence and fixing penalties.

Of course with all natural products there are many qualities of what is admittedly one kind of produce and it is of this variation that the profiteer attempts in the first instance to take advantage. In markets in which any product is largely dealt the qualities are differentiated and valued accordingly, in fact are classified, and it is common when the market for the highest quality is dull, for such material to be degraded by admixture with poorer qualities so that it may sell to the best advantage.

This is business but cannot be said to be adulteration in the strict sense. Whether it is good business or not depends upon whether the immediate purchaser is the ultimate consumer.

A grosser form of degradation, and one falling within our definition of adulteration is, when a product from another source of the same general but not of the same specific characteristics, is used in admixture, and this is, I think, the most general form which adulteration takes. According to the produce in question, seeds, grains, fibres and solid materials in general, it is more or less readily detected by the practised buyer or by simple tests, but where liquids are in question, (Oils, essences, juices, gums) the characterisation of the adulteration and its extent may require delicate and exact expert examination.

The grossest kind of adulteration, of course, is that which aims at increasing the weight for sale by incorporating materials of different sources and characteristics. The expert buyer does not suffer by this as to him it is recognisable at sight. It is only the general public (compelled to buy what is offered to it and with no special knowledge to assist it) which is the milch cow. Its safeguard in general has been the general fixation of what have come to be recognised as Trade Standards and in countries where specific legislation upon adulteration has been enacted, we find the courts dealing with cases which turn upon question of quality, by reference to expert business men as arbitrators, and many disputes are also settled by reference to individuals appointed by the Chambers of Commerce on account of their intimate acquaintance with special materials and Trade Customs.

With foodstuffs however the extreme limits of quality with reference to specific contents are generally fixed by the Acts embodying the legislation and in case of doubt it is only for the analyst to determine the nature and extent of adulteration and the court to fix the penalty. The difficulty which arises then, is to decide upon the guilty party, but the penalties have had a tendency to become sufficiently severe and cases of harmful adulteration of foodstuffs, are, I am confident, much fewer than they were, and the legislation has been distinctly beneficial.

For industrial purposes the variations in quality may be much wider without doing serious harm, but for the maintenance of the reputation of a manufacture it may be essential to use only specific raw materials and in such cases absolute purity is insisted upon. Then as we know, different qualities of one and the same natural product find markets for quite different purposes and it may be just as important for some manufacture, that adulteration should not be made with a higher grade product than it requires, as it is that no lower grade product should be added, and it is a general practice in such cases to buy upon contract with reference to a fixed sample.

Thus far, I have dealt with the subject on purely general lines and have made no reference to specific materials or cases. To do so, at all fully, would be impossible within the time at our disposal, but we have all met with instances of this pernicious practice and as consumers are sufferers.

As a chemist I must differentiate between the treatment of a product with the object of rendering it useful for some special purpose, the nature and quantity of the added material being decided upon by a trained mind thoroughly conversant with the object to be attained and the means to be employed, and the blind admixture of foreign substances by people who have no real knowledge of the nature of the various materials or of the purposes to which they are ultimately put.

A qualified chemist specialising in oils, for instance, is faced with the problem in the lubricating of a piece of machinery, from the moving parts of which the oil disappears quickly, and no oil of sufficient body can be found to meet the purpose. He is quite within his sphere in adding some thickener to reduce the fluidity of the oil under its working conditions and if the demand for such an oil is great to place the mixture on the market. It is not permissible, however, for a general dealer in oils to sell as Olive oil, for instance, an olive oil to which groundnut oil has been added, for, in many cases, olive oil is used for purposes for which groundnut oil is not suitable

and the purchaser would be defrauded. Linseed oil is another oil which is used for very specific purposes and the admixture of any of the common oils would interfere seriously with its value.

As an example of adulteration by persons who had no knowledge of the ultimate destination of an oil I cannot do better than refer to a case which created a big stir some few years ago. In Germany a large number of mysterious cases of poisoning occurred and by investigation the authorities came to the conclusion that the poisoning was caused by two kinds of Margarine or Butter—substitute which were selling largely in the districts affected. In every case, the sufferer had partaken of one or other of these margarines and the makers realising their responsibility, but unable to account for the trouble, requested the Government to make a thorough investigation. Government Chemists went through the whole process, carefully testing all materials, and came to the conclusion that the cause of poisoning was Chaulmoogra oil.* The records of sales indicated that

*We are indebted to Mr. C. Tadulingam, F. L. S. for the following note on Chaulmoogra oil [Ed].

The true chaulmoogra oil is obtained from the seeds of *Tarak-togenos Kurzii*, King; a tree 40 to 50 feet high, of the forests of Sylhet, Chittagong and Burma, with large woody globular fruits of about the size of an orange. It was long supposed to be the product of *Gynocardia odorata*, R. Br. (*Chaulmoogra odorata*, Roxb) an allied plant of Sikkim, Chittagong, Assam and one of the false chaulmugras. This mistake was discovered in about 1899 from seeds received in Europe and the correct botanical source of the chaulmoogra seed was then finally determined. The oil is recommended to be used internally and externally in cases of leprosy and other skin diseases and the treatment is said to meet with some success. It is first administered in 5 to 10 minim doses and gradually increased to 30 to 60.

The other false chaulmoogra is *Hydnocarpus Wightiana*, Bl. of the same family to which the other two belong viz, Bixineae, locally known as *Maravatti* in Malayalam and *Niradimuthu* in Tamil. This is a tree indigenous to the Western Peninsula from South

the affected lots of margarine were made from oil bought by the two firms from one and the same dealer in Hamburg, and it was found that this dealer had still some of this oil in stock. It was from a consignment shipped from India and was found to contain Chaulmoogra oil—an oil so far as I know only obtainable in India. No one conversant with the requirements of an oil for food purposes would have mixed in Chaulmoogra oil and the result of the adulteration in this case was to seriously affect the market for Bombay oil. I myself have been in an oil mill in India where the proprietor admitted that if he were required to deliver a certain quantity of a given oil by a certain date and had not the required quantity ready he got over the difficulty by mixing in any other oil which he was pressing at the time.

A big firm of shippers here, with which I have had to deal, have told me that they only ship oil in consignments obtained from individual pressers and that only thus can they control and guarantee their qualities. To buy from middlemen would be to render themselves liable for oils which when they reached the overseas market would be condemned and they would have no redress against their supplier.

It is the importance of a "Reputation" which so many small dealers in India ignore. Without a reputation and a pride in seeing that it is maintained, no really big business can in the long run be maintained.

Within my own experience I have come across the case of crude but genuine Bees Wax being bought by dealers and sent to Calcutta for "refining." It has been returned for sale in the district in which it was obtained, but the "refining" had consisted in the adulteration with 50 per cent. or more paraffin wax. A traveller here once appealed to me personally for a certificate as to the quality of wax he was

concerned to obtain along the coast ranges. In the West Coast districts oil obtained from the seeds of this plant is used generally for lamp burning and also medicinally. In Bombay and some portions of the Madras Presidency this is said to have been used with satisfactory results as a substitute for chaulmoogra oil, but unfortunately the seeds are not an article of commerce.

importing and hoping to sell to dyers, ghee-makers and others. This product was white paraffin wax and my certificate was that, if I heard of him selling it to the people specified I would place the matter in the hands of the police and try to get him convicted of false representation and fraud. To think of Paraffin wax being used as a ghee substitute may be astounding; but here in India food products capable of replacing ghee are rejected upon sentimental and religious grounds, but a material like a mineral wax, of no food value whatever and even directly harmful can be, and is used to, adulterate ghee, and because it cannot be detected either by sight taste or smell it passes, and no one is brought to book.

The destruction of the reputation of the product of a whole country is no light matter, and unscrupulous dealers in the hurry to get rich quick do not consider the harm which they may be doing to their fellow countrymen, for the lost reputation is not easily regained and a crop which was the mainstay of a whole people may get into such disfavour in the world market that there is a no demand for it except at ruinously low prices.

We have heard something recently of Tinnevelly Senna and the adulteration which has caused it to be a drug on the market—or at least a quality of a much desired drug for which there is no market, and the mention of Tinnevelly brings to one's mind the case of Tinnevelly cotton. "Tinnevellies" is a standard name, as well known in the world's markets as Sea Island, Egyptian, Broach, or any other. The name represented a cotton of definite characteristics, well adapted for spinning qualities of yarn for which there is a good demand. Could anything be more foolish than for the growers in the district which gives its name to cotton, for the sake of a little extra gain, mixing in with their crop another plant which gives a cotton of inferior characteristics, but a heavier producer and thus for a year or two making a little more money.

When that degraded cotton reaches the mills it will be found unsuited to the spinning of the qualities expected, and in future spinners would not risk paying the normal prices and growers would

of necessity be forced to take the low prices at which alone the mills would be prepared to take the cotton on account of the risk.

The watering of cotton is less serious perhaps, because it is a more readily detected and cruder form of adulteration but it is somewhat of a surprise to see the photograph of a two inch pipe delivering water at full bore to a spray which plays upon cotton before pressing and baling. I have referred to a few typical instances, but illustrations could be found in the case of almost every natural product and the question is, what can be done to diminish this practice and protect the people. Manifestly by legislation a Government could define the position and indicate penalties in specific cases, but no Government I think could really successfully take action unless it were backed by the general opinion of the people and in this country it is to my mind extremely important, that there should be the development of a strong public opinion unreservedly condemning all such malpractices and ensuring that any legislation will be welcomed and that the necessary "Standards" and analytical reports of competent men will be accepted and when convictions are obtained and penalties inflicted that the culprits shall be made to feel their greatest punishment is the loss of the respect of their fellowmen.

F. Marsden.

Discussion:—

Mr. M. R. Ramaswami Sivan enquired, if the Lecturer, or any one else in the audience, could give information regarding the balls of mud which are so frequently found in bags of Nellore rice. They are often of the same size and shape as the rice itself, and possess the same specific gravity. He had been told of the existence of a small machine by which these balls are made and added to the rice (Laughter). He wished to know if the adulteration were made by the middlemen (Laughter).

We are inclined to think that these balls of mud come from the threshing floor. When the paddy is passed through the hulling machine, the pieces of mud naturally get reduced to the shape and size of the finished rice [Ed].

The President observed that he had heard of the existence in Egypt of Scientific chambers where the art of adulteration was systematically carried on.

The Cocoanut and its importance to Malabar.

Malabar has been rightly called The Land of the Cocoanut palm. The most ubiquitous tree in the District, the whole land is studded with it. Her coast is pre eminently the seat of the cocoanut industry in India. She has given it her own name (the word Nalikerā by which it is popularly known being derived from the word Kerala), and two of its most important commercial products have been christened in her tongue. Her Copra and Coir have acquired a worldwide reputation, and are much in demand in foreign marts. The commercial importance of cocoanut to Malabar may be gauged from the fact that from the export of this product alone she derives more than a million sterling annually. Even apart from this, its value as an article of domestic use cannot be over estimated. One wonders how much it enters into the daily life of her inhabitants. Life in Malabar would indeed be different without its presence.

It is difficult to say whether the tree is indigenous to the District. According to Alphonso de Cándole its most ancient home is the Eastern Archipelago, from whence it was introduced into India about three thousand years ago. It exists in Malabar today only as a domestic plant, fond of human voice and contact; as a forest tree it exists rarely, if at all, though it is said that it is sometimes self sown.

It will give us some idea as to the actual area under cultivation if I say that it will be difficult to find even a single *paramba* in the whole District, except perhaps certain places in South Malabar, without at least one cocoanut tree in it. And the area is every year increasing. Not satisfied with planting *parambas*, the people have taken to converting paddy fields into cocoanut gardens, and clearing

the jungles. North Malabar, Ponnani and Cochin seem to be the places where the tree flourishes most.

I am not however sure that this expansion is not at the cost of good cultivation. Instead of tiring your patience with a dry narration of the details of the methods of cultivation followed in different parts of the country, I think, it will be more profitable if I only point out some of the defects which I have observed in them. These are four in number, namely, indiscriminate selection of seeds, inferior quality of the soil, inattention to spacing, and inadequate manuring.

The selection of seednuts is an important matter and should be done with great care. The best way is, to select the trees from which the nuts are to be taken and the rules to go by are :—a mature healthy tree in heavy bearing, nuts of medium size with thin husks, ripe but not dry. The cocoanut does not generally come true to seed, but there is a better chance of getting a superior type from a good tree than from taking seeds indiscriminately. But except, perhaps, in the case of well to do cultivators, no attention whatever seems to be paid to any of these principles, the people being mostly content to plant such nuts as they can easily get. The result is, as might be expected, that the trees do not flourish as well as they might otherwise do. I think and hope that the newly opened Government Farms in the West Coast might make themselves really useful by supplying at cheap rates seeds and seedlings of superior quality.

As to the selection of a good site, it is not always possible to obtain lands of superior fertility. In the first place, the amount of suitable land is limited and has mostly been already planted up. Secondly, it is not often possible for various reasons for one to get the particular land he desires. One lamentable result of this unavoidable circumstance is that, in planting no attention is paid to **spacing**, and as many are packed on a given area, as can possibly be. Properly speaking there should be at least a distance of 27 ft. between the plants; (It is said that the leaves of the trees should not touch each

other), but in the case of the new plantations, the distance is sometimes 15, 10 and even 5 ft. The mistaken impression perhaps prevails that number will make up for quality. This should be dispelled, and the people made to realize that a small number of well and properly planted trees will in the long run bring in more profit than a large number planted without regard to proper spacing.

Another and more serious defect which I may point out is the indifference of the cultivator **in the matter of manuring**. Even the richest soils have only a limited supply of the elements of fertility and if some of their constituents are constantly removed without anything being done to replace the lost elements, barrenness must ultimately ensue. Yet this is what is being done in Malabar at the present day in the case of the cocoanut cultivation i. e. to take all that nature gives and return nothing. Some experienced planters have expressed it as their opinion that the cocoanut plant is one that requires but little manuring. If the people therefore make but little effort on their part, the yield of the tree may be trebled or even quadrupled. It is extreme folly on the part of the cultivator to hesitate to spend an anna or two per tree every year when he can get one or two rupees from it in return.

Of late we have been seeing advertisements in the newspapers regarding cocoanut fertilizers. I have not known any instance in Malabar in which they have been tried, and unless one gives them a fair and satisfactory trial, it will not be possible to say anything definite as to their worth. It may however be suggested that it will do well for cocoanut planters to try them. I may also say that the work of trials and experiments is one that may be properly taken up by the Government, and I hope that it will occupy the serious attention of the West Coast Government Farms. It may be stated in passing that I understand that in this Coimbatore Central Farm and in the Taliparamba Farm, fish manuring has been tried with very good results.

Another point which the Agricultural Department has to tackle is about the enemies of the cocoanut palm, such as the wild pigs,

white ants, palm beetles, porcupines, rats etc. The damage done by these pests is enormous; sometimes whole plantation are said to have been destroyed by them. It is urgently necessary that some effective remedies should soon be discovered.

The uses of the cocoanut tree are too numerous to be described and I will content myself with saying a few words on **Copra Oil**, and **Coir**, the three products of the cocoanut which are of Commercial importance. Copra is the dried meat or albumen of the cocoanut. A large quantity of it is at present annually exported from Malabar for conversion into oil. If this could be prevented and the manufacture carried on in the country itself, besides the great benefit of finding employment for a large number of people, the profits that now go to enrich the foreigner will go into the pockets of the people themselves. The local process of manufacturing the oil has also to be improved by replacing the present country mills by modern mills, as the former are wasteful, leaving as they do a large quantity of oil unextracted in the punac. If co-operation be resorted to, I think there will not be any difficulty in producing large quantity of oil on improved methods.

The cocoanut oil exported from Malabar is reported to be much superior to that produced from other places. This is said to be due to the superior whiteness of the Malabar copra. Locally the oil is used chiefly for anointing the hair, for lighting and in seasoning curries. Modern science has however discovered many more uses for it. Dr. Deuner, a German Chemist, it was, who found that it makes a very satisfactory article in place of butter, which will keep from 15 to 20 days. The oil has also been largely used in recent years for making soap and candles. Within the last decade Chemical Science has produced from it a series of food products, which have revolutionised the industry. The conversion of cocoanut oil into dietetic compounds was begun in 1900, and today the world's demand for Vegitoline, Cocoline and other food products derived from the cocoanut is very great.

The next article of even greater commercial importance is the Coir. European writers who have described it, are in the habit of pla-

cing the coir from Malabar in the first rank. The name is derived from the Malayalam word Kayaru (rope) through the Portuguese corruption Coiro. Both the fibre and the rope were first exported to Europe about the middle of the 16th century, but it was not until the great international exhibition of 1851 that the coir rope and coir matting attained a commercial importance in England.

Locality seems to exercise a considerable influence over the quality of the fibre; soil, climate and proximity to the sea being important factors. But there are other considerations also. Certain varieties of cocoanut are better suited than others for the production of coir. The husks of immature nuts yield a better quality of fibre.

The process of extracting fibre may be thus briefly described. The husks are first removed from the shell and are then soaked in salt or brackish water for a period ranging from six months to one year. The next operation is to beat out the husks and rub them between the hands until all the interstitial cellular substance is removed from the fibrous portion. When quite clean, it is arranged into a loose roving preparatory to being twisted which is done between the palms of the hands in an ingenious way.

The fibre was at first used only for stuffing mattresses and cushions, but its application has now been greatly enlarged in foreign countries and its value greatly enhanced by mechanical processes. A variety of articles of great utility and elegance of workmanship are now manufactured from of it.

At present it is only in certain localities in Malabar that the fibre making industry is carried on. In a very large number of cases the husks are either burnt as fuel or simply thrown away. If these also could be made use of, I am sure that the amount of fibre exported from the country may be doubled or even trebled.

From what I have attempted to state above, I hope you will be sufficiently impressed with the vast importance of the cocoanut to the people of Malabar. Next to paddy it is the chief source of their income. But it is unfair to estimate its importance in pounds, shillings and

pence alone. In the whole vegetable kingdom it is difficult to find a tree which so lavishly blesses men as this angel among trees. And how grateful it is for any the least kindness done to it. For the very little care and attention that may be bestowed upon it, how profusely it pays us back.

There is vast scope for a much greater development of its cultivation in Malabar. It is none too soon that the Government has begun to interest itself in this matter. I feel sure that as a result a fresh, impetus will be given to it. I may also humbly suggest that the Government should not rest content with attempting to improve the methods of cultivating it. I think that it will be even more useful if they will attempt the pioneer work of introducing and popularising the modern developments in the manufacture of its products. It is gratifying that the Govt. oil expert has already made a beginning in the manufacturing of soap out of coconut oil. I am sure that the Government will make similar attempts in respect of the other branches of the cocoanut industry and this will be but in keeping with their present industrial policy.

Vengail K. Krishnan Nayanaf.

Discussion :—

Mr. Campbell of Messrs. Pierce Leslie & Co., said, that the cocoanut was a tree of which every part was useful and this reminded him of the pig in the preparation of meat. Though the trade in this nut is a very important one so far as Malabar and the West coast were concerned, yet its share in the world's market sank into comparative insignificance when placed against such formidable rivals as The West Indies or Zanzibar. The value of the copra alone had doubled within the last five years in the London Market. He believed that the yield of cocoanuts could be enhanced by as much as 300 or 400% by better cultivation and manuring.

Mr. Govinda Kidavu said that, in his recent enquiries into the cultivation of the cocoanut in the West coast, along with Mr. Sampson, he came across a two-acre plantation which yielded as many as 10,000 nuts per year. This plantation was situated in the interior, about 23

miles from the coast and the trees themselves were spaced 30 to 40'. He was of opinion, that the nature of the soil and elevation were important factors to consider, in the selection of a site for a cocoanut plantation. Thanks to the present system of tenancy in Malabar, the trees were often planted very close and this ultimately tended to lower the yield of nuts a good deal. About 20 years ago, the nuts were selling at Rs. 120 per 1,000. In the year 1913 they were selling at Rs. 60 per 1000. The prices now prevailing are Rs. 30 per 1,000 and this phenomenal drop was due to the elimination from the market of Germany and Austria, which, previous to the War, had been consuming as much as 70 per cent. of the Malabar trade. He deplored the now-steadily growing practice in the West Coast of opening new cocoanut plantations without any consideration, of the suitability, or otherwise, of the site in question, and desired to strike a note of warning at this stage, for, if persisted in, a condition of things may arise in Malabar, not unlike that, which followed the extension of groundnut cultivation in the district of South Arcot. Rao Sahib A. Rama Rao of Manganallur said that he owned a piece of saline land in the Tankas of Godavary consisting of black clay to a depth of 3' and enquired if any one could advise him as to what measures to adopt to raise a cocoanut plantation therein. Mr. K. Cherian Jacob said that in his own plantations, 6 to 7 thousand nuts per year were a frequent yield. In reply to the previous speaker he said that the best method of raising a cocoanut plantation under saline conditions was to heap up the earth and plant the young seedlings on these earth mounds. Mr. Unnikrishna Menon said that he had heard that the Rhinoceros beetle attacking young cocoanut trees could be easily kept out by smearing tar on the crown taking care to leave out the young shoots.

At the end there was an interesting discussion on the normal age of a cocoanut tree, on the number of leaves which a tree produces every year and the method by which the age of an old tree could be estimated; but the opinions expressed were rather divergent.

The Milling of rice in the Madras Presidency.

Rice is the principal food of about one half of the earth's population. It is one of the most important articles of food in all tropical countries, three hundred million East Indians alone using it, as their staple diet, the importance of rice in Indian agriculture is evident from this fact. It is one of the most prolific of all crops. In the Madras Presidency nearly 30 per cent. of the cultivated land is under rice, the chief paddy growing districts being Ganjam, Vizagapatam, Kistna, Tanjore, Malabar and Godavari where its production is steadily expanding with the growth of the population. In connection with this crop, therefore, the problems of agricultural improvement mostly centre round increasing the yield, and by that means the local food supplies. Most of the rice produced in the Presidency is consumed locally, or exported by rail or by coasting steamers to other parts of India and to Ceylon.

The grain which is harvested much in the same way as wheat is removed from the stalk by some form of threshing, leaving each grain separate and covered by an outer husk. In this condition known as paddy, it is stored and in this form reaches the Rice Mill. There the processes of preparing and cleaning are carried out on a commercial scale by means of machinery. The rice grain varies greatly. A casual examination reveals that there is short round rice, long thin rice, powdered rice and clear rice. Again an examination of the paddy shows that there are many other points of difference such as, thickness and nature of the husk thickness and nature of the mealy covering which underlies the husk, and variations in the colour of the latter. The removal of the mealy covering of the grain is the most important part of the milling process.

The process of rice milling requires highly specialized machinery for the shelling, grading and polishing of the grain, and

owing to the wide variations in the character of the rice grown not only in different parts of India, but even within relatively narrow limits in the same territory, expert knowledge and experience are necessary for the selection of the most suitable design of machinery. A certain type of machine which may be successful in the Circars may not be suitable for Tanjore on account of the difference in the original grain. Again, the market for which the rice is destined must affect the machinery required for the milling, to some extent; and this should be considered when installing new machinery.

The essence of good rice milling is, generally, to obtain the maximum proportion of whole well cleaned white rice from the paddy supplied to the mill, together with the automatic separation, grading, and dressing of the broken rice and bye products obtained in the process.

The process of milling in a properly designed and constructed mill, as carried out at Rangoon, would consist of the following operations:—

- Preliminary cleaning of the grain from foreign matter.
- Shelling.
- Winnowing.
- Separating.
- Whitening and Polishing.
- Grading.
- Bagging.

The paddy is first separated from the stones, mud and other foreign matter, which it generally contains in more or less quantities according to locality. It is then elevated into shellers where the removal of the outer husk is effected. This machine essentially consists of two well balanced cast iron plates, the lower of which revolves while the upper is stationary; these plates are covered with a suitable composition of emery which is easily

removable at slight cost when required. The grain is fed through the eye of the upper disk and the husk is cracked off as it passes through the two rough faces. The removal of this outer husk is effected with comparative ease. In a good mill 80% of the grain passed through is shelled and the percentage of broken rice is small being usually about 1½% to 2%. The remaining 20% is composed of small grains, to shell which with large grains would necessitate the breaking of the latter. From the shellers the grain is conveyed by an elevator to a separator where the coarse bran and broken rice are separated and taken off. The grain which is still mixed with husk is then elevated and passed through winnowers which generally comprise a double machine having one or more fans placed one above the other, giving a gentle and gradual separation, the aim being to obtain the highest possible percentage of the raw grain as finished product and to prevent good grain being blown away with the husk. The husk blown off in the winnowers is collected and conveyed direct to hoppers placed over the husk burning furnaces attached to the boiler, where it is used as fuel for steam raising. The shelled and winnowed grain is known as "Five part," or "Cargo" rice from the fact that it usually contains about one unshelled grain in every five. These unshelled grains are removed by a rotary separator or paddy eliminator. The grain is then conveyed to the cone-huller where the mealy covering is removed from around the kernel of the rice grain. The rice is then passed through an aspirator which removes all trace of any remaining husk or loose bran, and is then conveyed to the polishing machine from which it emerges clean and white. Finally the clean and white rice is separated into the various grades of quality as required for the consuming markets.

Of the whole milling process the whitening of the shelled grain is the most important; certain grains in Southern India are of a deep red colour underneath the husk. This inner skin

adheres closely to the grain and is difficult to remove without breakage resulting. The degree of whiteness and finish and freedom from broken grain determine the commercial value of the rice.

In the large Rangoon mills, grading plays an important part; the rice and broken rice being separated into various degrees of classification, the smallest broken grain being ground for the production of rice flour.

The bran that lies between the husk and the grain, and which is given off during the polishing processes is a valuable animal food, and contains much of the nourishing properties of the whole grain.

Although the commercial milling of rice has within recent years made great progress in Burmah and other parts of the World, little advance has been made in the scientific milling of rice in this Presidency. The process has apparently remained stationary for many years without any noticeable improvements having been made, but apart from the actual design of the plant, the construction of the mills and the installation of the machinery often leave a great deal to be desired. The mills are not erected in accordance with any standard plan or design and are almost invariably constructed in a most haphazard way, the result being that alterations and reconstruction are often necessary after completion. Even allowing for the fact that the Rangoon Mills manufacture principally for export whilst the factories of the Madras Presidency chiefly produce rice for local consumption, there is a great scope for improvement in the latter mills.

Both raw and par boiled rice are produced in this Presidency, although the latter is produced to a much larger extent than raw rice which is principally produced for immediate local consumption. In the Northern Circars all the largest mills produce boiled rice which, in normal times, is exported to the Malabar Coast

Coimbatore, Colombo and Mauritius. Unfortunately, facilities for transport to these places appear to be practically non-existent at the present time owing to the unprecedented shortage of rolling stock and of coasting steamers both large and small. The factories are in consequence unable to dispose of their produce with the result that most of them are closed down and the stocks of rice are large. There are also a number of smaller factories in the Circars which produce raw rice for local requirements and also for export. In normal times the chief markets for the raw rice of the Circars are the Bombay Presidency, the Nizam's Dominions, Bellary and Madras whilst a small amount is sent to Bangalore. In the Tanjore district par boiled rice is chiefly produced. It is chiefly exported to Colombo and the Malabar Coast.

Most of the par boiled rice factories of the Circars work on a modification of the Rangoon system. The paddy is first cleaned and separated from foreign matter and is then conveyed into a sheller which removes the outer husk. But as the husk still remains mixed with bran it is conveyed by a second elevator to a separator where the coarse bran and broken rice is taken off. From the separator the paddy is conveyed to the aspirating fans where the husk is blown off. It is then passed to another separator where the hulled grains are sifted and returned to the sheller for retreatment. The rice is then conveyed to the scouring and polishing cones from where the best bran is obtained, and is finally conveyed to a sifter which removes particles of meal and dust and any broken grain.

The raw rice factories work on a somewhat similar system, the main difference being that Engelberg Hullers are usually substituted for cones in the polishing operation, although the reason for this is not apparent, cones being equally suitable for raw or boiled rice.

The shellers, cones and separators on the whole are generally manufactured by Madras foundries and the remaining machines

which are principally constructed of wood are manufactured by local maistries. The construction of these machines often leave a good deal to be desired, the shellers for instance are often unevenly turned on the surface with the result that the shelling is uneven and the percentage of broken rice high. Two types of shellers are in general use, the Rangoon in which the lower plate revolves and the American in which the lower plates remain stationary the upper plate revolving. The former is generally preferred as the diameter of the plates is less and the balance is better maintained.

The process of par boiling consists in steeping the raw paddy for a period varying from 20 to 36 hours, the time varying according to quality, in masonry tanks, after which the grain is placed in drums where it is subjected to live steam for a further period of 12 to 15 minutes. From the pans the grain is taken out and spread over a brick or an earth floor where it is exposed to the direct rays of the sun for about 24 hours, being raked over until dry. Par boiled rice is not liable to deterioration on storage to the same extent as raw rice.

The steaming pans consist of wrought iron cylindrical vessels of a capacity of 25 to 50 bags, having a coned bottom connected with the main cylinder by a sliding cover. A vertical pipe is fitted to the centre of the pan having a number of perforated branch pipes issuing in all directions and extending to within an inch or two of the sides of the vessel. The main steam pipe from the boiler is connected to the vertical pipe, and the steam flows through the perforated branches percolating through the paddy which fills the vessel.

The mills in the Circars which have an output of from 700 to 800 bags of finished rice per day, are generally driven by a 35 N. H. P. simple non-condensing steam engine and a 24' x 6'6" Lancashire boiler. The boiler is fired by the husks produced in

the milling process, a specially designed furnace with stepped grate being used for the purpose. In these mills, however, the production of husk is only about 320 bags per day whilst the daily requirements of the furnace are 500 bags. The deficiency is made good either by obtaining additional husk from the oil engine driven mills, or using wood or coal fuel.

In addition to the mills referred to previously, which have outputs ranging from 150 to 800 bags of finished rice per day there are a number of smaller mills in the Circars consisting of an Oil Engine driving one, two or three pairs of Engelberg Hullers without the addition of any winnowing, separating or cleaning machinery. Attached to these mills are a number of hand mills where the paddy is husked and the resulting "cargo rice" conveyed to the huller which completes the hulling operation, the polishing being generally effected in a separate huller. There are about 75 of these hullers working in the Bezwada district. The hand shellers are manufactured at Guntur and cost about Rs. 90 each. A number of these hand mills are also in use in the villages—the partly shelled rice being conveyed to the milling centres to be hulled and polished. It follows that the appearance and finish of the rice produced by these small mills is distinctly inferior to that of the more elaborate factories operating on a modification of the Rangoon system.

In the Tanjore district the rice milling industry has shown remarkable progress during the last five years, but it is questionable whether the development has been on the right lines, consisting as it has of the construction of a vast number of single huller mills. There are a small number of mills in this district working on the Rangoon system, but the great majority consist of single hullers of the Engelberg type driven by oil engines. These small mills would have been of some economic value if they had paved the way for the establishment of large central factories but

this has not been the case and this system of milling regarded as an end in itself is devoid of advantage, and has probably had the effect of tending to arrest real development. A number of these small mills are situated in the most unsuitable places as regards proximity of raw materials and transport facilities.

Only boiled rice is produced in any quantity in the Tanjore district as the quality of the paddy is said to be unsuitable for the production of raw rice. The par boiled rice is exported to Colombo and the Malabar Coast.

These hullers have a capacity of about 50 bags of finished rice per day of 12 hours and are supposed to husk, clean and polish the grain at one operation. They require about 14 to 16 B. H. P. to drive, and are almost invariably driven by oil engines. They consist of two cylinders, one a small hulling cylinder above, and the other a large polishing cylinder below. The paddy is fed into a hopper and passes into the hulling cylinder, where it is retarded by a stripper plate against the grooves on the cylinder. This produces rubbing between the plate and the cylinder, and so the hulls are removed, the hull falling through the screen out of the way. The rice is carried on to the polisher, which is made of wood and has leather straps attached. This revolves inside a screen which receives the hulled grain at one end and delivers the polished rice at the other end. In Tanjore this polishing cylinder is seldom used the paddy being passed twice through the hulling cylinder.

For reasons that are not apparent shellers are very little used in the Tanjore district, although even moderately good results cannot be attained without their use. The method extensively followed in Tanjore of passing the paddy twice through the huller is open to objection as it not only considerably increases the cost of renewals but decreases productive capacity. Moreover by the use of a sheller the breakage of rice is considerably reduced.

The small rice milling plant just referred to has many disadvantages when compared with mills operating on the Rangoon system or even a self contained Engelberg plant consisting of a sheller, huller, aspirator and grader. The percentage of finished rice obtained is poor, the cost of renewals excessive, and the husk is often wasted. Further the breakage of grain is considerable and the appearance and finish of the rice distinctly inferior. Also, owing to the absence of any means of cleaning or separating the grain, the husk and bran obtained from these mills are combined together, and consequently, fetch a very low price for cattle fodder, as the husk is generally considered to be injurious; the fuel value of this mixed bye-product is also low and it is often thrown away the demand being small. The pure bran obtained from the mills operating on the Rangoon system commands a high price and considerably swells the receipt of a factory. Prior to the war a considerable amount of good quality bran was exported to Liverpool and elsewhere. These small mills are proving anything but a paying proposition for a number of their owners, and the efforts of the Department will be exerted towards restricting any further development on the present lines, and to encourage the creation in the Tanjore district of a larger number of mills operating on the Rangoon system or a modification thereof.

The country method of par boiling is extensively employed in the Tanjore district. Square wrought iron pans of a capacity of 15 bags of paddy are used. A wire gauze is fitted inside the pan, the space between the floor of the pan and the gauze containing water and the paddy resting on the gauze. Husk or wood fuel is used to heat the water and generate at atmospheric pressure the steam required to boil the paddy. This system of par boiling is primitive and inefficient, for not only does the boiling extend over a long interval of time, but the lower portion of the paddy boils much quicker than the upper layers, and in consequence the quality and value of the rice varies.

Modern rice mills of whatever kind employ relatively little labour, as the whole milling operation is automatic from the time the paddy is brought into the mill from the fields until it is bagged and stored. The cost of actual milling labour is low, but in connection with the sowing, harvesting and threshing of the grain employment is found for a large population. The handling and storing of the paddy and milled rice, and the collecting of the dried par boiled paddy from the drying grounds attached to the mills also give employment to a large body of native labour.

Reverting to the question of power to which reference was made earlier in this paper there are practically only two classes of prime movers in use at present in driving rice mills, the non-condensing steam engine and Lancashire boiler for the large mills, and the liquid fuel burning oil engine for the small mills. The latter class of mill owner has hitherto relied almost exclusively on the oil engine to furnish power at a reasonable rate but the price of liquid fuel has advanced considerably in the last two years, and in view of the increasing world wide demand for this oil it is unlikely that the price will ever fall to its pre-war level. The oil engine while therefore retaining the advantages of the simplicity and low initial cost, is in a very different position as regards economical generation of power to what it was a few years ago. Reference has already been made to the steam engines and boilers in general use, the great majority of the boilers are fitted with reasonably efficient husk burning furnaces, but the burning of waste materials for direct steam raising must always be a wasteful and objectionable method of generating power and it is probable that the great majority of rice mills will ultimately be driven by suction gas plants in which case almost all the drawbacks incidental to the burning of husk in a boiler furnace will be overcome. There are two great disadvantages attached to the burning of husks for direct steam raising, one

that the production of husk is often insufficient for the requirements of the mill, and the other the objectionable smoke and dangerous sparks which result therefrom. Several of the Municipalities in the Circars are considering measures to compel the husk burning steam mills to go outside the Municipal limits. The exhaust of a gas engine resembles that of an oil engine, and is consequently in no way objectionable, whilst no chimney is required.

As given quantity of husk will raise from four to five times the power when gasified than when burned under a steam boiler, and this is an important consideration in these mills where the amount of husk available is small and often insufficient for the power requirements. One of these plants, the first in this Presidency, has already been installed at Gudivada in Bezwada district, whilst a number are in successful operation in the Bombay Presidency. The consumption of rice husks in the Gudivada plant is only about 3lbs. per B. H. P. per hour.

To summarise the conclusions arrived at from an examination of many of the rice mills of this Presidency, it may be said that as regards the number of factories, the rice milling industry has developed rapidly in the last few years, but that broadly speaking it cannot be said to have developed on lines that are altogether desirable. In the chief milling districts the industry has been detrimentally affected owing to the competition arising from an excessive number of mills. The result of this over production is that few are operated continuously at their maximum capacity; and that in consequence, capital which might have been diverted into other forms of industry with great economic benefit, is not being used to the best advantage. In the Circars for instance the crushing of cotton seed, and the manufacture of cement are natural industries which might profitably have been developed. Rice milling cannot be satisfactorily run as a small industry.

It should be taken up by large capitalists who are in close touch with the markets, who can buy up the raw materials at the most favourable time of the year, and who can therefore be expected to construct good mills.

It is the intention of the Department of Industries to undertake a systematic survey of the rice milling industry of the Presidency, and the deputation of an officer to study the latest methods of rice milling practised in Rangoon is under consideration. It has been suggested that the condition of the industry in the different districts should be studied, an examination made of the different markets, the transit facilities connected therewith, and of the disposal of the bye-products. It is also proposed to investigate the merits of the different classes of machinery having regard to the percentage of finished rice obtained, the appearance and finish of the rice, the quality of the bye-products obtained, and the cost of renewals. An investigation of the industry on these lines is greatly needed, and should be productive of much good.

L. B. Green.

Discussion :—

Mr. D. Balakrishnamurthi said that he had found the small rice milling plants, crowded so closely together between Cocanada and Rajahmundry, to be on the whole a success. In these parts the husk is a universal cattle-food, and the supply frequently not adequate to meet the demand. The mill ashes are frequently used in the reclamation of saline land and fetches as much as Rs. 3 per cart load.

Mr. Unnikrishna Menon said that, in Sholavandan, Madura district, the ryots were frequently handicapped by shortage of labour in the milling and pounding of paddy and that occasionally even males took part in such operations (Laughter).

Rai Sahib A. Rama Rao, chronicled his personal experiences of visits paid to rice milling factories for a series of years. In the earlier days he used to find about the mills hillocks of paddy husk which later gave place to smaller hillocks of ashes—the husk being used as fuel. Of recent years even these ash heaps were disappearing owing to a growing demand for this stuff as manure. He would very much welcome a small mill to be driven by cattle power as it would be within the means of even the ordinary ryot to purchase. The discussion was becoming quite interesting but the President was reluctantly constrained to stop it as the hour was late and one more paper was on the Agenda.

How to spread Agricultural Education among the Masses.

The subject of agricultural education is engaging the prominent attention of the Government of India at present. The gigantic War that is being waged in Europe, has among other things, exposed the inadequacy of food production in the British Empire and awakened the statesmen and politicians who control its destinies to a sense of the necessity of improving and developing agriculture in different parts of the Empire so as to make it self-contained in the matter of food and other requirements of the Empire. India which is an essential component of the mighty British Empire is an Empire in itself with incalculable resources which, if but fully developed, will enable her to bear a large portion of the burden of the Empire in the different branches of its activities. It is but natural, therefore, that at a time when the resources of the Empire are being taxed to the utmost the Government of India, following in the foot-steps of the Imperial Government, should set its heart on the development of the agricultural, industrial and commercial possibilities of India. Not that this question was altogether neglected in the past; but a fresh impetus has been given to its solution in consequence of the revelations made by the War, though financially this is a time most unsuited for tackling

this question. The increased allotments that are being granted to the Department of Agriculture in spite of great financial stress and strain, the appointment of the Holland Commission to enquire into the possibilities of industrial development, and the recently announced appointment of a Trade Commissioner at London for the advancement of Indian trade are all indications of the earnestness of the Government of India in the development of the resources and the promotion of the material prosperity of the country.

In the matter of agricultural improvement it is gratifying to note that the Government of India have fully realised the importance of giving a prominent place to the subject of agricultural education. Early in 1916 a Conference was held at Pusa under the Presidency of Sir Claude Hill to discuss this subject. A number of resolutions were passed at that Conference, but evidently not being satisfied with the conclusions arrived at, the Government of India again called together a Conference consisting of officials and non-officials which met recently at Simla, also, under the presidency of Sir Claude Hill. The question of agricultural education in its various aspects was thoroughly discussed at this Conference and a number of important resolutions were passed. The proceedings of the Conference reported in newspapers are naturally short and incomplete, and a comprehensive criticism of its conclusions can only be made after the publication of the official report. From the information already furnished to the public it is, however, possible to make a few general observations.

A question of far-reaching importance was raised in the course of discussion at this Conference, namely whether demonstration work or agricultural education should be given prominence in the development of Indian agriculture at this stage. Some members were of opinion that demonstration should have precedence and that all the men that Agricultural Colleges are able to train for the next 10 years or so should be absorbed into the Agricultural Department to carry on demonstrations, while some other and particularly one gentleman said that preference should be given to agricultural education. It seems to me a bad policy to stifle demonstration work at present. The vast majority of our ryots are illiterate and the only way of drawing them

out of their conservative groove and leading them to the path of Agricultural improvements is to carry on demonstrations as extensively as possible under their very nose. Any kind of agricultural education that may be initiated cannot and will not reach the grown-up rural population of the country. Agricultural schools may be started in hundreds; but the ryot will hardly think it worth his while to go to such schools and begin his education. To him practical proofs of the benefits of scientific agriculture will appeal more than the instruction that he may receive from teachers and books; and hence the necessity of extending the operations of the Agricultural Department in the sphere of demonstrations. While recognising the importance and necessity of expanding demonstration work, one cannot altogether forget the influence of agricultural education on the younger generations and the far-reaching results which the education of the boys in the profession in which they are to be engaged in after-life will bring about. The chief obstacle that stands in the way of the popularisation of scientific methods of cultivation in India is the illiteracy and ignorance of the ryots. If the ryots had in their boyhood received some education, both literary and agricultural, the work of Agricultural Officers would have been much easier. The mistake of not educating the rural population in the past has now been exposed and surely it is the duty of the Government to see that this mistake is not perpetuated. It is high time, therefore, to think out and initiate a liberal policy of education for the boys of the agricultural classes. Apart from this standpoint of the improvement of agriculture, the question of agricultural education has also to be looked at from the standpoint, of the problem of the unemployed which is already forcing itself on the attention of the administrators.

Literary education is spreading in the country by leaps and bounds. Elementary schools are springing up like mushrooms, and the number of boys attending such schools increases by thousands every year. The one aim of all these boys at present is to pass some examination, procure a certificate and worry Government Officers for appointments. Boys of rural districts who, under ordinary circumstances would take to agriculture, their ancestral profession, are drawn

away into the whirlpool of literary education and struggle hard to secure a passport for Government service. 90% of them fail in their attempts and leave the school disappointed and dejected, unfit for Government service and for their own natural vocation towards which unfortunately they are developing a feeling of dislike and scorn. Even among the successful boys many find it impossible to get into Government service and they go about in the country ever seeking appointments and ultimately finding it a wild goose chase become discontented and turn out mischief-mongers. The problem of providing employment to these unhappy youths, both those who fail to complete their literary education and those others who having completed it and passed the examinations find it impossible to procure appointments, has to be tackled and successfully solved if there is to be contentment and happiness in the country. Viewed from this standpoint also the necessity of changing the present educational policy and introducing some sort of agricultural education so as to enable at least the majority of boys of the rural districts to remain on the land and carry on agriculture profitably becomes abundantly clear. Considerations such as these lead one to the conclusion that the subject of agricultural education is all-important and should not be left in the lurch even at the present stage of agriculture in India when it is not desirable, no doubt, to slacken the efforts in carrying on demonstrations.

How best can agricultural education be spread among the masses is the point to be considered. The resolutions passed at the Simla Conference, in my humble opinion, do not go far enough in this matter. It was decided there that there should be an Agricultural College in each Province for imparting higher education in agricultural science, and that one or more agricultural schools should be established in each rural district near Experiment Stations and Demonstration Farms for training the sons of farmers in practical and theoretical agriculture. The number of Experiment Stations and Demonstration Farms in each Province is not very large at present, and if agricultural schools are only to be opened near such stations and farms the rate of progress in the spread of agricultural education among the masses will neither be

appreciable nor satisfactory. Of course, the starting of a larger number of agricultural schools, it may be argued by those who are against such a policy, depends upon money and teaching staff. Both these are difficult to get at present, and hence there should be no grumbling at the inevitable slowness in the spread of agricultural education. One must admit that without money and men for teaching, agricultural schools cannot be opened. But are these insuperable difficulties? I think not. As far as money is concerned I think it possible to chalk out a scheme of agricultural education which does not involve such formidable expenditure as is considered necessary by the authorities. Of course, some money has to be spent and the Local Government can make a provision for the same by reserving a special allotment every year even by curtailing, if necessary, the expenditure to that extent on higher vernacular education of a purely literary kind in rural districts.

The question of finding teachers for the agricultural schools is even more important than that of finance. There are now a number of Agricultural Colleges in India and the Simla Conference resolved that each Province should have one such College. In these Colleges there are two courses, one for 2 years and the other for 4 years. At present the men who are trained in the Colleges are mostly absorbed into the Agricultural Department. This policy should be changed. The men undergoing the four years course may all be taken into the Department, and from those who take the two years course a good proportion should be made available for teaching in the agricultural schools. The number of students admitted to the latter course can be increased to at least 40, without much additional cost of lectures and appliances. Of these students at least 30 may be expected to pass out every year and of them 10 should be taken into the Department and the remaining 20 should be employed as teachers in agricultural schools. If this course is adopted it will be possible to open at least 10 agricultural schools every year in each Province 2 teachers being employed in each school.

The students taking the four years course should be so trained as to be able to rise even to the higher rungs of the ladder of Agricultural

service and to undertake scientific investigations in different branches of agriculture and the allied sciences after a further course for a year or two of post graduate studies. Such men must naturally possess a high standard of general education and admission to the four years course may, therefore, be restricted to graduates of Universities and preferably those who have secured a high pass in the sciences in the degree examination. The men who pass out of this course must be granted a degree in agriculture, the Agricultural Colleges being affiliated for the purpose to the Universities.

The students who go in for the two years course need not possess such a high standard of general education as those who take the four years course. All the same, since they are intended for serving in the Agricultural Department and for teaching in the Agricultural schools I would prefer for admission to this course candidates who have passed the School Final or some other equivalent examination. There is an impression in some quarters that much general education is not necessary for the lower subordinates of the Agricultural Department. From my experience of such men in my own Department I find it impossible to endorse the above view. Men without a high standard of general education, but only trained in agriculture, are not altogether bad; but those who combine in them good general education and agricultural training are always found to do better. The School Final men are ever on the increase, any number of them are without employment, and why not make use of them for agricultural work and agricultural teaching? These men are ready to accept clerks' posts even on Rs. 10 per mensem. If after two years' training in an Agricultural College they can get a start of Rs. 25 or Rs. 30 with prospects of rising to about Rs. 100 or so in the course of their official career very many of them will willingly join the Agricultural College. The teachers in agricultural schools and the lower subordinates of the Agricultural Department, except the maistries, peons, and menial servants, should certainly have prospects similar to those of the Sub-Overseers, and Overseers of the Public Works Department, the Hospital Assistants and Sub-Assistant Surgeons of the Medical Department &c. If such prospects can be held out in the Agricultural

Department there will surely be no-difficulty in attracting School Final men to the two years course in Agricultural Colleges.

As already stated, by the adoption of the course suggested above 20 teachers in agriculture can be produced every year in each Province, and with them at least 10 agriculture schools can be opened. These schools are solely intended for training men for practical agriculture, men who will go back to the land and engage themselves in cultivation. Appointment-seekers should not be allowed to contaminate the atmosphere of these schools and poison the minds of the innocent boys who wish to develop into practical farmers. No hope of entering Government service should be held out to these boys and very great care should be taken from the start to admit only boys who are prepared to devote their life to agriculture. Such boys can be had in plenty everywhere and there need be no anxiety on the score of paucity of students for admission to the agriculture schools. I speak from my experience in Travancore and conditions in British India cannot be far different from those obtaining here. Admission to the agricultural schools should be open to boys who have studied up to the fourth standard in vernacular schools and who are not less than 12 years old. The medium of instruction should naturally be the vernaculars, and the boys must have had sufficient general education to be able to read and understand ordinary books in their own vernacular. To each school must be attached a farm of about 5 acres which must be divided into plots and distributed among the students for cultivation. The instruction given in the schools must be as practical as possible. The boys must not be made to cram up books. In fact it is better to avoid the use of text-books altogether. The teachers must read up books, take notes, and instruct the boys in the elementary principles of agricultural science. The instruction thus given must be impressed on the minds of the boys by corroboration with their own practical work on the farm. Every item of work on the farm must be attended to by the boys themselves, and as an encouragement to them they must be given the produce of their own labour. The boys attending each school will be drawn from the neighbourhood of the school itself, and it will not be difficult, therefore, to insist on their attendance in the

school early in the morning and remaining there till evening with a couple of hours interval in the mid-day. Both in the morning and in the evening they must attend to farm work for 2 or 3 hours and in the interval they must be given lessons in the class room for 3 or 4 hours. The course of training must extend over at least 2 years, and the backward boys must be kept on for another year or so, the ultimate object being to fit him for practical agricultural work on improved lines when they leave the school.

The school that I have in contemplation is more or less after the model of the Loni Agricultural School in Bombay Presidency with this difference. In the Loni School the boys permanently reside on the farm itself and are fed at Government cost. With regard to the school that I suggest the boys are not required to live on the farm. But since they will mostly be of the poor classes, it may be necessary to provide them with mid-day meal on the farm and that at Government cost. By supplying one meal a day to the boys and allowing them to stay in their homes in the night instead of making them live on the farm and feeding them at all times, the expenditure on the school can greatly be reduced from what it is at Loni, without impairing the efficiency of the training. The Loni Agricultural School is, no doubt, an excellent institution, but the cost of maintaining it is so great that no Government, however strong its finances may be, will be in a position to open a sufficient number of such schools so as to bring agricultural education in the near future within the reach of the whole rural population which is naturally the goal to be aimed at. A less costly, but not less efficient, scheme has to be formulated if the goal is to be reached within the next one or two generations. I have given some thought to this question and arrived at the conclusions described above which I place before the Madras Agricultural Students Conference for consideration.

N. Kunjan Pillai.

Discussion :—

Requested by the President of the meeting Mr. Wood, who had just returned from Simla after the Educational Conference there, briefly enumerated the various views current on the subject and observed that

the teaching of a concrete subject like Agriculture as against a purely literary one demanded a greater and more detailed attention from the teacher and thus necessitated comparatively smaller classes. He had made a rough calculation and found that the staff required would be roughly six times that required for a literary subject. He emphasised the importance of Agricultural Research for improving the quality of teaching at the College, and mentioned that in one of his recent tours with the students, he came across two entirely new crops not known to the Department till then. He would, for some years to come, attach great importance to Demonstration work which would not only bring well tried improvements to the very doors of the ryot but was also likely to serve as an advertisement for the College and stimulate the influx of the right sort of material into its portals.

Mr. M. R. Ramaswami Sivan suggested that, by a system of co-operation between the Educational and Agricultural Departments, experienced Farm staff might be *lent* from time to time to serve as Agricultural teachers in the Government training schools. It often happened that men who could not get a berth in the Agricultural Department started service as Agricultural teachers in the Educational Department with little or no practical experience, and that they frequently got disappointed because of the limited promotions. The scheme, he suggested, was exactly similar to what obtained in the Engineering and Medical Colleges.

Notes and News.

During the month, the games captain was busy organising matches. On the 5th of August our team met the Young Men's United Team in a Hockey match. It was a well contested match and our opponents would have put in a goal but for Mr. Parnell and our splendid backs. Just before the close of the match, we pulled up and put in a goal, so winning the day by one goal to nil.

On the 7th we again met the above team in a football match. During the 1st half, our forwards now and then attacked the goal

of our opponents but were repulsed. Just before half time, their captain with his usual calmness and skill, scored a goal to his credit. The second half was one sided and the ball was often playing near our goal, but our backs defended well. Unfortunately, at the last moment, a fine drop sent by our opponents, left forward turned out to be a goal. Thus we lost the match by two to nil. Had Dharmalingam been in his best, the match would have been otherwise.

On the 14th we played a Hockey match with the London Mission High School. From the very outset our forwards covered their goal on all sides and began to put in goals in succession. We had a very easy game with our rivals and gave them ten goals to nil before the match ended.

On the 19th we arranged for a cricket match with our next door neighbours, the Foresters. We took to batting and Messrs. Vittal Rao and Sivan started the game. Mr. Vittal Rao played a steady and graceful game and scored the highest runs for the day. Mr. Sivan played a young man's game and had two boundaries to his credit. Dharmalingam as usual scored quarter of a century. Mr. Veeraraghava Rao, though out of practice, played his best and our total score stood at 177 for the 1st innings. Mr. Veeraraghava Rao did equally well in bowling and put down four or five wickets. In the end our bowling got slack and our opponents taking advantages of this scored some boundaries. The first innings came to an end with 139 runs to the Forest College and we narrowly missed the victory by 23 runs.

Again, on the 21st we met the Forest College in a Hockey match. Unfortunately some of our players could not play on that day. The Foresters took advantage of this and attacked us and snatched away four goals from us. We secured only one goal. We congratulate our opponents on their splendid victory.

On the 8th August under the auspices of the Students' Club Mr. S. R. Srinivasan of Class III read a paper on paddy cultivation in Tanjore with R. C. Wood, Esq., M. A., in the Chair. The essayist gave a detailed description of the paddy cultivation in Tanjore and brought home to the audience the several difficulties of the ryot and suggested several lines of improvement. Messrs. Vedantham and Kuppuswami Ayyangar of Class IV who are natives of Tanjore made certain further remarks on the lines of improvement suggested. M. R. Ry., C. Narayana Ayyar, Teaching Assistant, gave his experience of the Tanjore Ryot. The President in closing thanked Mr. Srinivasan for his excellent paper. It is to be hoped that the Students' club will show greater activity in the future, by meeting at least once in a fortnight and discussing agricultural practices of different localities. In 1908 when the club was first started there were only 20 Students and owing to the activity of the pioneer Secretary Mr. Charlu there were at least a dozen meetings in the course of the year. Now the College has been strengthened by more Students and teachers and as such greater facilities exist for arranging such meetings. A thorough grasp of the local agriculture and the constant desire to apply the knowledge gained for its improvement will greatly help the student in achieving a successful course in this College, which otherwise the student often thinks to be a rather rough and rugged one.

K. T. A.

The following members of the Madras Agricultural Department were present at the College Day and Conference :—

Messrs. G. A. D. Stuart,
 „ H. C. Sampson,
 „ G. R. Hilson,
 „ R. D. Anstead,
 „ Roger Thomas,

„ F. T. T. Newland,
 „ Aswatha Ayyar,
 „ D. Balakrishnamurthi, and
 „ M. Govinda Kidavu.

Messrs. M. K. Nambiar,
 „ Budhavidhya Rao,
 „ Seetharama Pathrudu, and
 „ S. Pranatartihara Ayyar,—of the First Circle.
 „ Rajagopalachari,
 „ Raghavalu Nayudu, and
 „ Ratnaji Rao,—of the Second Circle.
 „ Unnikrishna Menon, and
 „ Viswanatha Ayyar,—of the Fourth Circle.
 „ Rao Sahib A. Rama Rao,
 „ W. Raghavachari,
 „ T. V. Seshachari, and
 „ Veeravardha Raju,—of the Fifth Circle.
 „ N. S. Kolandaswami Pillai,
 „ S. Narayaniah,
 „ Gopalakrishna Raju,
 „ A. Chinnathambi Pillai,
 „ Sankaram Pillai, and
 „ Balakrishna Ayyar,—of the Sixth Circle.
 „ Vellodi, and
 „ Govinda Nambiar,—of the Seventh Circle.
 „ K. R. Sankaranarayana Ayyar, and
 „ Doraswami Ayyangar,—from Pudukottah.
 „ T. V. Srinivasa Charlu,—from Tanjore.

Departmental Notes.

M. R. Ry., K. Krishnamurti Rao, Chemical Assistant, Office of the Government Engarcane expert, Coimbatore, is granted privilege leave for 1 month and 9 days from or after 20th August 1917.

M. R. Ry. A. T. Tirumuruganatham Pillai, Agricultural Demonstrator, is granted sick leave on medical certificate for 3 months in continuation of 3 months' privilege leave already granted to him.

M. R. Ry., T. R. Ranganath, Assistant in Mycology, is granted a further extension of sick leave for 2 months in continuation of 8 months' leave already granted to him.

APPENDIX I.

College Day Sports, List of winners.

Hundred yards Race—11½ sec.	...1. S. Dharmalingam. 2. Seshachalam. 3. John Singaram.
Long jump. 16'—1½"	...1. Seshachalam. 2. S. Dharmalingam. 3. Annapurneswara Rao.
High jump. 4'—11"	...1. S. Dharmalingam. 2. Appadurai. 3. Seshachalam.
Putting the shot. 22'—10"	...1. Bhandari. 2. Vittal Punja.
Quarter mile Race. 62½ sec.	...1. { K. K. Subramanian. S. Dharmalingam. 2. Seshachalam.
Throwing the cricket ball. 85 yds. 1½'	...1. Vittal Punja. 2. Bhandari.
Kicking the football.	...1. Annapurneswara Rao. 2. K. K. Subramanian.

Hurdle Race. 20 sec.	...1. Seshachalam. 2. Dharmalingam.
Half mile Race. 2 min. 36½ sec.	...1. K. K. Subramanian. 2. E. S. Viswanathan. 3. John Singaram.
Slow Bicycle Race.	...U. Vittal Rao. } both C. Narayana Aiyar. } officers.
One mile Race 6 min. 7½ sec.	...1. E. S. Viswanathan. 2. John Singaram. 3. V. S. Viswanatha Rao.
Obstacle Race.	...1. K. K. Subramanian. 2. E. S. Viswanathan. 3. C. Appadurai.
Sack Race.	1. K. E. Viswam. 2. C. Rangaswami.
Cross Country Race.	...1. E. S. Viswanathan. 2. K. K. Subramanian. 3. John Singaram.
Tug of war—won by the District Team of—	Messrs. 1. G. A. D. Stuart. 2. H. C. Sampson. 3. R. Thomas. 4. D. Balakrishnamoorthy. 5. T. Budhavidya Rao. 6. K. Gopalakrishna Raju. 7. M. U. Vellodi. 8. M. A. Balakrishnan.
Championship.	...S. Dharmalingam.

APPENDIX II.

The D'Silva Memorial Fund.

Below is published the fourth list of subscriptions to the D'Silva Memorial Fund. In October last a committee consisting of Messrs, Vengail Krishna Nayanar (President), T. N. Veerayan Thirumalpad, and K. Raghavachari (Joint Secretaries) P. K. Achan, Rao Saheb, A. Seturama Iyer, G. Jogi Raju and Badami K. Venkat Rao—was elected by the old students of Mr. D'Silva to take steps to perpetuate his memory at the Agricultural College, Coimbatore.

The committee started with a nucleus of Rs. 25 handed over as surplus by the committee which organized a send-off to Mr. D'Silva on the eve of his departure from Coimbatore.

Appeals for subscriptions made from time to time, through the columns of this Journal and through letters, have brought in an aggregate amount of Rs. 381. Of the above amount only Rs. 228 have been actually collected and it is hoped that the various subscribers will kindly pay up their amounts at an early date. It is further requested that other intending subscribers will kindly send in their donations early, as it is proposed soon to close up the list. Of the sum of Rs. 381, Rs. 72 have already been spent in connection with the Bromide enlargement a replica of which is published as a frontispiece to this issue, and other sundry items. With the amount collected it is proposed to institute an annual prize at the College the details of which will be published later.

K. Raghavachari,
Joint Secretary.

The fourth list of Subscriptions to the D'Silva Memorial Fund.

		Already subscribed.	Rs. 276
1.	Mr. B. S. Tolar.	...	2
2.	" Badami K. Venkata Rao.	...	7
3.	" T. V. Rajagopalachari.	...	10
4.	" R. Swami Rao.	...	3
5.	" V. Ramanatha Ayyar.	...	3
6.	" K. Balaji Rao.	...	2
7.	" V. S. Subrahmanya Sastri	...	4
8.	" P. A. Raghunathaswami Ayyangar.	...	5
9.	" S. Sitharama Pathrudu	...	2
10.	" V. Muthuswami Ayyar.	...	2
11.	" M. Govindakidavu.	...	2
12.	" A. Chinnathambi Pillai.	...	2
13.	" K. S. Sankaram Pillai.	...	1
14.	" M. U. Vellodi.	...	2
15.	" M. A. Balakrishna Ayyar.	...	1
16.	" S. Narayanayyah.	...	2
17.	" D. Balakrishnamurti.	...	2
18.	" S. Pranatartihara Ayyar.	...	1
19.	" K. Unnikrishna Menon.	...	2
20.	" N. Raghavalu Nayudu.	...	4
21.	" T. V. S. Charlu.	...	2
22.	" C. V. Seshachari.	...	5
23.	" A. Rama Rao, Rao Sahib.	...	5
24.	" K. Sankara Ayyar.	...	2
25.	" A. Thirumuruganatham Pillai.	...	3
26.	" V. Ratnaji Rao.	...	2
27.	" Bhairy Siva Rao.	...	2
28.	" M. K. Nambiar.	...	3
29.	" N. V. Visvanatha Ayyar.	...	5
30.	" W. Raghavachari.	...	2
31.	" H. C. Javarayya.	...	2

32.	Mr. K. R. Sanker.	...	1
33.	„ T. R. Venkaswami Rao.	...	2
34.	„ T. P. Subrahmanya Kandar.	...	2
35.	„ C. S. Madiiah.	...	3
36.	„ N. S. Kolandaiswami Pillai.	...	3

Total Rs. 381

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THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. V.

September 1917.

No. 9.

Editorial Notes.

Such of the members as were present at the last conference may remember the note of complaint in the Report of the Working Committee of the Union on the paucity of contributions from the members. We stand this day much in the same predicament as that described in the Report and consequently desire to invite the attention of every member to the following few lines:—

Unlike organizations which wake up to life only once in a year and then go into a self-complaisant sleep after recording a long and enthusiastically worded Annual Report we hold that our Union should pulsate with life every day, nay every hour of its existence and we ask "In what better way can a member enable the Union to realize this ideal than by constant contributions to this little journal of ours which is circulated to every member of the Union at least once a month?" If only every member will make it a rule to send in at least one contribution,—shall

we say every year—the Editorial Board at Coimbatore will soon be overstocked with matter too voluminous to squeeze into the journal.

We have come across an attitude in certain quarters, according to which the duties of a member to the Journal—the only all-the-year round activity of the Union—are over when the annual subscription is paid and an Editorial Board is elected. They would appear to argue that the Editorial Board is there to “see” to the Journal. We, on the other hand, are of opinion that the real Editorial Board of this Journal is co-extensive with the membership of the Union and the most valuable members thereof, are those in the far off villages, in—every—day—contact with the cultivator—should we specify that such are the District Staff and the few members who have started enterprises of their own? The Editorial Board at Coimbatore is functioned primarily to select, to sift, to collate, to print and to publish. When this aspect of the matter is fully realized by each member and subscriber, we feel confident that the Journal can be made the most interesting and instructive, though not the most learned of the Journals in South India.

And lastly, we would point out, that the contributions that are expected are such as not to throw much strain on the time or energy of the contributors. A little observation on crops and local practices, a note on some local agricultural or co-operative activity, a note on a local shandy or the agricultural products seen for sale at a local festival, a short description of peculiar weather conditions, a re-

view, an abstract or an extract of published papers, any of these will be very welcome and will surely make the Journal more interesting. In short, we desire to see reflected in these pages, the fact that our Union Journal is something more than a College Journal. While there are 115 members (36 officers and 79 students) in the College there are 189 members all men of experience, throughout the Presidency and some outside it; and their responsibility in the matter of contributions is correspondingly greater.

We invite the attention of our readers to the Article entitled “The Economics of a Deccan Village” by Dr. H. H. Mann which was published in the July 1917 number of the Agricultural Journal of India. It describes a kind of activity which can easily be taken up by any small batch of the members of our Union and it is impossible to exaggerate the value of such work in the solution of many agricultural problems now and in the future.

As usual our College played a prominent part in the War Fete held at Coimbatore on the 18th of August 1917.

Our Principal, Mr. R. C. Wood was the Secretary. Mrs. Barber organized a fine picture gallery and was able to remit over Rs. 1000 to the Fund while the National Indian Ladies Association with Mrs. Sivan as the organizing Secretary remitted about Rs. 250 from a stall of ‘Odds and Ends.’ The Chemical section of the College gave a magic performance

A line of
work for
members of
the Union.

The War
Fete.

remitting over Rs. 50, and several members of the staff and students helped in one way or other.

Messrs. K. Ramiah, L. Ag., Assistant to the Government Economic Botanist and D. Panakala Rao, L. Ag., Assistant Manager at the Government Sugar-cane Breeding Station and eight students (Messrs. (1) C. Appadurai, (2) P. Padmanabha Ayyar, (3) P. Janakiraman, (4) V. S. Viswanatha Rao, (5) K. E. Visvam, (6) Rao Appa Rao, (7) C. S. Namasivayam Pillai and (8) B. Ramachandra Nayudu, applied for enrolment in the Defence of India Force, and we are glad to hear, all have been found medically fit.

For the information of our readers we publish the following appreciation of our Journal by the Agricultural Journal of India.

"The Journal usually contains good reading matter, and we hope it will become more and more popular, as it deserves to be, among those for whom it is intended."

The present condition of the supply to South Indian towns of milk and its products, with special reference to Palamcottah, one of the municipal towns in the district of Tinnevely and practical suggestions to organise and control an improved system suitable to local conditions.

Milk:—The present condition of the supply to South Indian towns of milk and its products is in a deplorable condition both in point of quality and quantity. Speaking about quality, it may be re-

membered that in most of the South Indian towns where infant mortality is very great and where as in every part of the world it is a great necessity to keep the infants with a complete and easily digestible food like milk, it is our duty to see that milk is supplied in the purest form possible. There is no denying that milk is generally mixed with water in different proportions—the proportion varying according to the demand for the milk and its availability. No consideration is paid whether the water that is thus mixed is pure or impure. Another most important point which escapes the notice of every one is the milking. Milking is generally done in dirty vessels and the milkmen never care to clean the udder of the cow or their own hands before milking. The carelessness on the part of the milkmen is due to their ignorance of the importance of cleanliness in the stuff they handle. The practice of wilful adulteration is encouraged as there is no legal measure, unlike in the European countries to punish a man who dilutes milk. The adulteration is partly done by the milkmen themselves and partly by the vendors, who purchase milk from milkmen and sell it in the streets. Very many of those who sell milk in the streets are cheating the people in the towns by selling adulterated milk as genuine and it is not uncommon to see people diluting Buffaloes' milk with a quantity of water to its bulk (because it is thick and contains more fat) and passing it as cow's milk. In some extreme cases and specially at Palamcottah, people who are engaged in milk trade, buy separated milk from the dirty local dairies, adulterate with water and pass it for pure cow's milk at the Railway station close by Tinnevely Bridge. Thus the introduction of improved appliances in the towns to facilitate easy separation of butter from milk, leads certain individuals to practice cheating. There is a great demand for milk, in the South Indian towns and the people in the towns without knowing the real state and value of the stuff and without knowing the importance of the purity that is wanting in the stuff, buy indiscriminately and use it. What is the cause for this awful adulteration? The answer is, the great demand for milk in South Indian towns and the limited supply which exists there at the present time. This state of affairs leaves the door open for fraud and wilful adulteration. In

many cases milk is usually carried in small quantities in brass vessels or tins. As there is no cover to close the mouth of the vessel the milk is subjected to all kinds of infection.

Butter milk:—Madras butter milk is always red in colour. This is partly due to careless boiling and partly due to the large quantities of dirty water they add. A little butter is left in the butter milk while churning according to the country methods and this small percentage of butter gives a good taste to the buttur milk. The women that prepare this stuff try their level best to remove the butter completely by freely using their dirty fingers; by doing so the good taste in the butter milk vanishes. Another defect in the preparation of butter milk is that the fermentation is not properly controlled. As far as Palamcottah is concerned, the town demand of butter milk is supplied by the shepherd women who bring large quantities of the stuff in big mud pots from "Naduvakurichi", a village about 6 miles from Palamcottah. They collect the butter milk for 2 or 3 days together and sell it in the streets of Palamcottah at a cheap rate of 4 pies a Madras Measure. Even in dealing with this cheap butter milk adulteration with water is very common. As butter milk is sold in the street the bulk of it is kept up by adding water little by little and the acid butter milk will allow any amount of water to be added to it. During the hot days butter milk is cool and refreshing to the system.

Curds:—Curds are obtainable in large quantities in South Indian towns. In some cases due to careless boiling the curds give a bad taste. Palamcottah town gets its supply of curds from the same village "Nadivakurichi" mentioned above.

Butter:—The method of preparing butter in these parts is very crude and time honoured. As much as possible milk is sold as such. The balance of milk is well boiled and fermented. The next morning this is churned with the local churn and butter is collected. The quantity of butter thus obtained, being very small is generally kept for a number of days until a sufficient quantity is got for being converted into ghee. The result of this process is that the butter gets rancid and the ghee got out of it is equally bad and unfit for

table purposes. *It is said that butter is adulterated in the Mysore State with flour of rice or ragi. As far as Palamcottah is concerned, butter is rarely sold as such and such adulteration is entirely out of practice. Butter is clarified and ghee is obtained.

Ghee:—Ghee is very badly adulterated in South Indian towns chiefly with gingelly oil, cocoanut oil or more commonly with groundnut oil. Cow's ghee is generally used in medicines and much higher price is paid for it than for the buffalo's ghee. **It is not unlikely therefore that buffalo's ghee is very cleverly coloured with turmeric (saffron) and passed for cow's ghee. Ghee is in some places adulterated with fat of several animals, gingelly and groundnut oils and also starches. Apart from adulteration the preparation of ghee from butter is very bad. The butter is either over boiled or under boiled. In both the cases the result is the same i. e., the production of a bad ghee. Palamcottah gets its supply of ghee from the same village from which it gets all the other milk products. Few samples are in an unadulterated condition the chief adulterant being either gingelly oil or groundnut oil.

So much about the quality of milk. Now coming to quantity:—

Milk:—The supply of milk in any South Indian town cannot in the least meet the demand and it is very unsatisfactory. The cost of milk is also gradually increasing and in few towns it has gone as high as 2 annas a pound.

Even 1 anna which is paid in many towns for a pound of milk is rather high. Taking the case of Palamcottah the quantity of milk that is required to meet the demand may be roughly estimated as follows:—The population of Palamcottah is nearly 50,000 (23,000 males and 26,000 females and 1000 visitors etc.) and the following tabular statement gives the total quantity of milk that is essential for proper daily supply of milk to that town.

*Page 4 Bulletin No 9—Department of Agriculture Mysore—Method of butter making—local and improved.

**The Journal of the Madras Agricultural Students' Union Vol. VI. No. 4 page 83.

Total population 50,000.

Particulars of the distribution of population according to age.	Total number in each.	Rich 10% 5,000.				Middle class 40% 20,000				Poor 50% 25,000.			
		Number.	% that require milk.	Quantity consumed per head in lbs.	Total quantity consumed in lbs.	Number.	% that require milk.	Quantity consumed per head in lbs.	Total quantity consumed in lbs.	Number.	% that require milk.	Quantity consumed per head in lbs.	Total quantity consumed in lbs.
Children below 5 years of age 10%.	5,000	500	90	$\frac{1}{2}$	225	2,000	50	$\frac{1}{2}$	500	1,500	10	$\frac{1}{2}$	125
Between 5 and 20 years of age 15%.	7,500	750	75	$\frac{1}{2}$	422	3,000	25	$\frac{1}{2}$	562	3,750	Nil		
Between 20 and 50 years of age 50%.	25,000	2,500	75	1	1,875	10,000	50	$\frac{1}{2}$	3,750	12,500	Nil		
Above 50 years of age 25%.	12,500	1,250	75	$1\frac{1}{2}$	1,431	5,000	25	1	1,250	6,250	15	1	937
Total...	50,000	5,000	...	...	3,953	20,000	...	...	6,062	25,000	...	...	10,62

According to the above statement the total daily requirements of milk for this town comes to nearly 11,000 pounds. How the demand is met with is a serious question to be solved. Very little milk is brought from out side the town to meet the demand and train service is of little or no use in this case. Practically all the milk consumed in the town is obtained from animals maintained in the town itself. According to a rough calculation there are at present (apart from the dry cows and buffaloes) 250 rich milch cows and nearly 900 buffaloes within the Municipal town and taking 5 lbs. as the average daily milk yield of a cow and 9 pounds that of a buffalo, the total quantity thus obtained amounts to $(250 \times 5 = 1250$ and $900 \times 9 = 8100$ i.e., 9350 pounds) 9350 pounds per day. Out of these 250 cows, more than 150 are kept for private use only. The milk trade of Palamcottah is in the hands of a special class of people—"The Shepherds"—and the supply is mainly derived from the buffaloes and the few cows maintained by them for the purpose. The milk is produced amidst very insanitary surroundings. The shepherds in a few cases take the cows and buffaloes direct to the door of the consumer to milk them in his presence. Thus every day both morning and evening a number of cows are led through the streets. In this case the adulteration is somewhat limited. They sell this milk at a little higher rate than the ordinary one. This system is adopted only by a few rich people. The middle and the poor classes are the victims who suffer most by adulteration. The shepherds are a very industrious and painstaking class whose duty it is to look after the feeding, washing and milking of the buffaloes and the few cows. No doubt the work is very troublesome in towns but for his trouble he is well paid. The buffaloes, they keep, are found to be more profitable animals than cows. All the same the practice of adulteration is increasing by leaps and bounds. We will find out the reason for adulteration.

Town production of milk is	...	9350 pounds.
Genuine milk consumed by those who keep private cows.		750 "
Balance	...	8600 "

Town requirement	...	11,000	„
Milk consumed as genuine milk	...	750	„
Balance	...	10,250	„

So the 8600 pounds must be made into 10,250 pounds to meet the town demand. Because the general milk supply is from buffaloes and as buffaloes' milk is thick and rich in fat it stands the 19% of adulteration. Such is the milk supply in Palamcottah town and I think it is not very different in other big towns like Madras, Madura, Trichinopoly, Coimbatore, Salem etc., but it may be worse and it is the duty of the leading men to solve this difficult question. Let us now consider the situation of the supply of milk products.

Curds and Butter milk:—The supply is nearly equal to the demand in almost all towns. As stated elsewhere Palamcottah town gets its supply of both the products from the village “Naduvakurichi”. The trade of these two milk products and the other important product—ghee—is in the hands of the shepherds. This place is a shepherd settlement and there are facilities for keeping buffaloes in numbers because they are close to paddy growing tracts where they can get fodder at a cheap rate. There are extensive public grazing grounds, and good water supply close by. As there is no facility for them to take milk to Palamcottah for selling, they prepare all milk products from the milk they get and supply the demand of the people of Palamcottah. Curd is obtained at Palamcottah during all seasons at the rate of one anna a Madras Measure.

Ghee:—The supply of ghee is very important in big towns and more so in Palamcottah—the capital town of Tinnevely where vegetarianism plays its prominent part among the Brahmins and high class non-Brahmins. The main supply of ghee is from the same village “Naduvakurichi.” A fourth part of the supply is from “Kayathar” a village 21 miles from Palamcottah. There are middlemen in both these villages and they collect ghee from houses and bring them to Palamcottah, either by rail or by carts once a fortnight and sell it in

the streets. Ghee sells at the rate of Rs. 2 to Rs. 2-8-0 per Madras Measure and even at this rate a few samples are adulterated with gingelly or groundnut oil. Many samples have a smoky taste. All the same, there is sufficient supply of ghee to Palamcottah town; but we must try to improve the quality by suitable methods. In the above pages the present condition of supply to South Indian towns of milk and its products with special reference to Palamcottah are described. The next point is to find out suitable methods for improving, organising and controlling the same.

Improvement.

At the present time the best service which could be rendered by any man to his country is to find out suitable methods for increasing the milk production of the cows and buffaloes in the towns. What are the main requirements for effecting the increase? Three important conditions are to be considered (1) knowledge (2) capital and (3) labour. Knowledge is very important, because without knowledge our capital and labour will be wasted. So we must take the earliest opportunity to impart some knowledge into the minds of the people about milk and its products and the importance of proper handling of the same. Lessons on milk and its products may be inserted in vernacular reading books. Such books can be introduced in schools, especially in Girls' Schools and training institutions. Both boys and girls will learn the importance of milk and the methods of handling the same, and they will not forget what they learnt in their early days. When they attain age they will put them into practice. As far as possible, demonstration dairies must be opened by the Municipal authorities and women must be given the facilities for handling dairy appliances. As to the suitability of women to dairy operations an interesting line is found in the Journal published by the Madras Agricultural Students' Union. * “We will look forward for the day when the Akkals and Ammals of the countryside replace the Chetties and Goundens in all dairy operations in which women seem to be peculiarly suitable.”

* Madras Agricultural Students' Union Journal, Vol. IV. No. 9.

Careful Breeding:—

The definite lines on which we may effect practical improvement in the milk supply of the town is a serious problem. We can increase the supply suddenly but it may not be steady. What we require is a steady but sure increase of a lasting nature. We cannot all of a sudden dream of introducing foreign breeds of cattle in order to improve the town supply of milk and its products. We must first try to improve the splendid indigenous breeds of South India and for doing this work we want several able workers. They must start the work and their work must be real and useful. They must spring up from below and not be grafted from outside. When such workers succeed in their trials they must exhibit the results before the ryots' eye. As far as possible cattle shows must be organised by the Municipal authorities in every municipal town and the ryots must be encouraged to exhibit their cows. Prizes must be awarded for the best cows and buffaloes, for the well kept animals and their calves on which the future success depends.

In these places valuable and interesting information regarding the improvement of milk yield of cows and buffaloes can be let known to the ryots, in the form of leaflets and lectures. This is a handy way of carrying information to those interested in such work. Cross breeding will surely increase the milk supply but such trials must be started by the Government first and then it will stimulate other private bodies to do the same. In this connection it is interesting to note the Presidential address given by His Excellency Lord Willingdon, the Governor of Bombay at the Agricultural Conference held at Poona in 1913.* "I hope the Government may set an example by selecting good cows locally bred and by crossing them with improved imported bulls specially chosen in order to improve the quality of the dairy cattle in the country and I trust that the example may stimulate others to do the same."

*Proceedings of the Agricultural Conference held at Poona on the 15th to 17th September 1913 P. 3 under the head. Stock—raising.

The Mysore Agricultural Department **speaks very favourably in favour of introducing animals of higher milking quality to improve the milk supply. We can improve the town supply of milk by having recourse to cross breeding, but there is one disadvantage and that is the crossbreed animals are more susceptible to cattle epidemics and some of the cattle diseases in India completely wipe out crossbreed animals. If the opinion of the people or the Municipality is in favour of introducing crossbreed animals in the South Indian towns they must arrange previously for inoculation for protecting such valuable animals.

Feeding:—The next point of consideration for increasing the supply of milk and its products in towns is the careful feeding of animals. Feeding of cows and buffaloes is not properly attended to at the present time in South Indian towns. What is the chief reason for it? The answer is (1) want of fodder (2) the high price of fodder (3) want of money in the hands of the poor cow keepers to buy cattle food in the season at a cheap rate and store the same in their yards. This question can be solved very easily. Enterprising capitalists must come forward, take up the question and advance money to the poor cow keepers at a cheap rate of interest for such useful purposes. Co-operative purchase societies can be organised among the cow keepers of the town for purchasing cattle food at a cheap rate and distributing among themselves. For this we want earnest workers to start the business. If such societies are started in every town and thus the cost of maintaining an animal is reduced to a minimum, the milkmen of the South Indian towns will never sell their valuable cows to butchers for slaughter when they become dry. Thus many valuable cows will be saved from the hands of the butcher and the milk supply will be considerably improved. Hand in hand we must try our best to put a stop to the exporting of good milch cows and buffaloes

**Bul No. 7 Deputy Director of Agriculture, Mysore State. Note on the Milk supply of Bangalore "The introduction of animals of Higher Milking capacity will automatically bring about improvement in milk supply which we desire so much." For the same cost of feeding and housing, an animal of better breed gives much more milk than one of a poor breed.

that are sent from Madras ports to other places. If this is done, the milk supply in South Indian towns will be considerably improved.

Housing :—At present in most of the towns in Southern India and specially in Palamcottah cows and buffaloes are kept in the verandahs of dwelling houses under insanitary conditions and thereby their health is completely spoiled. They must be kept in cheap natural surroundings outside the towns where they can roam about freely and thereby maintain their condition. We must also look to the supply of fresh water to these animals. If proper housing is given to milch animals and free grazing is allowed their condition will be good and consequently an increased supply of milk can be ensured. Facilities for breeding, feeding, and grazing exist in Palamcottah but the only defect is lack of organisation and control.

The next point for consideration is the organisation and control of an improved system for supplying milk and its products suitable to local conditions. For advancing the economic conditions of a country for developing its material resources and increasing the production of any produce, the co-operation of the growers and the purchasers is required. In every business, organisation plays an important part. When once the general supply of milk is improved, suitable methods of distributing the same in the purest form possible must be found out. To achieve this the active agency of local leaders is necessary. They can show the people as to how they can improve their position by the easy method of co-operation. With the aid of the co-operative societies and with the aid of the Bank we can work wonders. The first point to be considered is that we must gain the confidence of the cow keepers in the towns and organise co-operation among them. This can be done only by the leading local men in whom they have confidence. If this method is not successful, the next thing is to organise co-operative milk supply societies of the leading men of the town. The object of such societies must be to help the cow keepers in all possible ways i.e., by advancing money at a cheap interest for buying good cows and buffaloes, for purchasing concentrated food in the proper

season and storing etc. In turn, the cow keepers must bring their cows to a central place and milk in the presence of a reliable man selected by the society who will keep an account of the quantity of milk purchased from each milkman and the quantity distributed to members. The distribution of milk can be done through vendors in special milk cans, sealed so that adulteration is impossible. If this system is not possible the municipality whose bounden duty it is to look after the welfare of its rate payers, must take on its shoulders the responsibility of supplying pure milk to the people in the town.

The Palamcottah Municipality which generally takes the greatest care of its people in other directions can work out this great question of milk supply on the following lines :—

1. In every ward of the Municipality a milk shed may be built and this milk shed must be provided with two carts. The 2 carts may be differently coloured—say green and red. In one, cow's milk may be stored and in the other buffaloes' milk. In each milk shed a well paid manager, a maistry and two coolies for drawing the carts may be stationed. The pay of the establishment may be met by the municipality.
2. License may be issued to all the cow keepers within the municipality excepting those who keep cows solely for private use.
3. Both in the morning and in the evening the cow keepers must be made to bring their cows and buffaloes for milking to the sheds specially built for the purpose in the ward to which they are attached.
4. Milking will be done in the presence of the manager and milk drawn from the cows and the buffaloes will be recorded and stored separately in carts kept for the purpose. The mouth of the barrel in carts will be sealed by the manager and given in charge of the maistry who will attend to the distribution.
5. All the rate payers who require milk must apply to the manager who will arrange to supply a certain definite quantity regularly.

6. A fixed deposit or security must be collected from those men who require regular supply of milk from the municipality. The deposits will be refunded when the member ceases to get milk from the municipality.

7. Money will be realised from the rate payers at the end of the month. The milkman will be paid according to the quantity he supplied, at the close of the month but small advances may be made at the beginning of the month to all cow keepers if necessary.

8. Notice will be given to the people in the town to the effect that when they buy milk they must see that the seal on the mouth of the barrel is in tact and that they are supplied milk from the proper cart.

9. Complaints from the consumers will be attended to by the ward councillor.

If such strict rules are to be laid on the poor milkmen who adulterate milk and by such adulteration live a decent life, they will soon be discouraged. They may even slowly leave their profession. As a sort of encouragement, the municipality must help them in all directions and the following methods of helping the poor cow keepers are suggested :—

1. The municipality must make it a point to advance small sums of money to cow keepers for feeding the cows with concentrated food.

2. Free service of the cows with special breeding bulls noted for good milking qualities must be arranged for at municipal cost. By adopting this system an improved progeny will be ensured.

3. Dry cows of the town may be located in municipal sheds built out side the town. The feeding may be attended to by the municipality and a small fee may be collected from the owners of such animals.

4. Money can be advanced to the milkmen by the municipality for buying good breeds of cows and buffaloes (like Delhi and Ahmedabad buffaloes which give large quantities of milk). Very low interest may be charged and the amount may be received by part payment system.

5. Suitable rations for cows and buffaloes must be let known to the ignorant cow keepers and suitable concentrated food stuffs may be purchased at a reduced rate in large quantities and distributed to the milkmen at the same reduced price.

If this improved system is organised by the municipality or the co-operative milk supply society in the South Indian towns the difficult problem of pure milk supply is solved. Now we will turn to the supply of milk products.

Milk products :—In the same way as we propose to deal with the milk we must deal with ghee also. Good centres from which the town's ghee supply is obtained may be selected and in these centres the municipality or the specially organised co-operative society may start improved methods of preparing ghee using the improved appliance—cream separator and barrel churn. By adopting the improved method we not only prepare good ghee but also save a lot of wasted labour. According to the actual working of the Department of Agriculture, Mysore, the increased out-turn of ghee by the improved method on an average comes to 38%. *The ghee thus obtained may be brought and kept in places specially built for that purpose in some important centre of the town and sold to the people at a fixed rate. The villagers also will be pleased because they get ready money at their doors for their milk without any trouble. The separated milk will be returned to the people who will prepare curd and butter-milk and sell them in the towns. The proper method of preparing curd and butter-milk is taught to them. In the case of Palamcottah town, the important centre from which the major portion of ghee, curd and butter-milk is obtained, as stated elsewhere, is "Naduvakurichi." If the municipality or the special co-operative ghee supply society were to organise and control this improved system of the supply of milk products on business lines it is quite certain that the supply of these products to that town will be materially improved both in point of quality and quantity.

*Page 6, Bulletin No. 9 Department of Agriculture, Mysore State, methods of butter making—local and improved.

Conclusion. In conclusion the deplorable condition of the supply to South Indian towns of milk and its products with special reference to Palamcottah town at the present time is described both from point of quality and quantity, the method of improving the above conditions are discussed and practical suggestions to organise an improved system and controlling the same according to the suitability of local conditions are given. Many minor difficulties may arise, in carrying out the business as described above but if the municipality were to work with its heart and soul for the sake of its rate payers and if the co-operative society started for the purpose works for a noble cause with full spirit and enthusiasm, I am sure that its labours will be crowned with success.

K. Sankaram Pillai.

Extracts.

Experiments at the Eradication of Korai grass at the Palur Farm by cultivation in the growing season.

The Korai grass is dormant in the hot weather when soil conditions are dry but as soon as a heavy rain falls the "nut" germinates. If they are near the surface they merely send out leaves which spread out and form the plant. If deeper down they send out a rhizome which in its turn forms a new "nut" near the surface. This forms leaves which force their way above ground. When once the leaves have spread they replenish the "nuts" below. These nuts form a chain with a rhizomous growth from one nut to the next and often the lowest nut on the chain is at a considerable depth below the ground. How these deep seated nuts are formed is not clear. The only possible solution which I can see is that the rhizomes which form the "nuts" grow downwards as the moisture in the soil subsides and that the nut nearest the surface from which the rhizome started is really the oldest nut on the chain.

However these nuts are formed, and it is evident that the leaves above ground are responsible for restoring the store of food in the chain of nuts which was used to start growth. If therefore the nut nearest the surface is separated from the rest of the nuts on the chain after it has formed leaves and before it has had time to restore the stored plant food which it has used then all the nuts on the chain are weakened and they are still weakened by the next nut on the chain having to use up a still greater quantity of stored food to reach the surface. The severed nut, however, retains considerable vitality and if not dried out on the surface, will if there is moisture, continue to grow or will lie dormant if the soil is dry until rain moistens the surface soil. It then not only sends out leaves to the surface but also sends out lateral branches which again form new nuts from which leaves are sent to the surface. It is not therefore sufficient, to sever the nuts from the chain, but also to bring these to the surface where they can be killed by the sun. This is especially important where mould board ploughs are used as these invert the soil and merely encourage the growth of this weed by layering the plants in the soil.

The cultivation treatment on this basis is (i) allow the "nuts" to "germinate" in the cultivation season and then as soon as they appear above ground sever their connection with the nuts lower down on the chain. (ii) bring the plants thus severed to the surface. (iii) repeat these two operations as soon as a fresh growth of this weed appears above ground. In the various plots the following implements have been allotted the work of severing the connection between the surface plant and the nuts below. The monsoon plough, the *Bakhar*, Ransomes three furrow plough and the country plough. The "cultivator" and the three tined gorru have been allotted the task of bringing these severed plants to the surface, first working these across the ploughing and then, after an interval for exposed plants to dry out, working these across the first working.

Another point in connection with this weed is to prevent it seeding as the seed seems to germinate very readily.

(Extract from the monthly report for July 1917 of the Deputy Director of Agriculture, V and VII Circles, Trichinopoly).

Missionary work in Agriculture.

Twenty one years ago, an Edinburgh student, F. P. Walker, made a solemn vow that, God helping him, he would work in the interest of Agricultural education through the farmer on behalf of the farmer, recognising that agriculture, in its broadest sense, was the most important, noblest and essential industry to any country. The vow has been honourably kept and he now states that nothing less than a world war was necessary to demonstrate the truth of his convictions. He has worked in several English counties and in Africa and has suffered in health, wealth, reputation and social position. In the earlier years, he had much worry over the inefficiency of his superiors in office, but later on he ceased to worry about it and realised that work well done, was man's greatest blessing and source of true happiness, and he has since been enjoying perfect health. Ten years ago he became Lecturer in Agriculture in Armstrong College, Newcastle, and has greatly influenced the farming in several northern counties and, with the help of progressive farmer friends, has increased the production of foodstuffs immensely and economically on thousands of acres of land, good, bad and indifferent. In a contribution to the Chemical News, he encloses particulars of a 400 acre farm which has been improved beyond recognition within 5 years and states that similar improvements have been effected in hundreds of farms in the northern counties and asserts that vast improvements can be effected throughout the British Isles with an economic combination of labour, capital and brains. So far as British Isles are concerned, if the country should be made quickly and profitably self-supporting, certain conditions must prevail and these are:—

1. Provision by Government and farmers, of skilled labours, better traction and more manure.
2. Agriculture should never more be a shuttlecock between political parties.
3. Greater personal interest by the landlords in their tenants and labourers.
4. The help of the Press to teach the populace and establish the true importance of Agriculture.
5. The essential industry of Agriculture never to be sacrificed for the interests of industrialism.
6. While all this is being done, we must educate, educate, educate, not pull down, but lift up. More attention is to be paid to duties than to rights.
7. Education and scholarship are not synonymous. The truly educated man is the man who gives of his best, no matter what may be his birth, breeding or social position, for the welfare, uplifting and happiness of his fellowmen.

Mr. Walker is now the Agricultural Adviser and Executive Officer to the Durham War Agricultural Committee and, while disclaiming any desire for advertisement, would like any agriculturist to make a tour with him and see for himself what has been done for increasing crop production in the northern counties, long before the necessity for it was accentuated by the war.

(From the Chemical News).

In commenting on the above straightforward communication of Mr. Walker, so far as it is applicable to Indian conditions, one cannot but feel that similar enthusiastic agricultural missionaries from some of our best students will spring up here and try to

effect wholesome changes in the cultivation of lands in India. Government has rightly taken up the work, but unofficial missionaries of an educated class can effect the spread of the work of the Department much quicker. Mr Walker's motto "Work with all your heart, in the interests of the farmer and through the farmer" is safe to follow for any genuine patriot.

M. R. R.

Future of the Indigo Trade.

"This year's crop of Indigo is estimated in India at a value of £6,500,000. Before the war the figure had declined to less than £100,000. The area under cultivation has increased during the war from 148,000 acres to over 600,000 acres. It is therefore of very vital interest how far the return of peace will bring with it a renewal of the German artificial dye competition, and the Indian planters have been in conference with the British Empire Producers' Organisation on this important question of industrial development. Study of the pre-war conditions is bringing to light some remarkable and curious features. Most surprising is the fact that many people of "Scientific" attainments appear to have accepted without question the claims of superiority on behalf of the artificial substance. Now it appears that what came in the form of "synthetic indigo from Germany, at an amazingly low price, was for the most part merely alizarine blue, and not indigo at all. It dyed things blue, but not so as to stand long exposure to sun and salt water. The one commercial advantage offered was cheapness and preparation in convenient packet form, the larger cakes of natural indigo requiring the use of machinery. It is hoped that as the result of current experimentation this difficulty may be shortly overcome and the material be presented in the form of a paste of even quality. The cost of producing natural indigo is, of course, much lower than

that of making "synthetic" and there appears to be room for much further research in the commercial utilisation of the crop."

From the Chemical News B. V. N.

Method of estimating the age of eggs.

A simple instrument has been devised the using of which is based on the fact that a new laid egg weighs heavier than water and that it gradually loses weight as its age advances. When about seven weeks old, the egg is of exactly the same density as water, and then its weight gradually passes into minus values as the egg passes into advanced stages of preservation. With this simple instrument the weight of the egg in water is divided by its weight in air and multiplied by 100. The resulting figure is about 8 for a new laid egg and decreases at the rate of 1 per week as the age of the egg advances.

For example an egg weighing 2 grms. in water and 60 grms. in air would be $8 - \frac{2 \times 100}{60} = 8 - 3.3$ or 4.7 between 4 and 5 weeks old. From the international Agricultural Journal. K. R.

Spineless Prickly-pear.

While tramping through the adjoining forests it was with some surprise that I came across spineless 'prickly pear' extending over fairly large areas. The plant was not absolutely spineless but the fact that the plant could be handled with impunity is some indication of its spineless nature as compared with the more common *Opuntia Dillenii*.

(Extract from the report of the Deputy Director of Agriculture, VI Circle for July 1917). T. S. V.

Philippo Zevéque De Vilmorin.

One of the most conspicuous figures in European Genetics died on the 30th of June 1917 at the age of 45. He and William Bateson of England were frequently in close correspondence and

many a reference to the former may be found in the published works of William Bateson. The De Vilmorins have in every generation been identified with the progress of scientific agriculture in France and who has not heard of Louis De Vilmorin the producer of the sugar beet? His achievement is one of the stock examples in Text books on plant breeding. It was his selection work in the Beet that enabled continental Europe to compete with the sugarcane growing countries of the Tropics in the matter of sugar production. Starting with a yellow slightly sweet variety of beet from Germany, he was able to produce by selection a beet with as much as 18 per cent of sugar.

(Journal of Heredity August 1917.) T. S. V.

Moringa Pterygosperma (Goertn).

This tree known as the "Drumstick Tree" or "Horse Radish Tree," is deserving of a greater deal of attention because of the wide popularity of its unripe pods as a vegetable, when it is known as "Murunga" by the Sinhalese and "Murunga-kai" by the Tamils.

It should attract the attention of all those who wish to go in for market gardening, because the pods keep well and travel well and always command a good price; and very often in the Colombo or Kandy markets it is considered a delicacy to be bought only by the well-to-do classes owing to its scarcity.

This plant is found cultivated in the native gardens of Ceylon, and is said to be wild in the forests of the Western Himalayas. The flowers and leaves are also eaten. All parts of the plant possess medicinal properties well known to native practitioners. Exudations from the stem are used locally in Jaffna for dyeing purposes.

In Jaffna—a land of vegetarians—there are few vegetables that are preferred to "Murunga-kai" for flavour and delicacy

There are four varieties in Jaffna that are distinguished by the colour and length of the pod. The best of them is the "Chavakacheri Murunga," the pod of which is often 3—4 ft. long, and usually sold in the Jaffna markets at 3 cents each. Next to this, the "Chem Murunga" is a valuable variety. It can be recognized by the red tips of pod. The pods are often 2—3 ft. long. A great advantage in this variety is that it flowers all throughout the year and therefore is a heavy yielder. The "Kadu Murunga" is a jungly variety with small pods.

The plant does best in an insular climate on sandy soils containing a good amount of lime.

Propagation by seed takes a long time before the plant comes into bearing. Propagation by cuttings should be the method preferred. Cuttings should be at least 5—6 ft. in length. In Jaffna, they are planted in August about 8'—12' apart in holes 1½' deep. The planted cuttings are watered once in eight days till the rainy weather sets in. The cuttings strike readily and will bear in 5—6 months. For the first 2—3 seasons the tree will yield 80 to 90 pods. After two years, an yield of 500 to 600 pods per tree is not uncommon. The soil will only need constant weeding and hoeing once every year.

(From the Perideniyan, May 1917.)

T. S. V.

Notes and News.

Eight minor zemindars with their tutor, Mr. C. Morrison, made a stay of over 10 days during the month at the College. It was the practice hitherto for the Court of Wards minors to halt here for a day or two for seeing the Farm and playing a cricket match. This year it was business with pleasure, and more of business than usual. The wards had regular classes arranged for them, with the help of the College staff, in each branch of science and in different kinds of farming. They apparently enjoyed their stay.

The Tanjore District Co-operative manure society of which Rao Bahadur M. R. Ry., A. Annaswami Thevar is the President and Rao Saheb A. Seturama Iyer the Secretary has sent us a copy of the second Annual Report. The total value of manures sold during the year in the form of bones, flour phosphate, fish guano and wild indigo is Rs. 920. It appears to be a rather small transaction but apparently the organizers wish to proceed with caution.

We learn from the *Indian Planters' Gazette* that Messrs. Tata and Sons will shortly open a branch of their firm at Ernakulam, Cochin, to run a factory for the manufacture of margarine from coconut oil. That things are to be done on a large scale, as is usual with this firm, will be seen from the statement that the estimates for the factory amount to Rs. 23 lakhs. The Durbar has promised to give the site free of cost, and also to give every possible Assistance to help to make the venture a success.

Students' Corner.

It is once again a pleasure to us to announce that the College acquitted itself so well at the Grigg Sports held this month at Coimbatore. Only three events, 100 yards Race, Quarter Mile Race and One Mile Race were open to us and we obtained 4 out of possible 6 prizes. S. Dharmalingam and Seshachallam were 1st and 2nd in 100 yards, K. K. Subramanian was 1st in Quarter Mile and E. S. Viswanathan was 1st in 1 Mile Race.

The students played a cricket match with the staff on Sunday the 9th September. Dr. Barber and Messrs. Wood, Vittal Rao and Raghava Rao, were unable to take part, but the staff made a decent total of 71 runs. The students put up a total of 203 runs for the loss of 5 wickets, the important feature of the game being that Ranga Rao, who was also the best bowler of his side, retired with a score of 103 runs not out. The bowling and scout-

ing by the officers' team were not as good as could be desired, but none the less they congratulate Ranga Rao on his century.

During the last week of August, the Principal took the Second year students on tour to Salem and North Arcot Districts. In Salem the party camped near Saramangalam and saw wet, dry and garden land cultivations. The dry land crops were already well started whereas in Coimbatore they were not yet sown in many cases. The rainfall seems to be satisfactory in and around Salem whereas it is a failure in and around Coimbatore. In the light-red dryland soils of Salem, groundnut, cholam, cumbu and ragi are grown. In groundnut fields, castor or red gram are sown in lines about 10 to 15 feet apart as a mixture crop. In cholam, cumbu, and ragi crops, cowpea, lablab and other minor pulses are sown as mixtures. Ragi is transplanted in drylands in lines made by the country plough. Next day after the rain or when there is prospect of getting rain in the near future, furrows are formed with a country plough and ragi seedlings are planted in these furrows. Inter-culturing is done with the country plough. In garden lands, paddy is grown in rotation with cholam and ragi. The need for bulky manure is very great for both wet and garden lands. Cattle manure, Municipal rubbish, groundnut husk form the chief bulky manures.

From Salem, the party moved to Gudiyatham, a taluk head-quarter in the North Arcot District. Paddy is the chief crop in the neighbourhood. Fields are large in size and level in condition and the cultivation is of a clean nature. In some fields, a mixed crop of indigo and gingelly is grown and indigo is ploughed into the soil as a manure to the succeeding paddy crop. Duck-farming is undertaken by some classes of people in Gudiyatham. Ryots are of opinion that these ducks greatly help the ryots in checking the ravages of crabs and insects which otherwise do great damage to the crops. Before the planting

of paddy these ducks roam about in the fields and pick up crabs and insects. During this short tour we had many conversational classes under the shade of a coconut tree or a mango garden when the Principal put many searching questions.

A. Student.

Queries.

M. R. Ry., H. Sreenivasa Rao Retired Forest Officer Hoongainahalli, Malur Post, Kolar District writes. "I have planted cocoanuts in about 30 acres. My plants are doing well except for attacks of the Rhinoceros beetle which, of course, I am picking up every day. Can you suggest any hedge plant which will grow rapidly but is not eaten freely by cattle or goats."

Departmental Notes.

The following Assistant Farm Managers on probation are confirmed in their appointments with effect from the dates of their entertainment in the Department as such.

1. C. R. Srinivasa Ayyangar.
2. R. Swami Rao.
3. K. M. Jacob.
4. A. Gopalakrishnayya.
5. L. Narashimachari.
6. S. Viravaradaraju.
7. K. S. Sankaran Pillai.
8. M. P. Kunhikutti.

Privilege leave for one month is granted to M. R. Ry., U. Vittal Rao, Botanical Assistant to the Government Sugarcane Expert, from or after 15th September 1917.

V. Ramanatha Ayyar, Assistant Farm Manager on probation is confirmed in his appointment from the date of his entertainment in the Department.

C. V. Sundaram has been appointed as sub-Assistant to the Government Entomologist on probation (on Rs. 35-24-75 per mensem) for one year from the date of his joining duty at Coimbatore.

The Government have ordered the following amendments to the College rules in G. O. No. 2730 dated 3rd September 1917.

Rule 4-A:—Officers in the lower subordinate branch of the agricultural and scientific sections of not less than two and not more than five years' service may be admitted as students for the second course on the following conditions:—

They must have obtained the certificate of the first course. They must be nominated by the Deputy Directors of Agriculture or the heads of the scientific sections under whom they are serving. Their nomination must be approved by the college board.

Candidates who fulfil these conditions may be deputed by the Director of Agriculture to undergo the second course.

While on deputation they will draw the pay of their grade and be eligible for annual increments.

They will draw the travelling allowance of their grade for their first journey to and their last journey from the college, but not for intermediate journeys.

Corrections in August 1917 issue.

Page 181, 10th line from top for "numbering" read "numbers".

Page 183, 3rd line from below read " $PE = 0.67 \sqrt{\frac{\sum d^2}{n-1}}$ ".

Page 183, 4th line from below for " d^2 " read " $\sum d^2$ ".

Page 221, 7th line from top for "Rs. 120" read "Rs. 20".

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The rates of Advertisements of Trade, other than Agricultural subjects, will be one and a half times the above. Preparation of blocks, unless supplied by firms, extra.

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The Manager, M. A. S. U. Journal,
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THE JOURNAL OF The Madras Agricultural Students' Union.

Vol. V.

October 1917.

No. 10.

Editorial Notes.

Dr. W. H. Harrison has been appointed Imperial Agricultural Chemist. While congratulating him on this appointment which will doubtless widen the sphere of his usefulness, we feel sorry that he is to leave us. We understand that, to him also the separation is painful, because of the long connection he has had with our College and the Department.

Passing his B. Sc., with honours from the Yorkshire College, Leeds, under very eminent chemists, he held the responsible post of Chemist and Superintendent of the large sewage works at Leeds for eight years before he was selected as the Madras Agricultural Chemist among the first batch of Experts appointed under the new scheme in the year 1906. After a few months stay at Pusa he worked for about nine months in the Chemical laboratory attached to the College at Saidapet pending construction

of buildings at Coimbatore and came to Coimbatore at the end of the year 1907.

He was responsible for the design and equipment of the magnificent laboratories at Coimbatore and even to the minutest details, they reflect the thoroughness with which they have been designed. His lectures in Chemistry have been much appreciated by the students, as being clear and impressive; and in this work of Teaching he was ably assisted by Mr. M. R. Ramaswami Sivan.

Research appears to have had a greater attraction for him than Teaching; and in this field he soon made a name as one of the foremost Agricultural Chemists in India. His clear perception and subtle intellect enabled him easily to pick out the salient points from a mass of details, while his accurate and detailed knowledge enabled him to turn his hand to any problem that presented itself.

His recent work on the gases issuing from paddy soils, in which he had the able assistance of Mr. P. A. Subrahmanya Ayyar is considered to be of a very high order of merit and it brought him the much-coveted degree of D. Sc., from the Victoria University, Manchester. Soil surveys of two districts have already been published while that of a third is nearing completion.

He encouraged and greatly assisted his staff in undertaking research work on their own account and this has brought out one or two Memoirs and some papers by his Assistants. He freely associated with himself the names of his Assistants in the various pieces of research under-

taken from time to time and this sense of ownership naturally brought out the very best from his staff. He is said to have frequently fought hard to safe-guard the interests of his staff and office and leaves behind him a grateful staff. He leaves to his successor a well equipped laboratory and a well trained staff and what more can his successor want?

He ceases to be the Madras Agricultural Chemist but only to become an All-India Chemist, and, since Madras is a part and,—we were about to say, rather an important part of India,—we hope to receive our due share of the benefits of his service.

We wish him, Mrs. Harrison and their son a hearty God speed.

M. R. Ry. M. R. Ramaswami Sivan has been Gazetted Acting Govt. Agricultural Chemist.

The full text of the resolutions passed at the Agricultural Education Conference held at Simla on the 18th of June 1917 are now published in all the papers. At a first glance, one experiences a feeling of disappointment that this All-India Conference had to leave so large a portion to be worked out by the various Provincial Governments, but a careful consideration shows that this cannot be otherwise. We have all heard of the well tried saying that many an Agricultural problem requires to be worked out separately for each province, and it is no wonder that because of widely varying conditions, especially in the educational calibre of the people,

Simla
Agricultural
Education
Conference.

the question of Agricultural Education should be considered to require a similar solution. We understand that the Government of India have circularized to the various Provincial Governments full texts of these resolutions urging *"The local Governments will view the matter from a broad standpoint and that a consistent policy, based on the lines laid down by the conference with such adaptations as local conditions may demand, will be formulated and steadily pursued."* We are publishing elsewhere a fairly full text of the resolutions passed at the Conference.

At the instance of the Government of His Highness the Maharajah of Mysore, a Conference to consider questions connected with the serious and important disease of Sandal known as "Spike" was held in Bangalore from the 4th to the 6th of October. The Conference was presided over by Dr. Coleman, Director of Agriculture, Mysore, and the Governments of India, Madras, Coorg, and Mysore were all represented.

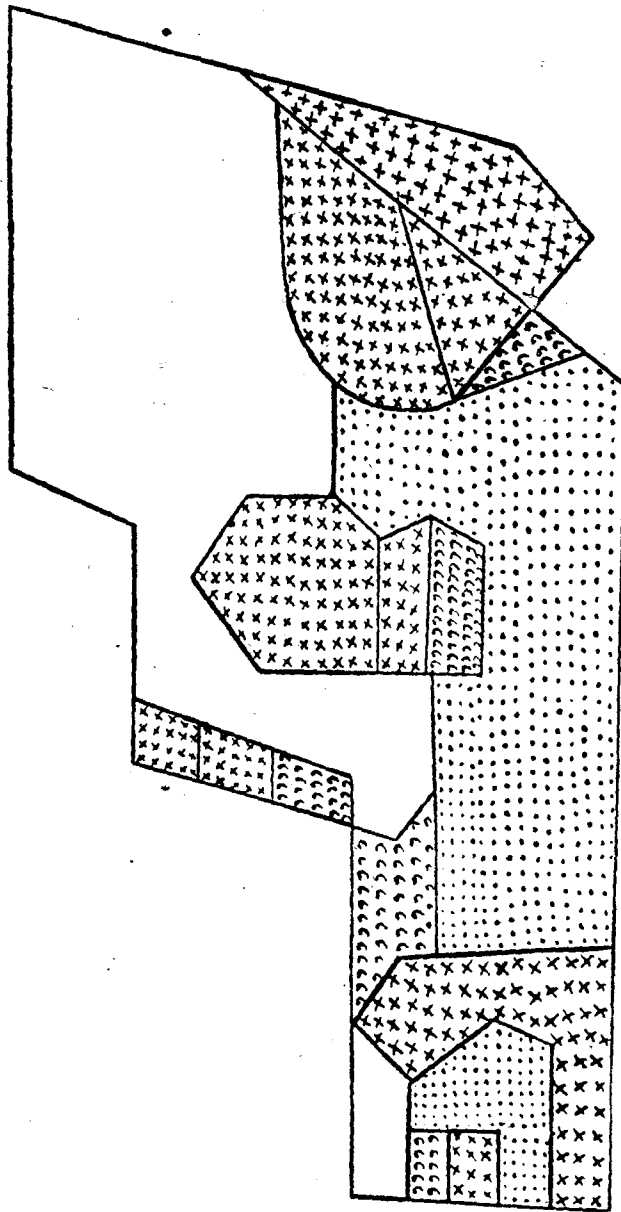
The origin and nature of this disease have eluded many a patient and painstaking researcher in the past one of the early workers in the field being Dr. Barber, now the Government Sugarcane Expert. The main object of the above conference was to establish a certain amount of co-ordination among the various workers. We understand that Dr. Coleman is soon to have the services of a Bio-Chemist to help him in his investigation of the disease. In a recently published bulletin, Dr. Coleman estimates the annual loss to the State from this disease at Rs. 6 lakhs, and this estimate

was thought to be a rather conservative one by the Conference. This gives an idea of the importance of the Conference. We have visited the recently erected plant at Bangalore for the extraction of sandalwood oil and were much impressed with the enormous possibilities of this Industry.

Possibilities of Consolidation of Holdings in the Madras Presidency.

One of the greatest obstacles to the progress of agriculture in this Presidency is the very scattered nature of even the very small holdings, which most of the ryot population possesses. Almost every ryot, rich or poor, has got his lands divided into small plots, distributed in various places, many of which are too small to be cultivated. This system of keeping one's landed property scattered is economically very unsound, adding to the indebtedness of the ryot.

It may perhaps be argued by some that the fact is exaggerated, that lands are held more compact than others presume it to be. Statistics are not available to show the extent of scattering, but a perusal of the karnam's account of any ancient village will plainly show two things, namely (1) the numerous pattadars having their share in one survey field, and (2) the numerous small plots of land for which one landholder pays assessment. The greater part of the fertile tracts of Salem is owned by small holders, who are themselves cultivators, and one would naturally expect such industrious small ryots to pay much attention to their holdings. Field S. 1 in the village of Venkambatti in Salem Taluk (vide rough sketch) measures about 7



Rough sketch of a field (Survey No. 1) in the village of Venkambath, Salem district showing the distribution of holdings.

acres and is sub-divided into 18 pieces and owned by five pattadars, many of whom have grown up sons dependent upon land and are going to divide the land in the course of a short period. Of these,—to show two instances,—one holder, pattadar No. 73 owns.

S. $\frac{1}{2}$	0.08 acre.
S. $\frac{1}{8}$	0.12 „
S. $\frac{1}{12}$	0.01 „
S. $\frac{1}{13}$	0.16 „
S. $\frac{1}{17}$	0.05 „

0.42 acre in five places.

Pattadar No. 133 owns

S. $\frac{1}{4}$	0.44 acre
S. $\frac{1}{8}$	0.44 „
S. $\frac{1}{10}$	0.03 „
S. $\frac{1}{15}$	0.48 „
S. $\frac{1}{18}$	0.12 „
S. $\frac{1}{19}$	0.09 „
S. $\frac{1}{21}$	0.01 „
S. $\frac{1}{24}$	0.13 „
S. $\frac{1}{28}$	0.04 „

1.78 acres in nine places.

They have also lands in other places. In the adjacent village, Mukkuthapalayam S. No. 40 measures 1.66 acres and is owned by as many as 37 pattadars paying together a total assessment of Rs. 4-10-0.1. One of these pattadars is a retail merchant living 10 miles off having 10 cents of land his only landed property in the village. Space does not allow detailing more instances, but anybody moving with land-owners must have noted this.

The causes that have brought about the splitting of holdings should be understood before one considers the question of consolidation. People in authority attribute it to the Hindu law of succession which allows the division of parental property equally among the sons;

but the scattering of the holdings need not be the inevitable consequence. Ninety per cent of the ryot population who own among them 61 per cent of the total ryotwari area are poor, owning from less than $\frac{1}{4}$ th acre to 10 acres, paying an assessment of less than Rs. 30. These poor holders are entirely dependant upon the land for their maintenance, and having very little money to invest upon the land depend also upon the rain and the natural fertility of the soil, both of which except in special tracts are very indifferent. The ryot population knows no other calling except the time-honoured primitive methods of cultivation. They are poor in the knowledge of handicraft as one can see from the numbers of people who wait for days together at the village blacksmith for sharpening a sickle or fitting a handle to it. Emigration is taking away a small portion of the population, but it is mostly the cooly classes that go, and most of them return home after a period of hard life, with a little wealth earned at the expense of health and a lost tendency to manual labour. So much so population is pressing on the soil, and the industrial progress being also very slow every partner of a parental property is very anxious to have his just share of the property. The productive power of the land is never the same throughout one particular field still less in various fields and hence is the primitive way of the division of all lands, good, indifferent and bad into equal divisions. For instance in wetland, the plots situated near the irrigation channel have the advantage of a better water supply and drainage, and are at the same time richer, due to silting and every partner wishes to have a portion there, and an alkaline corner will not be accepted solely by one individual. Similarly in the uniform level black soil tract of Tinnevely district every partner wishes to have a piece of the Kambadi (*கம்படி*) land (the rich soil close to the village) where the ryot grows his food crop of cumbu. So on with garden lands, topes, threshing floors, house sites etc.

The frequent purchases and sales by the land holders add their share to the splitting of the holdings. The speculative ryot that purchases lands as they are offered for sale never cares to see if the piece is adjacent to his own. It is no exaggeration to say that in many cases the neighbouring ryot is prevented from purchasing the

adjacent piece by the jealous villagers who would even lose both their eyes, if the neighbour loses one. The idea of a safe investment makes all people, from the poorest tenant to the big Vakil, purchase land without their ever paying attention to the compactness of the holding. Lands are not generally available in blocks for sale, and the purchaser does not wait until a reasonable amount is accumulated before he goes in for land. So odd bits are purchased as they come for sale and as money is accumulating, and in the end the new land holder has as many bits as the brother pattadar possessor. There is still another cause which is at present operating in many places, tending to increase the number of plots of a landholder. This is the division of the common lands (Gramasamudayam) the property of the commune from whose income the communal expenses such as the repair of channels and roads, are met. This is because of the absenteeism of the landlords, who only care for the income and not for the communal interest.

The defects of this practice of scattering the holdings should be realised before the urgency of reform is considered. In the words of Mr. D. T. Chadwick, "this has a profound bearing on the agricultural economy of South India, because it means that implements have frequently to be carried or moved to small and distant fields, and therefore it is essential that they should be light and portable. It renders supervision of labour more difficult, and makes it almost impossible for a farmer to fence a considerable portion of land for pasturage and care of his cattle. The country is practically in a condition which some 2 or 3 centuries ago in England was known as the open field. * * * * The cattle of the village are usually grazed together on the stubbles or other waste land which increases the difficulty of any farmer who attempts to take special care with his breeding stock or who endeavours to cultivate a different system of cropping from his neighbours."† It further "renders all economic arrangement for irrigation and drainage of land quite impossible, and it involves the ryots in endless disputes regarding the ingress and egress of water to and from the neighbours' plots."‡

†Southern India, its history, people, commerce and industrial resources.

‡Agricultural Journal of India Volume VIII, Page 101.

The open field system is the inevitable result of the scattered holdings, as no ryot is able to fence all his land, as the cost will be abnormally high and it is very difficult to protect the fencing. Moreover each ryot has got to provide the right of way for the neighbours, as each man has got to pass through another's field to get into his own.

It is this open field system that is responsible for the vast acres of land, fit or unfit, being sown with the same crop almost simultaneously. Although the monsoon is the limiting factor in South India in raising crops, it is still further limited by the open field system. If one important villager sows his crop on a particular date all the rest of the ryots should do it at once, or the crop of the man that sows late will be destroyed by the village cattle that will be let free. If any ryot makes an innovation in his cropping by introducing more profitable or longer duration varieties, the village cattle will certainly "eat the corn in the blade." It is this again that is responsible for the "weeks of feverish activity passed suddenly into months of comparative indolence."* There is quite a paucity of labourers, wages run abnormally high, and the wage earners not accustomed to thrift squander their savings in drink, and in a month or two after harvest both the landlord and the labourer have got to wait upon the money lender to carry on for the rest of the year.

The crooked small plots such as are at present seen are the cause of the enormous litigation about encroachment. A ryot that would hardly spend a few rupees in removing Marali from his field, will spend hundreds of rupees in litigation in claiming less than a cent of land from his neighbour by encroachment.

The enormous loss of rich soil due to wind and rain from the undulating tracts, is never attempted to be prevented by embankments, on account of the numerous people owning land on a slope, who in many cases are prevented by law from obstructing the natural flow of water though the water carries with it all the valuable soil.

*R. E. Prothero, English Farming Past and Present.

Anybody who is accustomed to village life must have noticed two important means of livelihood of the poor classes. The one is the removal, when the ryot is away, of the fencing material mostly dead wood, to provide fuel which is becoming scarce. The large number of goats kept by landless folk in a village, are a regular pest to live fencing, and to the growth of any tree in unprotected land. Thus every pound of flesh made by the goat is obtained at a cost of a pound sterling to the community at large. With consolidation of holdings, these goats must disappear and the country side will be more full of groves and under wood, and there will be a less dearth of firewood. The cowboys that attend to the grazing of village cattle are disproportionately small, compared with the number of unruly vicious creatures that are grazed, and a boy has to manage at least a dozen before he can get Rs. 2 worth of grain a month. But these animals travelling daily almost a whole village in a vain search for scanty fodder are kept under bounds by a large number of youths that follow the cattle, collecting carefully all the dung voided by the animals for making dung cakes. It is a very common sight to see numbers of boys and girls of the labouring class, returning home in the evening with a basketful of dung, and a small bundle of twigs removed stealthily from the fencing. It need not be told that this vast drain of the wealth of the village, by the removal of fencing the burning of the manure, and the ravages of the goat is the consequence of the scattered nature of the holdings.

The scattered holdings necessitate a very large waste of good cultivable land, for the purposes of path ways, bunds and irrigation channels. The foot paths often 10 to 15 links broad across the cotton fields of the Tinnevely District, and the numerous small channels as much as a dozen in number, all beginning their source at one sluice, and running long distances to irrigate separate, contiguous fields such as are seen in Coimbatore wetland tracts may be quoted as examples of the waste of land, of water, and of money to keep the channels in repair, not to talk of the endless quarrels of the neighbours. The irrigation and drainage in the deltaic wetland tracts are anything but satisfactory. Murders have not been uncommon between

neighbours in their disputes to take water from one field to another or in draining the excess water into the one lower down for want of suitable irrigation and drainage channels, and it is next to impossible in the present state of holdings to provide irrigation and drainage channels to each piece of land. The increased expenditure to the ryots in cultivation on account of transport of labour etc., and the consequent waste and the inefficient supervision are too well realised by every ryot to need explanation. It has been worked out in Australia that the expense in cultivation of land increased for every 500 metres (550 yards) by 5.3% for manual labour and ploughing, 20 to 35% for transport of manure, and 15 to 32% for transport of crops.* "It is on this account that agriculture cannot produce its maximum profit, the cultivation of produce for commerce and consumption, the rotation of crops so often necessary to allow live stock to graze cannot be practised, the cost of cultivation becomes high, more labour is necessary, greater effort and supervision forcibly limited which is also affirmed by the well known Dutch proverb 'the further the land is away, the nearer the loss.'†"

Various improvements in the cultivation and cropping that have been quite successful in the Government Experimental Farms, cannot be carried out by the ryots in their own lands for the same reason. Green manuring gives an increased outturn at a less cost, but the ryot fears the village cattle. Improved ploughs and cultivators are very effective, but the strips are too small for the proper working of the implements. A power crusher is very efficient for milling sugar cane, but the ryots cannot go in for the same on account of the transport difficulties from scattered strips cultivated by them. Castor cake and superphosphate give high yields in paddy, but the ryot fears that the manure will be washed away to the neighbour's field who has got a right to take the water from the neighbour's plot to his. It is said that except for a very minute quantity that might get mechanically washed, the manure gets fixed in the soil, and cannot get washed by the irrigation water. But the continued high yields of the un-

*Agricultural Journal of India Vol. VIII. Page 161.

†Bulletin of the Bureau of Economic and Social Intelligence.

manured plots which got their water supply through the manured plots in the C block manurial tests in the Central Farm, Coimbatore are ample proof that a ryot has cause to fear the washing of his manure to a lower plot. Thus the present nature of the holding is one great reason for the slow progress in agricultural development in which the whole staff of the Agricultural Department is putting its heart and soul. It is therefore "useless to spend money freely to increase crops by suitable manuring, to sow choice seeds if the results expected are nullified by the inconvenience and needless expense caused by the irregular farms, and the small division of the parcels" (1).

The evils of scattering holdings is being now felt by the ryots, as the population is pressing more and more upon the soil, as the price of produce is ranging high, and even the remotest village is subjected to the influence of a foreign market. The standard of comfort has increased, without an increase in production, wages have risen, and the ryot must get a greater produce for his expenditure. Else the foreign countries will compete with the South Indian ryot even in food production at his very door, and the inefficient Indian cultivator will have to go to the wall.

Thus by consolidating the scattered strips into compact blocks, most of the defects noted above will be overcome and the waste prevented. The present system of the ryot population crowding together in a portion of the village away from the land is probably one of the results of the scattered holdings, for how can a ryot owning an acre of land in half a dozen places live on his holding? He is quite impartial and lives away from all of them. A consolidated holding will certainly force a ryot to live on his land, and do better cultivation, as the Coimbatore ryot does, who cares more for the hut in the land than for the house in the village. The promiscuous village cattle will give place to better types, and as each ryot realises that he has got to feed the cattle on his own land, and not to graze in the neighbour's fields, he will certainly keep a smaller number of better cattle. By consoli-

(1) Bulletin of the Economic and Social Intelligence Vol., III Page 118.

dating the holdings, every ryot can make a garden out of his poor land, and live a better life. Even if the area is very small, he can "dig it and dig it and dung it" without any trouble from the neighbour and his cattle, and live a more healthy contented life. In the words of the present President of the Board of Agriculture of the United Kingdom, "a poor man who is a monarch of but one enclosed acre, will receive from it more than from his share of many acres in common with others." Needless to say that, with the status of the ryot population increasing, the wealth of the nation and the revenues of the State will automatically rise up.

The defects of the scattered nature of the holdings being so grave to the progress of agriculture and the advantages of consolidation being so prospective both to the ryot and to the State, the ways and means of bringing about the consolidation must be considered. The primitive state of soil, the vagaries of season and the consequent vagaries in irrigation facilities, the ignorance on the part of the ryots, the mutual ill will, and jealousy of the neighbours, all present serious obstacles to effect the consolidation in an easy manner. In many cases the minuteness of the holdings, and the advantages which the ryots will have in mixed farming of dry, wet and garden lands, in economising labour, offer another serious obstacle. And the third obstacle is the constant division of parental property without check, which will, if allowed to proceed as has hitherto been the case, multiply all the trouble and expense in effecting consolidation. But the prospects are not yet very gloomy. Most of the European countries were confronted with this problem at one time or another during the last century and each of these countries, and very recently Japan has by a series of legislations permissive and compulsory, brought about the consolidation of holdings, thus increasing the production a very great deal.

There is already a certain amount of exchange of lands going on between the amicable neighbours, but it is insignificant as compared with the enormous amount that has to be done. The first step in consolidation will be to increase this volunteer exchanges as much as

possible, by concession in stamp duty, if a total exemption is impossible. Sometimes a covetous influential ryot effects consolidation by hampering the poor neighbour who has to yield to a superior force lest a worse evil might happen. This has got to be checked. The village Panchayats from whom every department expects some work might in select villages, be requested to deal with small cases, which may not in any way affect the existing system of irrigation and drainage or involve any complications from mortgages, tenant right, inams etc. Their work in addition to being executive might be missionary in persuading the ryots to adopt it on account of the advantages. Their voice will be better heard than a stranger's. The apathy of the ryots will damp the spirit of even the most enthusiastic Panchayat. The ryots will have to be educated by demonstrations and popular lectures, the drawbacks of the present system and the advantages of consolidation, how great the demand is for their produce in foreign countries and how an increase in produce means a much better living for them. When one realises how even the educated class views with some suspicion the disinterested work of the Agricultural Department, it may give an idea of the great hue and cry that will be raised against compulsory legislation. "Few operations" says M. Deserious Head of the Department of Agriculture, Switzerland, "have called forth so much opposition from those who were to benefit by them, as has re-stripping." No child takes a dose of castor oil with ease, and the interested mother has to force it into the child lest it should get ill. The State should not allow things to go on as they at present are and put the agriculture of the land in jeopardy. For "in this question it will not be possible to obtain good results until compulsory exchange is instituted,"* and it is justifiable for the State to interfere because it concerns the augmentation of the productivity of the soil.† It therefore entirely depends upon the State's initiative, how far the consolidation of holdings is possible, and where this disastrous stripping of landed property should stop.

*Bureau of Economic and Social Intelligence Vol. II, No. 2. Page 225.

†Ibid.

To get a thorough idea of the causes and the extent of scattering of holdings and to consider the means of bringing about consolidation, a Commission must be appointed which should be represented by officials from the Agricultural, Revenue and Settlement, and in irrigated tracts the P. W. D. and a few non-officials to represent each their district, headed by an agricultural officer. The Commission should make its enquiries in a number of villages in each district selecting some of the worst villages. It should at the end propose various methods to be adopted to bring about consolidation, prepare the larger scheme of irrigation and drainage in special tracts, suggest openings for the evicted ryots if any, define the extent of an economic holding beyond which it should not get split and the minimum number of plots that each holder may have according to the conditions of the locality. It must prepare draft laws to effect consolidation in each tract and prevent stripping beyond certain limits. The Settlement Department in addition to its work must have a consolidation branch which will work out the details and prepare fresh plans etc. The law of succession will, however, be continuously operating in dividing the holdings, and re-stripping has got to be also continued. But with certain restrictions in division of landed property and by giving preference to a cultivator instead of to a non-cultivator, in the division of too small holdings, the labour and expense in re-stripping will be minimised.

The consolidation is a very expensive business, though it will be repaid within a short period by increased yield, and a greater extent of land brought under cultivation. So far as the ryot of South India is concerned it is not a question of who will bear the cost. The ryot is admitted on all hands to be very poor, and the question therefore is how far with all the help given to him by the State the ryot will come forward to be benefitted by it. The next question that will arise is why should the Government take up such an expensive undertaking. The answer is, as in all cases, the interest of the nation whose guardian it is. The expense will be soon reimbursed by the increased revenue to the State. A paper on consolidation of holdings will not be complete without a reference to Mr. Keatinge who quotes of a remarkable case of such a measure which occurred in Saxony "the village in

question contained nearly 1500 acres belonging to 35 proprietors, and in the course of time became divided up into 774 separate plots averaging about 2 acres each. The readjustment reduced the plots to sixty of about 25 acres each, nearly 10 acres of unnecessary roads and boundary fences were saved, while at the same time, the communications were improved. The operations were completed within a year, and cost less than Rs. 2000 which was more than made good by the ten acres gained. The immediate result was that it was found necessary to add to the store houses to make room for the increased produce"(1).

K. Raghavachari.

Combined method of Broadcasting and Transplanting of Paddy.

Paddy is generally grown either by broadcasting seeds or by transplanting seedlings from a seed-bed—roughly about a tenth of the area to be transplanted.

A few ryots in the neighbourhood of my village (Kadatur, Salem District), raise crops of paddy by adopting a method of combined broadcasting and transplanting. It is not a new method altogether, but is only an extension of the ordinary Transplanting process suited to their conditions. Instead of raising seedlings from a seed-bed in a small area and transplanting the seedlings, they broadcast the seeds over the whole area on which they propose to grow paddy that particular season. When the seedlings are about a foot to eighteen inches high, the seedlings are pulled and planted again in the same fields after giving a ploughing or two immediately. This method, it would appear, increases the yields by about 15—25% over ordinary yields obtained by either method separately.

The *modus operandi* is as follows:—As usual the fields are puddled and a dressing of green leaves, generally collected from the waste lands and *poramboke*, is given, 20 to 30 Madras measures of paddy per

(1) Rural economy in the Bombay Deccan by A. Keatinge Page. 41.

acre are broadcasted over the whole puddled area. This finishes the first stage.

In about 4 to 6 weeks (according to the variety) the seedlings would have grown up to a height of one to one and half feet and be just ready for or would have passed the stage of, the 1st weeding. This is the period when the second stage of the method is put into operation.

A set of coolies is let in, plot after plot for pulling the seedlings and keeping them tied up into bundles of convenient size on the bunds. When the first plot is finished a team of 4 or 5 ploughs works the fields lengthwise and crosswise once or twice and thus reduces the soil to a thin puddle. This ploughing destroys the weeds completely. A levelling board follows the ploughing. Then the batch of coolies begins transplanting the thick healthy seedlings in the most economic manner according to the season, nature and treatment of the land. The four operations of pulling seedlings, puddling, levelling and transplanting are done plot after plot automatically and this finishes the second stage of this method.

This combined method of Broadcasting and Transplanting is practised by a few ryots, only in fair season when enough water is available to bring the fields under puddle and maintain the puddle throughout. It is possible to adopt this method, in the locality I speak of, because (1) the area which each ryot cultivates does not run to more than an acre or two, (2) each acre or two commands a well which ensures his water supply, (3) the two extra ploughing operations do not cost him much as a payment of only 4 to 6 annas brings him a plough ready to work for the day; further-more, these extra operations pay him and pay him well to adopt, because considerable amount of weeding is necessary for a purely broadcasted crop or for purely transplanted fields, though a bit less in the case of the latter than in the former.

Eliminating the operations for which the same expenses are incurred, the following relative cost of cultivation for the extra items of operations in the case of pure broadcasted and transplanted crops as

compared with the combined method will be of interest and speaks for itself. It is evident that it does not entail any large extra expenditure in that particular locality.

Items.	Broad casted crop.			Transplanted crop.			Combined method of broad casting and transplanting crop.		
	No.	Rate.	Rs. as.	No.	Rate.	Rs. as.	No.	Rate.	Rs. as.
Preparatory cultivation ...		Same.			Same.			Same.	
Cost of manure ...		Same.			Same.			Same.	
Cost of seed...		Same.			Same.			Same.	
Pulling Seedlings ...		...		4 women.	2 as.	0- 8	5 women.	2 as.	0-10
Carrying Seedlings ...		...		2 women.	2 as.	0- 4		...	
Ploughing and levelling.		...			...		8 ploughs	4 as.	2- 0
Transplanting Seedlings ...		...		15 women.	2 as.	1-14	15 women.	2 as.	1-14
Weeding 1st.	20 women.	2 as.	2- 8	15 women.	2 as.	1-14	8 women.	2 as.	1- 0
„ II. ...	12 women.	2 as.	1- 8	8 women.	2 as.	1- 0			
„ III. ...	8 women.	2 as.	1- 0						
Harvesting and threshing.		Same.			Same.			Same	
Total cost of extra items of operations ...			5- 0			5- 8			5- 8

It is no wonder at all to learn that the yield is more than in the common method of broadcasting or transplanting. The weeds are completely destroyed by the ploughing. The green leaves that had rotted well for over a month and a half get thoroughly distributed over

the fields. The seedlings start better and grow healthy and strong. Labour is cheap and hence the cost of cultivation does not go high, even with the extra operations. In short, this method combines the advantages of both the transplanted and broadcasted crops.

C. R. Srinivasa Aiyangar.

A note on Hariali grass.

Every one of us is familiar with the Hariali grass. It is a perennial plant flowering nearly all the year round and is distributed throughout all the warm countries. It is known as Arugampul in Tamil, Gariki in Telugu and Du'b grass in upper India. Its usefulness is very well known. It is held sacred by some, it is a bad weed to a farmer and a good feed for cattle, it makes an excellent hay for stacking, and forms a good binder of soils, a fine lawn for tennis and a nice pitch for cricket.

This has so far been known to consist of only one species, botanically named *Cynodon Dactylon* Pers. A recent investigation has disclosed that this comprises two more forms which, though differing in several respects from the ordinary one remained unrecognised and undescribed. One of these was described and named *Cynodon Barberi* by Rai Bahadur K. Rangachariar and myself sometime last year and published in page 846, Vol. 24, part IV of the Journal of the Bombay Natural History Society. The other which was for the first time collected in South India at Gokkavaram in the Godavari District in 1907 and subsequently in the districts of Chingleput, Tinnevely and Nilgiris has been found to be distinctly intermediate between the cosmopolitan *Cynodon Dactylon* and the newly described *Cynodon Barberi*. From the above distribution it may be said to be fairly well represented in Southern India. This has a fine, extensive, superficially creeping and rooting habit, differing from the ordinary one in the absence of deep subterranean stoloniferous

branches, and in bearing long slender delicate spikes besides other minor characters. A small branch introduced from Kallar (Nilgiris) behind my residence at the Agricultural College is fairly well established and is spreading rather rapidly. Description and illustration of this grass are under preparation.

C. Tadulingam.

Cleome Chelidonium L. F. (நாபக்கடுகு) as green manure Crop.

Year after year when the tank is dry, the bed of the large tank of Parthipanoor in the Ramnad District is overgrown with a luxuriant growth of this weed which may pass off to a casual observer as a regularly sown crop. The nature of its fruit, consisting of numerous seeds causes it to be a self-sown crop. The plants pulled out every year give about a thousand cart-loads of green manure to the wet-lands of the village, which, in their turn, get self sown next year. Mr. P. S. Subrahmanya Ayyar, L. Ag., a practical agriculturist of the place, applied 7 cart-loads of this to his lands last year and all of them fully occupied, during the off season, with this crop of weeds. This plant has been, and is being, valued as a good green manure by the cultivators here who apply it both for the nursery and the fields. It is possible that the absence of a forest close by, may have been the cause of the popularity of this weed as a green manure crop.

Not being a leguminous crop, it does not apparently fix atmospheric Nitrogen, but it imparts a dark green and healthy appearance to the paddy nursery. Its action may be similar to that of Erukkam leaves (*Calotropis Gigantea*) applied in Coimbatore. Being a deep rooted weed, it may withdraw plant-food from the deeper layers of the soil, and when ploughed in, restore to the surface layer, easily decomposable organic matter.

Its analysis may elucidate the quantity of mineral ingredients contained in it.

M. A. Krishnan.

Resolutions passed at the Agricultural Education Conference at Simla, 18th June 1917.

1. That it is desirable to lay down the general principle that a method for providing trained teachers in agriculture should be elaborated in each province, adapted to meet the requirements of the agricultural school system that may be in contemplation or may have been already devised for that province.
2. The conference considers that the question whether two years' courses can be combined with four years' courses at the agricultural colleges should be left to local Governments to work out in the light of further experience. Uniformity in this matter is not essential. For the high schools the full college courses should provide suitable teachers. For the teachers of the middle classes it may be necessary in some cases to modify the two years' courses so as to give a better education in science, to be supplemented by a course in pedagogy. This development also should be worked out by local Governments to suit local conditions.
3. Bearing in mind the importance of imparting a training in teaching to all those who are charged with instruction in schools of whatever character, it is desirable to require, that those who attain to the standards that may be determined on as necessary under the foregoing paragraph, should, before being recognised as qualified to teach in agricultural schools undergo a period of training in pedagogy.
4. The conference accepts the view which was urged by all the heads of Government Agricultural Colleges present that it is undesirable to attach training schools in pedagogy to the colleges.

5. The conference considers that the most suitable means at present of giving training in teaching methods for teachers of agriculture in agricultural schools would be to require candidates under the 1st resolution to undergo a course in a specially selected agricultural school to which should be attached an instructor fully trained in pedagogy. For this purpose each province contemplating the establishment of agricultural schools which has not already done so, would have to establish an agricultural school suitable for such training purposes, preferably one in each language area. When the number of agricultural schools and consequently the demand for qualified teachers multiplies sufficiently, it would be desirable to establish a special training institution for teachers in agriculture which would remain attached to an ordinary agricultural school.

6. The conference is of opinion that it should be laid down as a goal that every rural district should have one or more agricultural middle schools usually situated near to demonstration or experimental farms.

Mr. Wood wishes to qualify the acceptance so far as regards Madras by expressing his view that for that province concentration on demonstration was more desirable than the establishment of schools.

7. That, having regard to the diversity in the types of schools which have been evolved under the Education Department of different provinces, it is not possible to discuss profitably the precise type of school required to meet the needs indicated in Resolution 5, but that, having regard to the desirability of securing that early attention be attracted to this subject, the conference recommends that the Agricultural Adviser should prepare for the information of local Governments a memorandum showing what has already been done or attempted in India on these lines.

The Conference, however, desires to emphasise the importance of practical work in any school which teaches agricultural subjects and of having a plot of land, if not a demonstration or experimental farm attached to the school.

8. In view of the resolutions which have been passed at this conference, and of the changing conditions as affecting the expansion of provincial departments of agriculture, the conference considers that the resolution (1) relating to agricultural colleges which was passed at the Poona Conference should be modified and that local Governments should be left to work out their collegiate courses with reference to local conditions. They consider that each of the principal provinces of India should have its own agricultural college so soon as the agricultural development of the provinces justifies that step.

9. The conference recommends that the question of the affiliation of agricultural colleges should be left to the decision of local Governments in accordance with local conditions.

10. While desiring to emphasize the principle that the agricultural middle schools contemplated in resolution 5 should aim at training boys who return to the land, there would be no objection to recruiting boys from these schools, if suitable, for the subordinate posts in the agricultural department.

11. The conference accepts the principle that the text books of primary schools be adopted to the rural environments of the pupil. They consider that where necessary, the existing text books should be revised by the Educational and Agricultural Departments in consultation or that special text books or syllabus should be prepared by them.

12. The conference also strongly insists on the desirability of adopting primary education in rural areas more closely to rural needs. Whilst agreeing that no attempt should be made in pri-

mary schools to teach agriculture or horticulture as such, the following suggestions are made towards the solution of this problem:—

(a) Nature study should form a necessary part of the curriculum in rural schools.

(b) All subjects—reading, writing and figuring should be taught in relation to rural life.

(c) A garden should be attached to each rural school as an aid to nature study, though lessons should also be given in the surrounding fields.

(d) The teachers of rural schools should be recruited as far as possible from the rural population.

(e) Special attention should be paid to the training of rural teachers, preferably in a separate training school for this purpose.

(f) The Agricultural Department should, when opportunity offers, co-operate by vacation courses for such teachers.

(g) The Education Department should also endeavour to recruit as Inspectors or Deputy Inspectors a large proportion of science or agricultural graduates.

13. The conference agrees that the best method of reaching the illiterate classes is by demonstration work in the village and on the farm, and emphasises the importance of extension of this method. Under demonstration work should be included short courses in special subjects on Government farms.

Notes and News.

Deep water paddy of Orissa.

Eight varieties of paddy, all more or less coarse, which are capable of growing in large sheets of water and of not being spoiled when water is withdrawn, are described by Mr. Edwin, L.

Rout., Inspector of Agriculture, Cuttack. The cultivation seems to be similar to the Kol. cultivation in Cochin to a certain extent but not exactly so. Large tracts of submerged land in Cuttack, Puri and Balasore districts seem to be cultivated with these varieties which have the peculiarity of keeping their heads above water, as water rises in the fields, and are often 12 feet high. 33 maunds of 82 lbs.—2700 lbs. of paddy are obtained per acre. These varieties may be well worth introducing into the seacoast portions of deltaic tracts which are difficult to drain. (From the half yearly Agr: Jour. Bihar and Orissia Vol. IV).

M. R. R.

At a meeting of the ryots of the Kollair lake on the 16th of October 1917, an association, called 'The Kollair Lake Ryots Association' was formed to represent the ryots' grievances resulting from the bad drainage of the Lake. A strong and influential committee was elected and it was resolved that a deputation of ryots wait upon the Collector to request him to inspect the Kollair lakes so that he might have an idea of the large extent of uncultivated land uncultivated because of the floods of this year, and also to impress upon him the urgent need of effecting necessary repairs in the Kollair outlets, Upputeru and the Tammilaru and to carry out the drainage proposals of Mr. V. T. Srinivasa Ayangar, the Executive Engineer of the Kistna Eastern Division.

Students' Corner.

Chettiar. Good evening Pillai, shall we go out to observation? We are to submit our note books to-morrow.

Pillai. I quite forgot about it, it is a nuisance.

Chettiar. Well, Pillai, there is no royal road for Agriculture. We must go out, observe crops, take down notes and thereby learn Agriculture.

Pillai. It is well and true, but very often I used to manage by sitting within the four walls of my room.

Chettiar. You were merely wasting paper in these days of dearth. We shall walk out to the wetland.

Chettiar. Bye the bye, how did you fare in Agriculture in your last examination?

Pillai. An utter disappointment. I studied my notes thoroughly well; but no question turned out of it; all general questions based on observation. No use of mugging up notes. These examinations are quite different from what we had in our Schools and Colleges.

Chettiar. Exactly! Agriculture cannot be mastered from note books. Did you not hear our Principal saying that Agriculture is a science, an art and a business.

Pillai. Then what is the fun of their voluminous lecture notes?

Chettiar. They teach you in lecture rooms scientific principles underlying agriculture and in the field you are to observe and learn the art and business side of agriculture.

Pillai. Did you answer that question regarding "B block experiments"? Please explain it to me.

Chettiar. I have attempted it like this:—First plot green manure alone, second plot cholam green manure and Ammonium sulphate, third plot cholam green leaf manure, 4th cholam green leaf manure and Ammonium sulphate, fifth plot no hot weather operations such as ploughing, growing green manure crop and irrigating. Well, Mr. Pillai, I suppose you know the difference between green manuring and green leaf manuring.

Pillai. Certainly; What conclusions can be drawn from these experiments?

Chettiar. I suppose the following conclusions can be arrived at (1) whether green manuring is good or green leaf manuring is good (2) whether a combination of direct and green manures is profitable, (3) whether it is advantageous to plough, irrigate and raise a green manure crop on heavy soils during summer or to leave it to crack and then puddle it and apply green leaves at the time of transplanting.

Pillai. These are very interesting experiments. We must make further enquiries and watch the experiments. Chettiar, you are a capital fellow. How did you manage to learn all this.

Chettiar. Well I go out for observation, keep my eyes open, and make enquiries and learn things.

Pillai. Well, Chettiar. Please make it a point to take me whenever you go out for observation. I thank you very much for your information and hope to write better notes this time. You see many blanks in these transplanted plots of paddy. Can your knowledge of science art and business explain it?

Chettiar. Certainly, you know the function of the root system and its importance to plant life. This is science. Knowing the importance of root system, pulling out seedlings without breaking their roots is an art. Lastly allowing the coolies to transplant broken rootless seedlings is a bad business. This is the cause of these blanks. So successful agriculture is a science, an art and a business.

Pillai. How do you know that broken seedlings were planted there?

Chettiar. After the seedlings were pulled out I saw the nursery and found many broken roots on account of the hard condition of the nursery.

Pillai. It is getting dark, let us return.

Students' Friend.

The Coimbatore Hockey Tournament.

The matches in connection with this tournament were played in the grounds of the Police Recruit School from 22nd to 25th in excellent weather and in the midst of a crowd of spectators. The cup was instituted largely through the exertions of our Principal 2 or 3 years ago. In the first year our College own. Last year we were defeated by the Stanes High School in the finals. The hockey teams in the town had put in much practice for sometime; and much as we were coached by the Principal and Mr. Parnell, no one could tell before hand who would be the winners this year, out of the 6 teams which entered.

In the first round we met the United Eleven, a strong combined local team. They played a dashing game and won the first goal during the first half, within 10 minutes after crossing over, our right in, Singaram netted the ball after a hard fight. Then began an exciting game, each side eager to score the next goal, and the ball was hit from one field to the other until Mr. Parnell had a chance of sending in a stinging shot which found the net. The United tried their level best to equalise, but our backs and half backs kept them off admirably, and the referee's whistle left us winners by 2 goals to 1.

In the second round we had to meet the Police Recruit School. For a while the Police kept safe guard of their goal, but Singaram opened the score for us with a nice hit. Before the Police could rally Mr. Parnell put in another goal followed by one more from Singaram. When half time was called we were leading by 3 goals to nil. The Recruits now combined and secured one goal but before they had time to contemplate their win, Singaram put in the 4th goal for us. Mr. Wood had the satisfaction of his ball finding the net and Mr. Parnell added one more goal before the time was up, thus leaving us winners by 6 goals to 1.

On the 25th we had to meet the Reserve Police in the finals. They form a splendid combination and had the greatest difficulty in winning over the Stanes High School—the holders of the cup for the last 2 years—with whom the first match was drawn with 1 goal to each. The drawn game which was played on the 23rd was also almost drawn till the Reserves secured the odd goal in the latter half of the extra time allowed. They defeated the Coimbatore College easily and came determined to show a good fight with us in the finals. We were as determined as they were and the presence of all the staff and students who had come 5 miles to see our work put the mettle into our spirits. Soon after the bully, our forwards made a dash for the Reserve goal, but their backs were steady and the ball was taken over to the College goal by the Reserve forwards who were well checked in their march by our staunch backs. Each goal was visited in turn but both the goal keepers were firm and when the half time was called neither side had made a goal. Twenty minutes after passing over the Reserves put in a goal. We had only 10 minutes to time when Dharmalingam took up the ball skilfully sent by Chellam and running along the line passed it on to Singaram, who after a little dodging sent it on to Mr. Parnell, our centre forward, who shot it in equalising the goal. The score was one all when time was up. 20 minutes extra play was allowed and the Reserve forwards made many a rush towards our goal, but were kept back by our half backs. Both sides were vociferously encouraged by their adherents and just a few minutes before the final whistle Mr. Parnell sent the ball through the Reserve goal amidst great exclamation. The match was thus won by us by 2 goals to one; and in the extacy of joy our students carried the Principal and Mr. Parnell on their shoulders.

Mr. Robert Stanes presented the cup to the captain and the medals to the following players amidst loud cheers.

Krishnaswami Iyengar	Goal.
Abhishekanathan and Vittal Punja	} Backs.
Mr. Vittal Rao K. K. Subramaniam (Captain) D. P. Chellam	
Messrs. Wood, Parnell, Singaram, Dharmalingam and Muthuswami.	} Half backs.
	} Forwards.

The members of the 'Union' especially our sporting brethren in the moffusil will be glad to hear of the excellent team of our Hockey Eleven, and that is our excuse for giving a rather lengthy account of our tournament.

T. Seshachalam Naidu,
Vice-captain.

Departmental Notes.

Assistant Agricultural Demonstrator S. Pranatartiharam has been granted one month's sick leave from 8th September 1917.

M. R. Ry., M. U. Vellodi, Agricultural Demonstrator is granted privilege leave for one month from or after 25th October 1917.

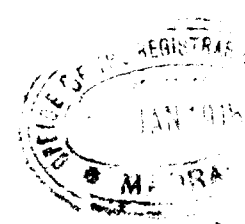
Ramanna Rai and P. Kannappa Pillai students who passed out of the short course at the Agricultural College, Coimbatore in March last are appointed as Assistant Farm Managers on probation vice M. R. Ry. C. S. Madayya and M. R. Ry. K. T. Bhandary promoted to the Upper Division on probation and posted to Coconut station Kasaragod and Kollatti Farm respectively for training.

Wanted a competent Agricultural College trained Manager for a Cattle breeding and Dairy farm, four miles from Guntur to efficiently manage the same and fodder cultivation of about 300 acres and 200 acres pasture. Apply stating age, qualifications previous experience and pay required, to M. R. Ry., R. Sriramulu Sastry, B. A., B. L., High Court Vakil, Madras.



The Late Rao Bahadur J. Dharmaranga Raju.

THE JOURNAL
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Editorial Notes.

In this issue will be found a portrait and a short life sketch of the late Rao Bahadur J. Dharmaranga Raju. The idea is not altogether a new one and our readers may remember the portraits and sketches which have appeared in the pages of this journal almost from its commencement; but it is proposed hereafter to develop this and make it a definite, though necessarily, an occasional feature of the journal. This idea has been before the Editorial Board for over a year and originated from our perusing the sketches appearing in "The Tropical life".

Our object in starting this series is two fold. Firstly, we desire to enshrine in the pages of our little journal small mementoes to "Our Friends"—persons, who directly or indirectly, have contributed, or are contributing, to the progress of Agriculture in this Presidency. Secondly it is

thought that such sketches will prove a source of inspiration and guidance to the various workers in the field of Agriculture, more especially the students.

We fully recognise that the task is not an easy one, for the salient features of a person's life are often so difficult to obtain, even from those who are nearest and dearest to him, and correspondence frequently brings in but a feeble response, but, against this, we have the full confidence that the various subscribers and members of the Union will all help to make this venture a success.

In the portrayal of a person's career, the little anecdotes and personal touches, which only his friends are capable of supplying, are often of far greater interest than information culled from newspaper cuttings or official documents and frequently reveal shades of character or sources of inspiration otherwise liable to be ignored. With the help of the numerous members of the Union, we shall easily be able to emphasize on this aspect in our sketches. To obtain such help we propose, when publishing each life sketch, to name "Our next friend". Besides personal touches, any references to newspaper articles or published reports will be welcome. Our next friend will be the late Rao Bahadur C. K. Subba Rao.

Our Friend—The Late Rao Bahadur J. Dharmaranga Raju.

The subject of this little life sketch was born in the year 1865. Though born of well-to-do parents and after ten years of married life, he was not brought up as a petted

child, a misfortune which often overtakes other children similarly circumstanced. In the year 1885 he matriculated from the C. M. S. College, Tinnevely, and the same year joined the Agricultural College, Saidapet, as a stipendiary student on the recommendation of the Collector of the district.

Even as a student he attended the Indian National Congress at Madras in 1887 as a delegate from Tinnevely and won the approbation of that august assembly by the clever and courageous address which he delivered on behalf of Agriculture. He took a high place in the final examination at the College and his examiner, Mr. C. Benson was so much impressed with his abilities, that he offered him the post of an Agricultural Inspector on Rs. 75. But, in deference to the wishes of his father who wanted him to remain in Tinnevely he had reluctantly to decline the offer and entered the Collector's office as an acting clerk on Rs. 15.

We can easily imagine what a sacrifice this meant to the boy enthusiast but, even under these depressing circumstances, he found the heart and the time to popularise Veterinary Science among his neighbours by treating gratis any veterinary cases that turned up. But this was not enough for his energies and his large heart, so he organized and started a girls' school at Palamcottah wherein he taught about 2 hours daily.

He was only a matriculate, but a large fund of common sense and industrious and honest work brought him quickly to the notice of the Collectors and he was soon enough

promoted over several seniors in the office. As a Revenue Inspector he was always on the side of the ryots and constantly interceded on their behalf to higher authorities for securing remissions. While a Sub-Magistrate at Sri-vaikuntam in Tinnevely District, he organized a troop of boys and school children and created a lovely flower garden round the temple there, cheerfully doing all the manual work involved in the operation. Later on as a member of the District Board and as a Divisional Officer he always fought in the interests of the ryots even at the risk of incurring the displeasure of his superiors.

As Divisional Officer, he successfully nipped in the bud, what might easily have been a serious riot between the Hindus and Christians at Radhapuram on account of certain religious differences. It is no wonder, therefore, that he soon endeared himself to the people and the Government who, in appreciation of his services, bestowed on him the title of Rao Bahadur in the year 1908.

His services were subsequently placed at the disposal of the Rajah of Pudukottah and as Dewan Peishkar he did a good amount of organization work in that State, chiefly in Agriculture. In the year 1913 he was reverted to British service and appointed as the Assistant Registrar of Co-operative Societies. The Director of Agriculture, Mr. D. T. Chadwick, who knew of Mr. Raju's abilities before as a Settlement officer in Tinnevely secured his services from Government as his Personal Assistant. But he did not live to join this appointment for which he was eminently suited, on account of his illness, which ended in his death at the premature age of 49.

He held that our national development was intimately associated with that of Agriculture in the country and did all in his power to promote it. He took every opportunity to inculcate to the ryots, about and around him, the essential principles of what was then but imperfectly and reluctantly recognized as a science of any practical application.

He was responsible for starting the Ranga Raju Dairy at Madras and started the now popular Tamil Agricultural Journal கருஷிசன். In the earlier stages of the journal we understand that he was frequently out of pocket because of his having undertaken to publish it at such a low price as 12 annas for 12 issues.

He took a very great interest in our Union. He was one of our Vice-Presidents and was always willing and ready to further its interests, be it a deputation to the Director of Agriculture to safeguard the interests of its members or formulation of a scheme to make the Department more efficient and more popular.

He loved Agriculture and believed in it. Though outside the Department, he did a good deal to popularise the Department and its work, and as a Deputy Collector he is said to have always carried with him 'an improved plough.' He was sincere and outspoken in his criticism. In his later days his love of Agriculture completely saturated the whole of his activities and his biographer in the Tamil journal கருஷிசன் remarks that he passed away singing Agricultural ballads. He was a missionary in the cause of Agriculture and his fervour was strong, deep-seated and contagious.

Translation of the Telugu verses composed by
M. R. Ry. D. Balakrishnamurti Garu,
Assistant Director of Agriculture.
First Circle.

Thin paddy seed-beds.

Chorus:—The proper way of sowing seed
 Learn ye all and get your meed.

1. You pride yourselves on tilling skill,
 And yet you hardly seem to know
 What vast amount of seed you waste,
 Because you know not how to sow.
2. 'We know it all' you are apt to say
 'There's nought for us to learn any more'
 Be not content with what you learnt
 From sires and grandsires gone before.
3. Behold! the ryots in districts nigh
 Have learnt new ways and means of thrift.
 Then why should you not profit too,
 And in the old ways cease to drift?
4. No good calf can e'er be born,
 Unless its sire be a sturdy bull.
 Select with care the seed to sow
 To have a harvest rich and full.
5. Soon after harvest, seed-beds plough,
 Your pulses yield thee little gain
 Better far for thee to plough and plough
 From reaping till you sow again.
6. As mother's milk doth nourish best
 The little baby from its birth
 The seedlings grow and flourish best
 By hardy tilth of mother earth.
7. By penning cattle, folding sheep,
 And, best of all (take special note)
 By penning flocks of goats on fields,
 Their yielding power you do promote.

Chorus.

Chorus.

Chorus.

Chorus.

Chorus.

Chorus.

Chorus.

8. But never treat thy precious field,
 With 'Penta' brought from far and near,
 This oft contains the seeds of weeds,
 Which smother seedlings that appear. Chorus.
9. Fifty kunchams seed, if coarse,
 Or less per acre, if it is fine,
 Will do for beds both wet and dry,
 But note the clime and weather sign. Chorus.
10. Don't pour the seed all out at once.
 But use a fourth for every round;
 Go, sowing, twice along the length,
 And twice along the breadth of the ground. Chorus.
11. If scattered thin the plants grow strong;
 They get more food and also air,
 But sowing thick gives crowded plants;
 Their healthy growth it doth impair. Chorus.
12. No need for you to idly fear,
 Well rooted plants are hard to lift;
 If the bed be watered well betimes,
 The seedlings can be lifted swift. Chorus.
13. Four weeks to six you needs must wait,
 From sowing ere you seek to lift,
 Take D. B. Murthi's good advice,
 And learn the aforesaid ways of thrift. Chorus.

(Sd.) B. Pattabhiramiiah.

Pariahs in Kollegal.

An outsider, whose knowledge of the Pariahs is, that they are a low class of seminaked, half starving people, struggling to earn a livelihood, will be surprised to find a decently dressed portion of this community farming their own lands and living a peaceful and contented life in Kollegal. This place is the most thinly populated portion of the Coimbatore district and there is still vast area unoccupied. The Pariahs here hold land on patta from Government, the other classes of

people apparently not caring to monopolise these lands on account of the hilly nature of the locality. A good number of these Pariahs cultivate their own lands while some are tenant cultivators. Apart from this, there are other factors which contribute to their prosperity. When they have no farm work, they engage themselves in cottage industries, such as rearing of mulberry silk worms and reeling of silk cocoons. Further they purchase young bull calves in weekly cattle fairs and rear them for two or three years and sell them for good prices. Many of them possess a few goats and sheep which bring them additional income. They get very high wages during agricultural seasons.

In other parts of the Presidency, we find Pariahs leaving their native places and going out as emigrants, but the Pariahs of Kollegal rarely go out to plantations for work. Their movable and immovable properties keep them tied to their homes and the work, in season and out of seasons help them to keep up a certain standard of material prosperity. This leads one to reflect on the problem of emigration and the uplift of the depressed classes. Which is the first need of a Pariah? Is it social uplift or moral uplift or material uplift? It is the want of work at the slack seasons and the want of attachment even to a cent of land which a pariah can claim as his own, force him to emigrate from his dear native land. A poet rightly says "Happy is he who possesses an acre of ancestral land." The first step to be taken for elevating the depressed classes is to improve their material prosperity and this can best be done by helping them to become owners of land and not merely by tying them down as labourers on another's land; and this is amply illustrated by the Kollegal Pariahs.

K. T. Alwa.

Feeding Dairy cows with Agathi leaves (*Sesbania grandiflora*.)

That the "Agathi leaves as a fodder increase the flow of milk" is the popular opinion among the cow keepers in Coimbatore. To find out how far it is true, four milch cows at the Central farm, Coimbatore

were given 7 to 8 lbs. of Agathi leaves per day in addition to the usual bulky ration viz., a mixture of fodder cholam and guinea grass. The experiment was commenced on the 12th September 1917 and continued till the 29th idem, i. e., for 18 days. During the period a decrease in milk yield in the case of all the four cows was noticed as detailed below:—

Name of cows.	The average daily milk yield for a fortnight before the experiment.	The average daily milk yield during the experi- ment.
	lbs.	lbs.
Ida.	15½	14½
Rose.	18	16
Sivappi.	14	12½
Brindle	21½	20½

As the trial was not considered satisfactory for finding the effect of Agathi leaves as it was given only in small quantity mixed with 40 to 50 lbs. of other green fodder, the experiment was taken up again on a more definite line. Accordingly, Brindle, a cow in steady milk was fed entirely on Agathi leaves for a fortnight beginning from the 17th October 1917. For the first few days 50 to 60 lbs. of the leaves were given daily and subsequently the quantity was increased up to 75 lbs. as the animal could take more. The average daily record of milk before and during the experiment was 20½ and 19½ lbs. respectively. Thus, the experiment showed a slight decrease in the milk yield of the cow. On the other hand, she added slightly to her own weight. It may also be mentioned that the cost of the Agathi leaves viz., 12 as., for about 75 lbs. is really prohibitive and any slight increase in yield of milk will not compensate for the high price at which Agathi leaves had to be purchased. Owing to the fact that no increase in milk yield was evident, the above trial, of feeding milch cows with Agathi leaves does not seem to confirm the popular opinion regarding its feeding value.

M. P. Kunnikutti.

Agricultural Station Report of the Madras Presidency for 1916-17.

It is extremely interesting to go through the Reports on the work of the several Agricultural Stations of our Presidency which are now in our hands.

Those who are interested in the improvement of the cultivation of "Paddy", the most important staple crop of Southern India will do well to possess a copy of the reports of the Central Farm, Manganallur, and Palur. At the Manganallur Agricultural Station a good deal of attention is paid to find out manures suited to the Deltaic conditions, the best time for applying them and the quantity of manure required, when a particular manure is applied alone, and when two or more of them are applied mixed together.

Space does not permit to detail here the various experiments conducted at the several Agricultural Stations. We shall rest content by summarising *as far as could safely be done at present*, the results of these experiments on the improvement of Paddy Cultivation.

(a) That the ploughing of a green manure crop, wherever it could be successfully done increases in the beginning the yield of paddy and maintains a high yield.

(b) That the application of bulky organic manures has a similar effect.

(c) That the application of superphosphate in conjunction with green manures or the addition of superphosphate to green manured fields or fields rich in organic matter gives an increased yield of paddy.

(d) That the application of superphosphate in three doses, one at the time of planting, one at the time of first weeding and one at the time of 2nd weeding, appears to be most profitable.

(e) That high yields of paddy have been obtained where superphosphate in conjunction with ammonium sulphate has been applied.

(f) That superphosphate can be substituted for cattle manure as a manure for double crop land, provided that the mechanical soil conditions of the season are favourable.

(g) That the addition of potash in the form of sulphate of potash does not seem to have any beneficial effect, and if anything, appears to have a depressing effect on the yield.

(h) That the application of quicklime to paddy fields gives no increase in the yields of paddy either in grain or in straw.

(i) That the addition of slaked lime to bonemeal and green manure seems to show an increase in the yield of paddy.

Central Farm, Coimbatore, must be congratulated on its high yields and profits. The Superintendent of the Central Farm writes that "on just over 40 acres, an average crop including experiments of all sorts, of 3200 lbs. an acre has been reaped, the highest in the recorded history of the land", and "in nearly all cases the profits have been more than Rs. 100 an acre and in some cases as much as Rs. 150".

On a perusal of the results recorded in the reports, we recommend to the wet land cultivators, under Coimbatore conditions, the following paddy varieties.

1. Sadasamba, unit strain No. 20, which has given the highest yield of 4800 lbs. per acre.

2. Poombalai which gave an excellent acre yield of 4000 lbs.

3. Sinnasamba 113 which has recorded over 3800 lbs. to the acre.

4. Government Economic Botanist's No. 24, the first of the Paddy Breeding Station strains which gave over 3600 lbs., an acre.

In the Palur Agricultural Station, we note that "Ramagarudan Samba" the unit strain from the local garudansamba variety, figures very high in its yields, viz., over 4200 lbs. an acre.

We wish and hope that ryots will not fail to take advantage to introduce these prolific strains of paddy varieties in their own cultivation next season and reap high yields.

Review.

Extracts.

M. R. Ry., D. Balakrishnamurti Avl., D. A. Assistant Director of Agriculture, First Circle, Anakapalli, while studying the cultivation practices of the Savars on the hills is said to have found an implement which represents the rudiments of the native plough and the hill tribes prepare their lands with this to receive seed. One end is like an ordinary hand hoe while the other end is bent to represent the plough without stilt.

(Extract from August monthly report).

The Agricultural Department is to be very well represented at the Madras Exhibition, to be opened by His Excellency, the Viceroy, on the 21st December; and judging from the monthly reports of the Government Agricultural Chemist for September and October, the Chemical Section is sure to attract a great deal of attention, for the whole staff has been engaged for over two months on investigations relating to the utilisation of indigenous products. Malt extracts, artificial foods, boot polishes etc., are only some of the products produced and they are in no way inferior to the imported articles.

Pusa 12.

It has been the fashion for so long to sneer at India as behind the times in all Departments of material activity that we may call attention to a fact, in itself of no great importance, which indicates how she is beginning to forge ahead. Just now there is a well-displayed exhibit of wheat in the windows of the South Australian Government offices, in the Strand, and one of the best specimens is marked "Pusa 12," a cryptic label signifying that one at least of the new wheats produced by the Howards at Pusa is considered to be valuable

in countries other than that for which they are primarily intended. We hope to hear that its popularity is maintained, and India may by and by send out other missionaries of the kind to the great Commonwealth of the South. (Indiaman June, 14, 1917).

Goat's milk.

The danger of infection of tubercle bacilli through the milk of diseased cows still exists, but goats, if not actually immune, are very refractory to the attacks of tubercle bacillus. The "goat's" milk is not only superior to cows, but is an excellent substitute for human milk. The milk is believed to be more easily digested than cow's milk, the curd being more soluble and the fat in finer emulsion. The goat will not touch dirty food, and is far cleaner in its person and habits than a cow. The percentage of fat is 3.1 in the Alpine breed and 4.3 in the German breed. In some parts of France and Switzerland the goat often takes the place of the wet-nurse, to the satisfaction of all concerned. K. K. Rao. (Page 215, Agricultural News July 14, 1917)

Speaking on the value of Agricultural Research Institution, The Tropical life comments as follows:—

"In comparison to the wealth that they will cause to be produced towards paying the expenses of the War, the cost of the first two Agricultural Colleges in the Tropics will not be noticeable, whilst the results, as proved by one item alone (that of wheat), out of many dozens obtained by one institution already established, viz., Pusa, shows that the cost will be only like an acorn, compared with the gain of wealth that is certain to spring from it if care is bestowed on the acorn."

Glycerine from sugar.

One more use has been found for sugar. It has been recently demonstrated in the laboratory of the Department of International Revenue at Washington that glycerine can be made from sugar at about one quarter of the cost of its manufacture from fats from which

it is at present made. *Apropos* of this, the Louisiana Planter observes in its issue of the 21st of July 1917.

"This leads us to think of India, with its enormous sugar production for untold years, reaching over two millions of long tons of sugar, never entering the markets of the world but consumed at home by those who are probably *the poorest peasantry in the world, the coolies of India*. They need their sugar for their own use and find its use as a food stuff economical." T. S. V. [The italics are ours. Ed]

With a view to bring the law relating to granting of loans for the improvement of Agriculture in line with that of British India, the Travancore Government have published a draft Bill in the current issue of their "Gazette." This enables the grant of loans not only to land improvement but also for purchase of seeds, manures, etc., which is not allowed under the existing Regulation. The Bill further seeks to simplify the procedure for the grant of loans to some extent, but apart from these there is nothing noteworthy in the proposed Bill. In view of the fact that the British Indian Acts are a failure we wish that His Highness's Government had introduced more modern features. We hope however, that in the light of public criticism, which will doubtless be offered, the scope of the Bill will be considerably altered for the better.

From the Hindu.

Messrs. Tata's New Enterprise.

(Associated press of India).

Bombay, November 9:—Messrs. Tata Sons and Co., have embarked upon another big industrial enterprise based upon business now taken from the Germans who had made a monopoly of it before the war. A Company with a capital of fifty lakhs of rupees has been floated by them to develop cocoanut industry in Southern India. The whole of the capital has already been

privately subscribed, all shares being taken up by a few industrial magnates of the city and as German capitalists made large fortune out of this industry, it promises to play an important part in the development of the country. Now that it has been acquired by Messrs. Tata Sons and Co., valuable concessions have been granted by the Government and it is expected that the Company will make large profits. Following immediately on the announcement of the inauguration of the Tata Industrial Bank, this additional enterprise which was hitherto allowed to be exploited by foreigners is being given a warm welcome. It is reported that Tata Industrial Bank will take a share in the capital of the Company. The Headquarters of the Company will be at Cochin.

It is understood by the way that the whole capital of the New Bank has already been underwritten.

Students' Corner.

Debate in College Hall.

"That in the opinion of this House, the Agricultural Department will be led astray if they adopt a policy of encouraging the cultivation of long-staple cotton."

The debate was opened by *Abhishekanathan* who contented himself with recounting the early history of cotton in India and drawing therefrom the conclusion that the large area under the present varieties of cotton show that they are suitable. India needed a cheap cotton and a short stapled cotton was cheap. Therefore it should be grown. The opposer, *Avadanayakam*, pointed out that if cotton was an ancient staple, it was a disgrace to India that it had so deteriorated. He objected to the statement that India needed only short stapled cotton and cheap cloth, and pointed out the progress which even the last few years had

seen. *Ananthan* considered that long-stapled cottons were synonymous with exotic varieties. The question was not a new one, and all previous attempts at introduction had failed. It would be dangerous to extend widely the area under irrigated cotton and long staples could not be grown on dry lands. He gave figures to show the cost of cultivation and was afraid of deterioration. *Chellam* spoke next. *Ranganayakulu* would not hear of long stapled cotton, even if it was profitable to the grower. He feared the risk of disease. *Nambiar* thought that local cottons could be ultimately improved by selection, quoting from experience with "Sea Island Cotton". *Srinivasan* referred to the usual precautions taken by the Department in the introduction of new exotics. There would be no difficulty about the mills taking all they could get. India would get left if she stuck to short staples. *Ranga Reddi* trusted in the bonafides of the Department and tackled the question from the point of view of the ryot. It was impossible to sow Cambodia in parts of the Ceded Districts but improvement in indigenous cottons was certainly indicated. He opposed the motion. *Abhishekanathan* summed up by appealing chiefly to sentiment.

Students' Tour.

During the last week of October, the Second year students were taken on a week's tour to the West-Coast by the Principal. The first place of camping was Kasergod, the southernmost taluk of South Canara. Here the Deputy Director and the Assistant Director of VII Circle met the party and showed the students the newly acquired cocoanut station at Kasergod. Very interesting and instructive information was given to students by the Deputy Director on the root system and the bearing capacity of cocoanut trees. The station is very close to the sea and the soil seems to be an ideal one, being a red sandy loam. During our stay at Kasergod we saw paddy, cocoanut, sugarcane, and tobacco

crops and made detailed enquiries on these crops. The success of paddy crop depends upon the loose-box cattle manure and that of tobacco on the sardine fish manure. The system of planting young tobacco seedlings in second nursery before they are finally transplanted in the sandy beach seems to be a peculiar practice in the locality. After two days halt at Kasergod, we came to Calicut on our way to Nanmunda, a place well known for its cocoanut cultivation in Malabar, the land of palms and root crops. Various new crops such as pepper, banana, ginger and several root crops occupied our attention. We saw excellent cocoanut gardens in this locality whence seed nuts are taken for planting in the newly opened Government cocoanut stations in Kasergod. The cocoanut trees selected for seednuts are in an excellent bearing condition and the importance of selecting trees for seednuts was forcibly brought to our minds. Select your nuts from the tree and not from the store. The Malayali seems to be a paramba or garden cultivator and not a paddy cultivator as his neighbour ryot in South Canara. He makes his money from cocoanut, pepper, ginger, banana and other crops, and depends on South Canara for paddy. He does not pay much attention for his paddy cultivation and is busy in extending his cocoanut cultivation both towards the coast and the uplands. From Nanmunda we came to Ottapalayam, a place of importance in the Waluwanad taluk of the Malabar District. Large areas of paddy lands are found and cultivation is of a better type and cocoanut occupies a secondary place to paddy.

From Ottapalam we went to Mankara to see the sugarcane cultivation of Messrs. Parry and Co. The enterprising Company is trying to grow Red Mauritius sugarcane on a large scale in Malabar and there is every prospect of its becoming a success. Last year the Company had 25 acres and this year it has extended the cane cultivation to 100 acres. The Company prepares jaggery at the spot and sends it to Nellikuppam sugar factory

Large number of setts were sent from this farm to Nellikuppam and we are told that these setts grow very well there. This short note on our tour cannot be closed without a reference to the hospitality of the Malayali who profusely served us wherever we went with tender cocoanuts and bananas. To many of us, the life and the surroundings of a ryot in Malabar were unique and we appreciated them very much. Throughout the tour, Mr. Kidavu, the Assistant Director, was with us, and rendered all possible help to the touring party.

Student.

The following hockey players were awarded "The Hockey Colours" for this year:—

1. K. K. Subramaniam.
2. A. Vittal Panja.
3. M. Krishnaswami Iyengar.
4. T. G. Muthusamy.
5. J. T. Singaram.
6. D. P. Chellam.

D. P. CHELLAM.
Honorary Club Secretary.

News.

With reference to a notice of the Tanjore District Co-operative Manure Society which appears on page 276 of the September 1917 issue, the Secretary writes to say that the report refers only to a period of nine months and that Rs. 2000 worth of manure was sold during the co-operation year 1916-17 (i. e., 1-10-1916 to 1-10-1917).

The last week of October was crowded with send off gatherings in honour of Dr. and Mrs. Harrison. Apart from private dinners and social gatherings, Mrs. Sivan had invited Indian and

European ladies to meet Mrs. Harrison at the College and Mrs. Lakshman Row had a similar one at the Students' pavilion; and both of them were much enjoyed. The staff of the Chemical section were at home to all the resident staff and students on 1st November and an interesting programme of games and music was gone through, and a sumptuous tea was provided. All the gatherings had been very well arranged and were amongst the best gatherings held here. Dr. and Mrs. Harrison left Coimbatore on 4th November for Pusa.

A Cotton Conference is sitting at Cawnpore from the 1st of November to consider the possibility of increasing the growth of long staple cotton in India. Various witnesses are being examined.

Correspondence.

The following answers have been received to the Query by Mr. Sreenivasa Rao published on page 278 October Issue.

(1) Prickly pear

R. C. W.

Agave Vera-cruz is the common agave grown as hedge along all the Railway lines in India and known in Tamil as Rail kathalai or Anai kathalai. Propagated by side shoots or suckers.

Azima tetracantha is known locally as "Sangam." This is a common evergreen bush of the plains, the branches of which are provided with four long sharp spines at every node. Propagated by seed, the berries assume white color when ripe.

Caesalpinia sepiaria is the Mysore thorn which Hyder employed to cover his fortifications. This is a thorny shrub of quick growth with large racemes of bright yellow flowers forming an impenetrable thicket. Propagated by seed.

Jatropha Curcas is Katt amanakkee (Tamil) of Madras Presidency largely employed in villages and gardens as hedges from its

easy growth, the seeds of which are administered as a purgative. This is an evergreen milky bush. Propagated readily from cuttings.

Commiphora Berryi is Mulkilavae (Tamil) of Coimbatore District where it is frequently employed for live fences. This is a spinous shrub. Propagated easily from cuttings. T. S. A. Sahib.

Is not the title of your journal "The Journal of the Madras Agricultural Students' Union" too long and may I add punctilious? Will not a shorter title do, such as, "The South Indian Farmer."?
"Brevity."

In any crop of Choram one often finds certain of the heads showing a distinct tendency to bend to the horizontal. There is no apparent sign of anything abnormal. Can any of the readers of the Journal enlighten me as to whether this is a varietal character and whether it is hereditary?
"Dabbler."

They are enterprising people in Anantapur, and evidently give the Department credit of being up to date. A request was recently received in the College Office, from a gentleman at Kondamcharla for the Departmental Calendar for 1919-20!

We understand that Mr. B. S. Tholar has entered service under Mr. T. Srinivasa Raghavachariyar B. A., B. L. High Court Vakil Coimbatore on his Ramaprasad Estate near Mettupalayam.

Departmental Notes.

1. Mr. M. U. Vellodi, Agricultural Demonstrator privilege leave for six weeks from 11th October 1917.
2. Mr. S. Ramaswami Pillai, Agricultural Demonstrator privilege leave and furlough for one year from date of relief.
3. Mr. S. Sitharama Pathrudu, Agricultural Demonstrator posted to District work Bellary, in relief of Mr. S. Ramaswami Pillai.
4. Mr. W. Raghavachari Agricultural Demonstrator privilege leave for weeks from the date of relief.

THE JOURNAL

OF

The Madras Agricultural Students' Union.

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Editorial Notes.

This exhibition, the second of its kind, was opened on 21st December 1917, by His Excellency Lord Chelmsford.

The Madras Industrial Exhibition and the Agricultural Department.

The fact of His Excellency the Viceroy's great and abiding interest in the agricultural advancement of the country has been repeatedly mentioned in this journal. It was, therefore, a happy augury for the agricultural activities of the Presidency that His Excellency laid particular stress in his address on the importance of the work which has been done so far and which still awaits to be done.

His Excellency's address contains several points which are worth noting. Regarding State control of industrial enterprises, His Excellency said that the old *laissez faire* policy was dead and buried, and that it has now been realised, "that it is the bounden duty of the State to foster industrial enterprise to the utmost of its ability," that he put the

matter of industrial development in the forefront of his policy and that great headway would be made in that direction after the war was over.

Madras, he said, has always been, and must continue to be, mainly an agricultural province; and a province, with a large sea board, had a great prospect before it for vigorous commercial enterprise, and he was glad to note that the mental alertness of the people of Madras was proving so responsive to new ideas. Regarding the possibility of improvement, he indicated certain lines on which progress might be made with regard to indigo, cotton and ground-nut. Madras grows more indigo than any other province in India, and a permanent revival of the indigo industry will depend on (1) the possibility of replacing the Sumatra plants by the Java species, (2) improvement in manufacture, (3) organisation in marketing and (4) cessation of adulteration.

As regards cotton and groundnut, the trade was steadily increasing. Future prospects were promising, but better methods of handling and marketing were necessary for a permanent reputation in the market; and, for this purpose, co-operation among cultivators and among traders was essential. The Department had evolved superior strains of cotton which fetched better price. As regards groundnut, the artificial damping of groundnut to remove the kernels yielded an inferior quality of oil and the shelling was more costly than when done by machinery. Two essential factors for the improvement of agricultural produce are, in His Excellency's words, a stoppage of adulteration which goes on in

all products and the development of co-operative marketing for better business handling of the produce; and to these two points His Excellency directed the earnest attention of the audience.

The members of the Union, it is hoped, will appreciate the idea of giving some prizes to the present students of the

College, as one way of utilising the interest of the Permanent Fund. Two prizes up to about Rs. 50 are proposed to be given to the students who make the best contributions to the Journal during the year 1918. This will help to develop the thinking power of students and also enable them to observe things around them carefully and write good tour reports.

Their attention is also drawn to the Munagala prize, so kindly offered once again by M. R. Ry., K. Ramasastrulu.

Nayudu Garu, B. Sc. The subject chosen this year is particularly of so wide an interest, and one with which a great many would have been faced, as soon as their college career was over, that it is our hope that a very large number of our members will compete. The experiences of a large number of our members, faithfully recorded, will certainly tend to give an idea of the various aspects of the question and will aid greatly in evolving a course of Agricultural Education in which the Government is greatly interested. It is therefore requested that a large number of the members, both private agriculturists and departmental officers, will compete.

We are extremely glad that Mr. Tirumuruganatha Pillai has been appointed acting Assistant Director of Agriculture. We congratulate him on his well-earned promotion and hope he will be confirmed in his appointment before long.

His Excellency Lord Willingdon, Governor of Bombay, opened the tenth meeting of the Board of Agriculture in India which was held on Monday the 10th December in the Council Hall, Poona. Very important speeches were made by His Excellency and Sir Claude Hill which we intend publishing in later issues, but in this issue we quote a few of their ideas and opinions. His Excellency said, "It is the prime object of the Agricultural Department to strengthen the position of the cultivator in such a way as to make him the master of his own fate and not the ready victim of any untoward circumstances that may occur." When speaking about the officers of the Bombay Department of Agriculture, His Excellency remarked "From a close association with their work, I can confidently say that we have, in this Presidency, moved rapidly forward in creating a desire among the farming classes for improvement and progress; and this has been largely brought about by the fact that Mr. Keatinge has, by his experience, energy and sympathy, given inspiration and example to his officers and has gained the confidence also of the agricultural population."

Sir Claude Hill, when speaking about the Indian sugarcane industry paid a glowing tribute to the work of Dr. Barber. He said, "On the agricultural side, I should like to

take this, perhaps the last, opportunity I shall have of saying a few words of appreciation of the invaluable work done by Dr. Barber at Coimbatore. The establishment of the sugarcane breeding station there was sanctioned in June 1912 and was inaugurated in October of the same year for a period of five years. The results so far obtained are extremely promising, and every one who has had the opportunity of visiting the station is deeply impressed with the thorough way in which the initial difficulties have been overcome and with the excellent collection of first class cane which has been produced. We believe that, so far as the supply of cane for Southern India is concerned, the objects with which the sugarcane breeding station was established may be regarded as already substantially achieved, while the solution of the problem of the supply for Northern India seems to be almost within sight. Dr. Barber's work in connection with the breeding station has been of enormous value to India, and I think that the whole country will owe him a debt of gratitude for the great fund of knowledge and experience and the great zeal which he has brought to bear upon the solution of the problem with which he was confronted. When we recently decided to recommend the continuance, for a further five years, of the term for which the breeding station had been established, we had hopes that possibly we might have the benefit of the continuance of Dr. Barber's valuable services and he has consented to serve only a few months more. We wish he could have stayed longer, for his loss to the department will be very great. The department will part with Dr. Barber with the greatest possible regret." At the Conference, there was an exhibition of the seedling

canes produced at Coimbatore which were very much appreciated.

Report on the Cultivation of Paddy in the Periyar tract, Madura District.

Periyar which literally means "big river", is a river that rises near the boundary separating the district of Madura and the Travancore State at a height of about 4,000 feet. It flows in a westerly direction through the latter State and pours its waters into the Indian Ocean. The idea of harnessing the stream in order to provide water for irrigating part of the arid plains to the east of the Ghats in the Madras Presidency was first entertained so early as 1798 by Pradhani Muthirulappa Pillai, the then Prime Minister of the Rajah of Ramnad. But the first estimate for this project amounting to Rs. 17½ lakhs was forthcoming only in 1867. Later on a more comprehensive project was estimated at Rs. 54 lakhs in 1870. This was sanctioned by the Government of Madras in 1881 and the work was begun late in 1887. It was decided to dam the river on the western slope and tunnel the intervening rock so as to form an eastern outlet from the accumulated water. Much difficulty seems to have been experienced in damming the river. This can be well realised when it is considered that the discharge, when the floods are at their highest, is equal to half the average flow of water at the Niagara falls. The lake as originally designed was to have covered 8,000 acres with a maximum depth of 176 feet, but owing to provision having been made for an extra 8 feet in the height of the dam both the area of the lake and the volume of water are considerably in excess of that provided for in the original estimates. The project was opened in 1895. The construction of the dam and of the necessary irrigation channels cost an aggregate slightly in excess of 103 lakhs of rupees. East of the tunnel, the water joins the Suruli and the Vaigai rivers and runs eastwards for nearly 86 miles along the Cumbum valley until it reaches the Peranai dam, where the river turns southeast. From here branches the main channel, running eastward for nearly 50 miles from Peranai to Melur. There are 11 branch channels, the 12th

being only a continuation of the main channel. The area irrigated east of the Peranai in 1915—16 was nearly 131,000 acres of which the area under second crop was 43,797.

The area irrigated under the Periyar project takes on roughly the shape of an isosceles triangle with its apex at Peranai and the equal sides bounded on the north by the Periyar channel and on the south by the Vaigai river into which the irrigation water drains. The base of the triangle runs from Chunnambur on the south to Tiruvadur, Vela-nur and Kilavalavu. It is a special feature of the project that there are a number of tanks to supplement the supply of water from irrigation channels. These are filled with Periyar water early in the season. Some of these are maintained by the Government and others are owned by private landlords and are known as *mamul* tanks. The advantages of these are most felt in years of uncertain or inadequate rainfall. But the local ryots hold that lands fed directly from the channels are more productive than those fed from tanks. This contention is based on the belief that the tank-fed lands have a greater tendency to accumulate deleterious salts. It is also of note that owners of tanks prefer the Vaigai water to Periyar water, not only because of the larger amount of silt which the former is said to carry in suspension but also because of the relative absence of soda salts from the river water.

The whole area under the project is divided into double and single crop wet lands. The former extends as far as the 9th branch channel and its distributaries, and this portion gets water from the middle of June to the middle of March. The rest of the area, that is, the 10th branch channel and wards down, comes under single crop where water is let in only by the end of August and continues to flow till the closing of the channel towards March. The following reasons may be adduced for the concentration of the double crop area in the upper reaches of the tract.

(1) To meet the exigencies of a failing monsoon, ryots have chosen the area where the cultivable portion is compact. In the lower reaches a fair amount of high lying inferior dry land is scattered amongst the wet land.

(2) The upper portion lies near the forest reserves and waste lands, from which it has been the practice to procure green leaves—often the only means of manuring the paddy crop.

(3) The soils of the upper portion possess a higher natural fertility, and wet land cultivation was commonly practised over a fair portion of this area, long before the advent of the Periyar.

Immediately the Periyar project was opened, ryots in the western or upper half of the tract took readily to the wet cultivation of that portion of their land which was formerly dry. In the eastern half, the dry lands, which later came under Periyar irrigation, were mostly cultivated by a section of the Kallar caste of ryots—a class whose chief means of livelihood was thieving blackmailing or cattle lifting. These in many cases did not realise the grand opportunities thus afforded them under the Periyar project but sold off their lands at ridiculously low rates. Such lands were taken up by enterprising ryots from Coimbatore, Tinnevely and Trichinopoly Districts. Those of the Kallars who retained their allotments found money so easy to make, that there was no longer any necessity for thieving to meet the common house-hold expenses. The easy profits which they now make are squandered in drink and gambling—vices which are no better than those to which they were previously addicted. To meet their debts, much of this land has since changed hands. The buyers are generally wealthy townspeople so that absentee landlords now enjoy a considerable area under the Periyar.

Assessment and interest on capital invested.

The water cess for patta lands still classed as dry is Rs. 5 for the first crop and Rs. 3 for the second. There are 3 tarams or rates fixed for mamul wet lands, namely Rs. $6\frac{1}{2}$, $5\frac{1}{2}$ and $4\frac{1}{2}$ per acre according to the class and sort of soil for the first crop; and half of this rate for the second crop. The lands which were previously Government waste lands are included in the above classification. In the double crop area, some of the mamul and Government waste lands are also charged compounded assessment, irrespective of a single or a double crop being grown. The revenue realised from all sources in 1915—

1916 was Rs. 6,22,869. The net Revenue was Rs. 4,60,486 which works out to nearly $4\frac{1}{2}$ per cent on the capital invested in the project.

Systems of tenure.

There are three common systems of tenure on these wet lands.

(1) *Pannai tenure*, where the ryot owns and tills the soil. The area under this system is relatively small. The ryot employs cooly labour to supplement his own. He pays for his labour in kind. A ryot with 1 cooly can successfully cultivate 6 acres and the cooly gets, on an average, $\frac{1}{2}$ of the total produce (kalavadi கலாவடி), 2 Madras measures of paddy for every working day and other emoluments. These amount altogether to nearly 2 kalams (1 kalam = 72 Madras measures). This works out to about Rs. 6 per mensem.

(2) *Varam tenure* is that in which the cultivator pays the landlord roughly one half the produce and one half the kist for the privilege of cultivating the land. The manuring charges have to be met by the ryot. In cases where the manuring and kist are borne by the landlord, the tenant pays the former two-thirds of the produce. The cultivation charges in either case are all borne by the tenant, whereas the harvesting expenses are borne in equal shares. This system is the most prevalent one in the tract.

(3) In certain favoured localities, there is a system of contract on lease whereby the tenant pays the landlord every year, irrespective of the actual yield, a fixed quantity of paddy in kind. The lessee bears all cultivation charges and kist. If a second crop is grown in the field, then from one half to three fourths as much again as in the case of the first crop is paid to the lessor. In double crop lands the lease is contracted for both the crops; and if only one crop is grown, a small reduction of about 10 to 15 per cent is made in the amount settled for both the crops. Thus for single crop, 6 to 8 kalams are paid, and for double crop, nearly 10 kalams per acre.

Common Paddy varieties.

The number of varieties of paddy grown in this tract is very small, when compared with the number that may be found in the deltaic

tracts of the Cauvery, the Kistna and the Godavary. There are two main samba varieties, namely Sirumani and Nellore samba and some varieties of kar or short duration coarse paddies.

(1) *Sirumani* is a $5\frac{1}{2}$ to 6 months' winter samba crop. It is fairly well-suited for cultivation in alkaline lands and is not badly affected by occasional submergence. The local crop does not mature evenly and a large proportion of grain is shed in harvesting. It is always sown in a nursery and transplanted.

Varikarudan samba is considered to have good cooking qualities. It is grown on a relatively small scale. It takes one week longer to mature than *Sirumani*. It is suitable for growing only on sweet soils and does not shed badly. These sambas have of late been largely replaced by *Nellore samba*, a $5\frac{1}{2}$ months' crop which grows and ripens fairly uniformly and sheds comparatively less. The yield is slightly greater than the other sambas and its cultivation is rapidly spreading in the tract.

Sirumani, however, commands the best market locally and it gives a higher percentage of husked rice than the other varieties. It also stands pounding better-both raw and parboiled.

Karthigai samba is a $4\frac{1}{2}$ months' samba variety. This was imported from the Tinnevely District and is grown in selected localities to suit a late monsoon. This may be transplanted as late as November and generally follows a kar crop.

Kar (Vellaihar). This is a short duration four months' variety, grown both as a summer and as a winter crop. It may be either broadcasted or transplanted according as to whether the supply of water is scarce, or copious and certain.

There is also a reddish coloured winter variety of kar, known as *Senkar*, specially suited to flooded areas. There is still another variety of kar called *Aruvathankodai* (literally sixty days' summer paddy) which is cultivated in localities where a copious or a certain supply is wanting for over 8 months. It is mostly broad-casted and takes about

100 days to ripen. When transplanted, it is done within 25 days in the nursery. In the upper reaches of the double crop area where the tanks supplement the Periyar supply, the ryots not infrequently raise in the same year 3 kar crops in succession. On the double crop area of the lower reaches, a shorter duration kar and a samba find favour.

There is a variety of paddy known as *Ovarkondan* (literally, Alkali feeder) grown on partially reclaimed alkaline lands which are being prepared for the cultivation of *Sirumani*. It is a 4 months' crop, a poor yielder and grey in colour with a red rice. It is generally broadcasted.

Statement showing the average yields and prices of the different varieties of paddy commonly grown in the Periyar tract.

Varieties.	Average acre yield in		Average per rupee in Madras Measures.
	Madras Measures.	lbs.	
			M. M.
Aruvathankodai ...	500	1,250	14
Kar ...	600	1,500	13
Karthigai samba ...	600	1,500	11
Varikarudan samba ...	700	1,750	10
Nellore samba ...	800	2,000	11
Sirumani ...	750	1,876	10 $\frac{1}{2}$
Ovarkondan ...	400	1,000	—

Most of the paddy grown in the Periyar tract finds a sale in the Madura market. Samba paddy is considered rather a delicacy by the growers and is always disposed of. *Sirumani* and *Kar* especially are purchased in large quantities by merchants from Tirumangalam and the surrounding dry tracts as far as Virudupatti and Ramnad. The quantity thus consumed is roughly estimated at about 20 to 30 thousand bags of *Kar* and 2,000 bags of *Sirumani*.

Cultivation Practices.

A noticeable feature in the cultivation of paddy in this tract is that ryots use a comparatively low seed rate in the nursery. This

averages about 24 Madras measures in a nursery of 6 cents to be transplanted on to one acre. Transplantation is generally done in bunches of 4 to 6. The ryots also realise the value of manuring and they try to help in this direction by various means. Green manure, much valued here as elsewhere, is brought from distant places in country carts or railway trucks. It is found profitable to apply wild indigo leaves even at such a high cost as Rs. 8 per cartload at the rate of anything up to four cartloads per acre. In places close to Madura town, night soil is carted in large quantities at a cost of Rs. 4 to 5 per cart and as much as 5 cartloads are applied per acre. The practice of cattle and sheep penning is commonly resorted to when other manures are not available, and periodically large flocks traverse the area during summer from the outlying dry plains and from Ramnad side. Carting of silt is very common. Castor and other cakes are of late gaining in popularity.

The preliminary cultivation is done with a fair amount of attention, notwithstanding the rather poor quality of the local live-stock. Ryots have no scruples about yoking dry cows and heifers to the plough. Instances are not rare of the poorer class of ryot who may own a single animal borrowing a second animal from his neighbour to plough his 2 or 3 acres, his own animal being lent in exchange as occasion demands. Ordinarily a ryot with an average pair of animals cultivates 5 to 6 acres of wet land. During the harvest season of single and double crop lands respectively, falling within a period of a few weeks over a large compact tract, there is naturally a dearth of labour. As a result, a considerable quantity of paddy is allowed to over-ripe, and shedding of grain is profuse.

The cost of harvesting comes to about 1/10 the value of the produce. Except in summer crops, the sheaves are straightaway threshed and taken home. In the case of Kar varieties, the sheaves are stacked for 3 or 4 days and then threshed by cattle. This is done, because the grain does not shed in Kar as readily as it does in Sambas. During the off season, between March and June, gingelly and cholam are occasionally grown with the summer rains. In suitable localities, where

fields command water facilities from tanks or wells, ragi is also cultivated.

Green Manuring.

It had been the practice in the mamul wet lands scattered throughout the tract to manure the lands with green leaves obtained from the waste lands and forest reserves on the Sirumalai Hills which adjoin the northern edge of the tract. With the advent of the Periyar, the demand for green leaves became so great that the Reserve forests were fast becoming depleted and restrictions in the form of increased seigniorage were placed on the supply from this source. A considerable quantity of green leaf, more especially wild indigo, continues to be brought by road and by rail from the red soils bordering the Trichinopoly District and from the sandy foreshore of the Ramnad District. The supply is so limited and the demand so keen, however, that the price has become prohibitive to all except the wealthiest landlords who now largely monopolise the trade.

It was to meet the demand for green manures that the Agricultural Department started propagandist operations in this tract in 1910. For the first three years advisory work regarding the cultivation of green manures on the paddy land in the off season had to be done spasmodically, at short intervals, owing to a shortage of staff. As this practice was quite new to the tract, progress was naturally slow; but since 1913 two demonstrators have been permanently stationed at Sholavandan and Madura to attend to this work. Since then steady progress has been made, as will be seen from the accompanying statement.

Kolingi (wild indigo) and *daincha* are the two crops which are found to be best suited to the local conditions. *Kolingi* is well suited for the high-lying well-drained sandy lands newly brought under wet cultivation. *Daincha* does best in mamul wet lands. The latter is specially suited for double crop lands where the fallow season is short and the soil inclined to be saline.

Indigo was gaining in favour until the war made the price of this seed prohibitive and checked further extension.

Sunn hemp has not so far been popular, as the existing conditions do not admit of its successful growth. It does best in sweet loamy soils which are irrigable in the dry season. Lands of this nature are very uncommon in the tract.

Statement showing the progress made in the distribution of green manure seeds in lbs. for the past four years in Periyar tract.

Green Manure.	Quantity distributed.			
	1913—1914	1914—1915	1915—1916	1916—1917
	lbs.	lbs.	lbs.	lbs.
Daincha	27,746 }	44,977 }	15,156	8,152
Sunn hemp			1,315	856
Kolingi			39,533	44,647
Indigo			183	192
Total	27,746	44,977	56,187	53,847

It is the experience of several ryots that paddy, following green manures grown *in situ* for 3 or 4 years successively does not respond to this system of green manuring as they do in the first and second years of application. This corroborates the laboratory experiments of the Government Agricultural Chemist that a green manure grown *in situ* has a tendency to exhaust the soil to the detriment of the paddy crop. There are a few villages where, quite naturally, this system of green manuring has become unpopular for this special reason. It is found, however, that an application of about 2 cwts. of ordinary superphosphate to land manured continuously with a green crop grown *in situ* still makes the practice profitable.

Other lines of work.

The advisory work of the Department is not confined solely to advocating the use of green manures. As the confidence of the ryots is being won, the economic planting of paddy, thin sowing of seed in the nursery, the use of superphosphate, fish manure and oil cake, all find a conspicuous place in the programme of work. The spirit of co-operation is yearly becoming more pronounced, and recently two Co-operative Agricultural Societies have been formed in addition to that already existing at Uthangudi. The Madura and Ramnad Agricultural Association, originally known as the Madura Farmer's Club, continues to do good work and is always ready to carry out the advice of the Department. This Association now deals wholesale in green manure seeds, in superphosphate and in fish manure and is showing increasing signs of activity, now that Madura has been made the headquarters of a Deputy Director of Agriculture. Some of the members have this year undertaken to test the suitability of a few varieties of selected paddies supplied by the Government Economic Botanist. The best of these will be distributed on as large a scale as possible, when further experience has been gained of their suitability for the locality.

Conclusion.

The concomitant changes in the agricultural practices of this tract since the inception of the Periyar project in 1895 present many facts in Agricultural Economics of absorbing interest. Though the dividend on the capital invested by Government in the scheme does not approach to the enormous returns obtained from irrigation schemes in the Punjab, yet the project is run at a small profit to Government; and, by increasing the productivity of the land irrigated, it has brought considerable wealth into the district. The officers of the Agricultural Department are endeavouring, with some degree of success, to show the local cultivator how to grow two grains of paddy where he previously grew only

one. If they have succeeded in their mission, and there is evidence to show that they have, at least in part, then according to one great authority, they have a claim to be considered as benefactors to mankind.

K. Sankara Iyer,
Agricultural Demonstrator.

Articles exhibited by the Government Agricultural Chemist, Coimbatore.

Under directions from the Director of Agriculture, Madras, Dr. W. H. Harrison, who was then Government Agricultural Chemist at Coimbatore, set some of the assistants, in the beginning of September, to take up the preparation of suitable substitutes for some of the imported foods, out of indigenous produce. The questions of cost and of commercial possibilities were perhaps outside the scope of the Chemist, but these were, to a certain extent, kept in view, so far as the initial stage would allow. The work was new and involved (1) a study of previous literature, (2) investigation into methods and designing of apparatus and (3) actual preparation. The scope of the work was gradually extended beyond food products, Departmental Agricultural work had to be set aside for a time and the whole staff consisting of the Acting Government Agricultural Chemist and five assistants were engaged on it for nearly two months. As was to be expected, the attempts of the staff were successful in some directions and were not quite satisfactory in others.

The Library at the College, though fairly well equipped with books on Agriculture and the allied sciences, is not so well stocked with books relating to human foods. Apart from it, the manufacturers of these foods, having evolved their processes after much labour and expense, naturally guard the little technical secrets of their manufacture. Such literature as was available was looked

up, and the scantiness of information necessitated our making, in some cases, a previous examination of the original foods for their food values.

Malted foods claimed our first attention. Barley, which is the grain almost universally used as the base for mixing in different malted foods, is grown only to a small extent in Madras. A substitute for barley was sought for, and the important cereal grains of the Presidency, namely, paddy, cholam, ragi and cumbu were each malted and their diastatic activity was determined and compared with barley. Cholam and ragi were found to malt even better than barley and we were able to prepare, from malted cholam and ragi, foods similar to *Benger's food*.

Malted starch liquor was evaporated, at a low temperature and under a reduced pressure, in an improvised apparatus—on the model of a vacuum pan—and malt extract was prepared which compares favourably with *Kepler's Malt Extract*.

The above improvised apparatus came in handy for preparing several products of the types of *Mellin's and Horlick's foods*, *Condensed milk*, *Sanatogen*, *Eucasein* and *Plasmon*. Among other food products which were prepared may be mentioned Grape-nuts from malted cholam, malted ragi and wheat flour, *Parched* and malted foods from rice and cumbu, *Shredded Wheat*, *Vermicelli* and *Mucaroni* from wheat, *Nutrose*, the widely advertised German product from ground-nut meal, *Candied peel* from oranges and limes and *Desiccated coconut*.

Flours for making soup were prepared from the pulse grains, red gram, Bengal gram and green gram and are pronounced to be as good as pea flour. *Sweet potato* and *Malabar plantain* gave meal which gave rather an inferior biscuit, and pure starches were isolated from cholam, ragi and sweet potato.

Malted cholam was found to brew very well and an attempt was made to produce cholam beer.

A fairly successful attempt was made to manufacture cheese of the sample of *Cheddar cheese*, but we have apparently to learn more of the technique of the ripening of the cheese.

Skim milk was manipulated for preparing pure *casein* and, after the removal of the *casein*, *lactose* or milk sugar was crystallised out of the whey. The *casein* was subjected to different kinds of chemical treatment and such diverse articles as *Distemper paints*, *Adhesives*, brown and black *boot polishes* and *photographic printing paper* were prepared out of it.

Lime Juice Cordial and *Citric Acid* were manufactured from limes and *Tartaric acid* from *Tamarind*. *Papain* which is said to have a better digestive action on meat than *Pepsin* was isolated as a pure chemical from the tapping of unripe *papaw* fruits.

For want of time, some of the prepared foods have not yet been analysed for their food values, and this work will be undertaken after Christmas. We have not succeeded yet in manufacturing *margarine* out of pure vegetable fat, having the taste and smell of butter or ghee, but hope to persevere in it.

M. R. Ramaswami Sivan.
Ag. Agricultural Chemist.

Agricultural prosperity is the foundation of all changes.

It does not require much thinking to make a general statement like the above. A concrete example illustrates the above remark. Such examples may be many in the living memory of most of the Agricultural Officers whose happy lot it was to observe the ryots of certain localities where substantial improvements have been effected and ryots are enjoying the fruits of such improvements. Last April, I happened to visit a locality in South Canara where sugar-cane

cultivation has made vast progress in several directions. As *sugarcane* is a paying crop and *jaggery* fetches a high price of late, the ryots of the locality have managed to drive the hungry wolf out of their doors and to save some money for their other needs. In villages where I was well acquainted, the villagers had a free talk with me and gave me opportunities to look into the changes in the inner life of the village. The village of *Bangrakuloor*, near *Mangalore*, with which I have been acquainted for the last ten years, gave me some material for this short note. Changes in several directions have taken place. During my earlier visits, the hospitable seat which a ryot often unwillingly offered was a mat spread on the bund of the field or on the thrashing floor. The ryot did not like that an outsider should see his poverty, hidden in low mud-walled huts thatched with *sugarcane* trash. It is a source of pleasure to see now a few well built tiled houses to which the ryot invites you and offers you a bench or a chair. He does not feel shy of you nor does he want to avoid you. The familiar mud pots, which the ryot used for collecting *sugarcane* juice, are giving place to copper pots. The ryot is no longer satisfied with the dreamy buffaloes which once dragged the lulling wooden mills, but he has purchased a pair of swift walking bullocks to work his more efficient iron mill. He wants to give a better preparatory cultivation to his *sugarcane* crop and attempts to use the *Meston* and similar small iron ploughs. He feels that the work of the country plough is slow and inefficient. The utilisation of human power for lifting water seems to him costly and he contemplates using animal power for it. Formerly he was spending very little on manure and used to go with his family to the seashore and collect some shell-fish and prepare a compost out of it, and use it as a manure for *sugarcane*. Now he is not satisfied with that, but spends some money in purchasing fish manure.

Leaving agricultural changes for a while and turning our attention to the relation between the landlord and the tenant, we find some change has begun to take place. One is not satisfied with the other. The landlord thinks that the head of his tenant has turned now, on account of new wealth. The tenant complains that the

landlord tries to squeeze everything out of him. In former years, the tenant used to supply the landlord with jaggery at Rs. 1—4—0 per maund and paddy straw at Rs. 4 per thousand small bundles. Now as the tenant demands double the prices, the landlord insists on the tenant paying the rent in kind and not in money. The tenant refuses to do so and the landlord threatens him of eviction and the tenant in return attempts in the law courts to establish his rights as a permanent tenant. The landlord says that his land is the source of the wealth and the tenant asserts that it is the labour of his hand and the sweat of his brow that brought in additional wealth. Both the landlord and the tenant conveniently forget, in their struggle, that the Agricultural Department contributed largely towards this additional wealth. The price of land has gone very high, every one is anxious to invest his money on land and every bit of Government waste land is asked for cultivation and assessment. Tenants are ready to pay one or two years' rent in advance to their needy landlords and so ensure their position. Competition for cultivating good land is increasing and the ryots realise at the same time the utility of the co-operative movement. They discuss among themselves the need for co-operative storing and co-operative sale of jaggery. They feel that the merchants are making a big profit at their cost. Supply of fresh water, by constructing dams across the streams, is engaging their attention and some are enquiring about the well boring system.

If we look into the social, educational, and religious sides of the village, perceptible changes have taken place. The village of Bangrakuloor is, more or less, a Roman Catholic colony and most of the cane growers are Christians. They are regarded as sudra converts by their enlightened brethren in the town who profess to be the descendants of Brahmin converts. There was very little of social intercourse between these two sections. Now we find a few young men of these sudra converts attending schools and colleges in Mangalore and many a Blue-stocking who once cared not to look at these low caste people, is casting her glance at these young men with a sigh. The Christian ryots of Bangrakuloor firmly believe that the social pride of their brethren in the town will be sacrificed at the feet

of Mammon and that many a wealthy descendant of the rustic will lead a Blue-stocking to the altar before long.

In the matter of education also, changes are noticed. Mr. M. D'Souza, one of the biggest sugarcane growers in the village, is the Manager of a Primary School and his son is a teacher in the same. Attendance in the school is gradually increasing. In addition to this, there is another school attached to a Church. During recent years both the school and the Church have been rebuilt and greatly improved. An interesting point connected with the rebuilding of this Church and school is that a portion of the money required was raised from the sugarcane growers as a sort of tax on their produce. The priest of the Church one day called a meeting of these cane growers and asked them not to sell their jaggery to any one except to a particular merchant who consented to pay them a fixed price. He further asked them to pay a rupee to the building fund for every candy of jaggery sold by them. On the other hand, the merchant who purchased the jaggery had to pay a small tax for every candy of jaggery purchased by him to the same fund. This device of the priest worked to the advantage of both parties and put his abode in a better foundation.

From this short note, one can see that the material prosperity of the villagers is the cause of all activities and this prosperity is based on Agricultural improvement. A few coins at the disposal of the ryot, after meeting his daily needs, give him courage, enterprise, push and desire for advancement of all kinds. It is no wonder that the ryot often turns a deaf ear to Agricultural sermons when he is labouring under the clutches of poverty. The improvement of the masses consists in the improvement of the soil.

K. T. Alwa.

Extracts.

Ground-nut Cake as Human Food.

We would invite the attention of prospective industrialists in the south of India to the great possibilities of the groundnut industry in

South Arcot as disclosed in a press note just issued by the Government of Bombay. It is the discovery of the possibility of easily turning out of the ground-nut oil-cake a "perfect" food very closely approximating to a patent German food sold here at Rs. 6 per pound, that is of special interest in it. This oil-cake, dried in the sun and reduced to a fine powder, has now been shown to be rich in proteins which are essential constituents of all foods. In our ordinary food, the proteins are built up of certain amino-acids which are stated to be linked together just like the building stones of a house. Now proteins of certain foods lack in some essential amino-acids. Thus, for instance, the proteins in wheat and barley, whilst sufficient to maintain body nutriment, will not, we are told, suffice to promote growth, for in these proteins the amino-acid, lysine, is found to be absent. The ground-nut cake, which has been analysed, contains not only a high proportion of protein but also certain amino-acids in quantity such as lysine. The ground-nut meal, however, is deficient in the amino-acid tryptophane. To overcome this deficiency, dried milk is added; and as the constituents do not go into solution readily, sodium carbonate or bicarbonate is added to them, and the new flour which consists of ground-nut cake, dried milk and bicarbonate of soda contains not only the necessary proteins but also mineral salts such as phosphates and can be prepared at one-twenty-fourth of the cost at which the German patent food, which it could effectively re-place, is now sold in India. Bread made from the new flour has been subjected to analysis, and sent out for trial. The results of these trials are stated to be very encouraging, as the bread is described as pleasant to the taste, easily manipulated, and possessing good keeping qualities. To summarise the possibilities of the ground nut: "Not only can the production of Arachis oil be improved, but the resulting ground-nut cake has a very high food value. The paper-like husks serve a useful purpose for stuffing mattresses and cushions, and also as a possible source of cellulose (55 per cent.) for paper-making, or as a source of fuel. The thin brown coating over the kernel may be used for manure, and also the ashes from the shells, if these are used as fuel. The leaves and branches of the plant form excellent fodder for cattle and the ground-nut cake also is a valuable cattle food." It will thus be seen that there is absolutely no

waste in the ground-nut industry, and that for the oil alone the commercial value is great.—*From the Hindu.*

Punjab Agricultural Department.

Sometime back in noticing the work of the Department of Agriculture in Madras, we referred to the complaint of the Director that inadequate strength of the superior staff interfered with the expansion of the activities over a wider area. A similar difficulty was experienced in the Punjab as well but there seems to be a good prospect of greater expansion in the future. The Punjab's share of the profits to Government, from the export of wheat to Europe, was Rs. 11,70,000 and the whole of this sum will be devoted, as the Government of India have decided already, to non-recurring expenditure for the benefit of agricultural classes. A tentative programme of expenditure, to be spread over several years, has been drawn up and an immediate start will be made with respect to the preliminary measures and minor projects. The Lyallpur Agricultural College is reported to be growing in popularity and there were 202 applications for 40 vacancies in 1917. One important change that will soon be given effect to, is the affiliation of the College to the University and the establishment of a Degree in Agriculture. It is stated that, in anticipation of these changes, the curriculum has recently been remodelled with the approval of the Government; the course for a degree will last four years, but a certificate will be given to those who have completed a two years' course but do not wish to take a degree. One of the means adopted for popularising improved methods is the providing of a short English course for Revenue and Irrigation officers and also a six months' vernacular course at Lyallpur Farm. The experiment is stated to be so very popular that the Government have decided to arrange for similar courses in another place. There can be no doubt of the fact that, as a result of such training, the Revenue and Irrigation officers who frequently come into intimate contact with the ryots, would be able to induce them to take to improved methods of agriculture. A similar experiment might, with great advantage, be introduced in other Provinces also. Valuable data were collected by the Economic Botanist from interesting experiments

in American cotton and wheat, but these have not been conclusively proved as better substitutes to the famous Pusa varieties. Another interesting feature of the Report is that some steps are being taken as a beginning for a scientific study of transport and marketing conditions, an essential subject which has hitherto received but little attention.

From the Hindu.

Fruiting of the Male Papaw tree.

It is a known fact that male and female flowers of the papaw are usually produced on separate trees and that occasionally flowers possessing both characteristics arise in female inflorescences. It has been found that the male tree can be made to bear female flowers and eventually abundant fruits by lopping off the top at an early stage of the growth. Even in the case of a tree with hermaphrodite flowers, when the tree was 3 ft. high, the sprout on the top was pinched off with the result that it threw out several branches; when about three months old, it bore a few fruits and, when eighteen months old, began to bear abundantly. (*From the Agricultural News*).—K. R.

Dairy wash.

A recipe for a new Dairy wash. Mix air-slaked lime in the freshly skimmed milk to a suitable consistency so that it can be applied smoothly with the brush. To each gallon of the mixture add one ounce of table salt. It is advisable to make just sufficient wash for the day and to use it fresh. This wash dries readily on wooden or iron surfaces. It possesses the advantage of adhering firmly, does not flake off and lasts longer than most of the washes now in use. (*Agricultural Gazette of New South Wales, March 1917.*) T. S. V.

Green manures and their solvent action on salts of the soil.

Green manures, kept moist until thoroughly decomposed, gave organic solvents which removed calcium from the soil in amounts

several times that added with the organic solvents. These solvents also removed magnesium, phosphoric acid and iron considerably in excess of the amount dissolved by water alone.

Three per cent of green manure and stable manure, mixed with soil and allowed to undergo partial decomposition, increased the solubility of calcium and phosphoric acid in the soils from 30 to 100 per cent.

The increase in solubility of salts is due in part to the action of the inorganic salts contained in the organic substances or their extracts and in part to the solvent action of the soluble organic compounds formed during organic decompositions. The fact that a deficiency in soluble iron is known to induce certain types of Chlorosis suggests that the beneficial effects following the addition of organic matter may have been in part due to its solvent action on iron and other soil compounds. From the above it will be seen that the effect of green manuring is not merely mechanical but also chemical.

The Journal of Agricultural Research Vol. IX, No. 8. K. K. R.

Indian Forestry.

In a paper read before the Indian section of the Royal Society of Arts on the Economic Development of Indian Forest Products, Mr. B. S. Pearson, Imperial Forest Economist, expressed the opinion that there was a large field for development of bamboo and elephant grass as raw material for paper making in India. Sir Robert Carlyle, who presided, said that he regarded the question of the development of forests of India as a most important one. India needed an increase in revenue in order to meet the great need for larger expenditure in many directions, especially on education, agriculture and industry. Although the forests of India were equal in extent to those of Spain, Portugal and Belgium combined, they represented only three pence in the acre

gross revenue. The development of the forests was impossible without expenditure. A good staff, most advantageous use of money, good roads and best machinery were all necessary.

(*Mysore Economic Journal*). W. R.

Milling of Rice and its Food Value.

The milling of rice partly removes phosphoric acid, potash, vitamins and other constituents and gives it a whiter and more attractive appearance. Rice has a high food value, but brown rice—i. e., rice which has not been milled to remove the outer coating—is richer in phosphoric acid and vitamins than polished rice. According to recent theory, some plants or foods contain substances in very small amount which are essential for the proper performance of the functions of the body; and, when these are not eaten in sufficient quantity, normal health is disturbed. These vitamins are organic compounds and are unstable in character, and there seem to be different groups which give rise to different symptoms. Diseases like Beri-beri or Scurvy which are caused by an exclusive diet of polished rice are cured absolutely by an extract of rice bran or rice polish or by substituting brown rice for polished rice. If, however, other foods containing vitamins are used with polished rice, such diseases do not occur e. g., milk, eggs, beans, peas, fresh meat etc., Although rice has a lower protein content than wheat or corn, it is suggested that it is so extremely used in the world on account of the fact that the proteins of rice, in their general make up, more nearly resemble the proteins of the animal body than the proteins of wheat or corn.

White polished rice cooks better and has probably a better taste than unpolished rice, but the fact remains that it is inferior in nutritive power. (*From Texas Agricultural Station Bulletin*.)

M. R. R.

Students' Corner.

The first batch of Advanced course students had their Diploma Examinations during the month of December and the following gentlemen formed the Boards of Examiners:—

Agriculture.—R. C. Wood Esq., M. A. and R. G. Allan Esq., M. A., Principal, Nagpur College.

Chemistry.—M. R. Ry., M. R. Ramaswami Sivan Ayl., B. A., D. A., and H. E. Annett Esq., Government Agricultural Chemist, U. P.

Botany.—Rai Bahadur K. Rangachariar Ayl., M. A., L. T., and F. R. Parnell Esq., B. A.

Mycology.—W. McRae Esq., M. A., B. Sc., and Dr. Leslie Coleman, Mysore.

Entomology.—M. R. Ry., T. V. Ramakrishna Ayyar Ayl., B. A., and T. B. Fletcher Esq., Imperial Entomologist

Veterinary Science.—A. J. Wilson Esq., and D. A. D. Aitchison Esq., Principal, Madras Veterinary College.

Engineering.—M. R. Ry., H. Venkataramanah, B. A., B. E., and L. B. Green Esq.

Many of our students took part in the "Our Day Celebration sports" of whom Singaram, Seshachalam and K. E. Viswam won prizes. Students, Jagadisan, Balaji Rao, Subramania Pillai and Viswanatha Rao decorated a double bullock cart with various crops grown in the Farm. The cart was majestically drawn by Budha and Shivamalai to the entire approbation of the crowd and a special prize was given to the artistic decoration.

The second year students were taken on a week's tour by the Assistant Principal to Erode, Gobichettipalayam and Tirupur about the end of November. It was a very successful tour and the students had the opportunity of seeing the most fertile portion of the Coimbatore District. The turmeric and the plantain cultivations of Erode and the intensive paddy cultivation of Gobichettipalayam gave ample matter to the observing eye and the enquiring mind of the student. Mr. W. Raghavachari, the Agricultural Demonstrator working in the Coimbatore District, was with the party throughout the tour.

The busy colony seems to be very quiet as the College was closed for the Christmas holidays on the 15th December and will be reopened on the 15th January 1918. We wish the students pleasant holidays and hope to see them with renewed energy.

News.

Mr. Daniel Ponniah, late Sub-Assistant in Entomology has been appointed as Insectory Assistant to the Government Entomologist, Federated Malay States on dollars 110-20-150. He left Coimbatore on 30th November to the States. We wish him every success in his new appointment.

Our Editor, Mr. T. S. Venkataraman, left Coimbatore early this month on a tour to Poona, Pusa, Aligarh, Gurudaspoor, Shajihanpoor, Sabur and other places in Northern India to study the sugarcane cultivation there and might be back about the end of January. We wish him a pleasant tour and a speedy return to us to inspire greater activities in the Editorial Board.

Mr. B. S. Tolar, an ex-student of our College, has been appointed 2nd Assistant and Agricultural Instructor in Mercara Secondary training school.

Messrs. K. Ramiah and D. Panakala Rao and M. R. Balakrishnan (Mr. M. R. R. Sivan's eldest son) have returned, with renewed vigour, from their military training, at Trichinopoly, under the Defence of India Scheme, their Regiment being called "The First Madras Infantry."

Diploma Examination results of 1917.

Agriculture.

Pass.

1. Ramaswami Ayyar C. V.
2. Chakrapanimarar K. W.
3. Kuppuswami Ayyangar S.
4. Vedantam S.
5. Dharmalingam S.
6. Govindapoi K.
7. Ramachandra Ayyar V.
8. Chokalingam R.

Agricultural Chemistry.

First Class.

1. Ramaswami Ayyar C. V.
2. Chokalingam R.
3. Chakrapanimarar K. W.
4. Vedantam S.
5. Kuppuswami Ayyangar S.

Pass.

6. Govindapoi K.
7. Ramachandra Ayyar V.
8. Dharmalingam S.

Agricultural Botany.

Pass.

1. Ramaswami Ayyar C. V.
2. Chakrapanimarar K. W.
3. Chokalingam R.
4. Vedantam S.
5. Kuppuswami Ayyangar S.
6. Govindapoi K.
7. Ramachandra Ayyar V.
8. Dharmalingam S.

Mycology.

First Class.

1. Ramaswami Ayyar C. V.
2. Kuppuswami Ayyangar S.
3. Chakrapanimarar K. W.
4. Ramachandra Ayyar V.
5. Vedantam S.
6. Dharmalingam S.

Pass.

7. Govindapoi K.
8. Chokalingam R.

Entomology.**First Class.**

1. Ramaswami Ayyar C. V.
2. Dharmalingam S.
3. Chokalingam R.
4. Vedantam S.

Pass.

5. Chakrapanimarar K. W.
6. Govindapoi K.
7. Kuppuswami Ayyangar S.
8. Ramachandra Ayyar V.

Agricultural Engineering.**First Class.**

1. Ramaswami Ayyar C. V.
2. Chakrapanimarar K. W.

Pass.

3. Ramachandra Ayyar V.
4. Chokalingam R.
5. Vedantam S.
6. Dharmalingam S.
7. Govindapoi K.
8. Kuppuswami Ayyangar S.

Veterinary Science.**First Class.**

1. Ramaswami Ayyar C. V.

Pass.

2. Chakrapanimarar K. W.
3. Vedantam S.
4. Chokalingam R.
5. Kuppuswami Ayyangar S.
6. Dharmalingam S.
7. Govindapoi.
8. Ramachandra Ayyar V.

Prizes and Medals.

Robertson prize for Agriculture (Gold Medal) Ramaswami Ayyar C. V.
Keess' prize for Agricultural Chemistry (Gold Medal) Ramaswami Ayyar C. V.

First Class Diploma for having passed in five out of seven subjects in the First Class. Ramaswami Ayyar C. V.

We offer our hearty congratulations to all the students of late class IV for having obtained the Diploma of Licentiate in Agriculture and especially to C. V. Ramaswami Ayyar for having secured a First Class Diploma and secured the coveted medals. We wish them all success.

Departmental Notes.

On return from Military duty, Mr. Panakala Rao, L. Ag., will rejoin the Sugarcane Station under the Government, Sugarcane Expert.

Mr. M. Chinnaswami Naidu, Assistant Farm Manager, is transferred from the Sugarcane Station to Palur.

Mr. D. Balakrishnamurti, Assistant Director of Agriculture, First Circle, is granted privilege leave for three months from or after 15th January 1918.

Mr. A. V. Thirumuruganatha Pillai is to act as Assistant Director of Agriculture vice Mr. D. Balakrishnamurti granted leave or until further orders.

Mr. T. Ramiah, Assistant in Economic Botany on probation, is granted leave for 15 days from 22nd November 1917 on loss of pay.

Mr. John A. Muliyl, Assistant in Entomology on probation, is granted privilege leave for 18 days in continuation of the X'mas holidays.

The combined privilege leave for 2 months and 29 days and furlough for one year granted to Mr. K. Narayana Ayyangar, Agricultural Demonstrator, is extended by 9 months and 1 day.

Mr. V. S. Subramannia Sastri, Assistant Farm Manager is granted combined privilege leave and sick leave on Medical certificate for 6 months from date of relief.

Wanted a competent Agricultural College trained Manager for a Cattle breeding and Dairy farm, four miles from Guntur to efficiently manage the same and fodder cultivation of about 300 acres and 200 acres pasture. Apply stating age, qualifications previous experience and pay required, to M. R. Ry.; R. Sriramulu Sastry, B. A., B. L., High Court Vakil, Madras.

APPENDIX.

The Madras Agricultural Students' Union,
Agricultural College, Lawley Road, P. O.,

11th June 1917.

DEAR SIRs,

The Working Committee has great pleasure in inviting you to this year's College Day and Conference to be held from the 14th to 17th July.

The Hon'ble Sir Alexander Gordon Cardew, K. C. S. I., I. C. S., has kindly consented to preside at the Conference.

The suggestions regarding the amendments to the rules of the Union received by the General Secretary are published overleaf. These will be discussed informally the previous day before being placed at the Annual General Meeting.

I beg to invite your attention to the last sentence of Rule No. 11 of the Union rules published in the cover of the journal and to request that you will please send your votes for the election of the moffusil Vice-Presidents and of the Council Members.

The expenses incurred by the Union in connection with the College Day last year exceeded Rs. 500. The Committee confidently hopes to receive, as during past years, liberal contributions towards the success of the College Day and Conference and requests you to send in yours to the General Secretary at an early date.

The Warden of the Students' Hostel has kindly consented to arrange for the boarding at Re. 1 per diem during the Conference and it will greatly facilitate arrangements if you could let me know in good time the date of your arrival.

I remain,
Dear Sirs,
Yours sincerely,
K. KRISHNAMURTI RAO,
General Secretary.

To
All the Members of the
Madras Agricultural Students' Union.

Proposed Changes in Rules.

In Rule No. 10. Delete last sentence "Two resident members etc."

Proposed by Mr. R. C. Wood and seconded by Mr. D. Ananda Rao.

In Rule No. 11. Alter the existing sentence into "From amongst the last, the General Secretary and the Editor shall be elected."

Proposed by Mr. T. S. Venkataraman and seconded by Mr. K. Krishnamurti Rao.

Rule No. 11. Alter into "All members of Council shall be elected on the occasion of the College Day by the Electoral Board consisting of (a) 20 old student members (b) 5 officer members and (c) 10 students under training—three from each of the classes I and II, and two from each of the classes III and IV. The representatives to the above Board under the groups (a) and (b) will be elected at a General Body Meeting consisting of old students and officer members while students of each class will nominate their own representatives.

Proposed by Mr. Krishnamurti Rao and seconded by Mr. T. S. Venkataraman.

Rule No. 12. Alter into "The resident Vice President and the 7 members of council shall form a Working Committee. The Working Committee so formed shall appoint from amongst their number a Treasurer, a Manager, a Sub-Editor and an Assistant Secretary, the last being a student under training. Four student members, one from each class, nominated by the Electoral Board will co-operate with the above Committee.

Proposed by Mr. T. S. Venkataraman and seconded by Mr. G. N. Rangaswami Iyengar.

Rule No. 13. Alter into "The conduct of the journal shall be in the hands of an Editorial Board consisting of (1) the Editor (2) the Sub-Editor (3) the Publisher (4) the Manager and one other member.

Proposed by Mr. Ananda Rao and seconded by Mr. C. Narayana Ayyar.

Members of The Madras Agricultural Students' Union.

Corrected up to 10th June 1917.

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42.	Stuart, G. A. D., I. C. S.	
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45.	Subbaraya Ayyar, P., B. A., Rao Bahadur.	10
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189. Sankaranarayanan, K. R.
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191. Sankaran Nair, Kunhi, L. Ag.
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194. Seshachari, C. V., L. Ag.
195. Sitharama Patrudu, L. Ag.
196. Sitharama Sastri, G.
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198. Sivarama Rao, D. B., L. Ag.
199. Siva Rao, Bhairya, L. Ag.
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203. Srinivasachari, N. R.
204. Srinivasa Charlu, T. V.
205. Sriramulu Pantulu, R.
206. Sriramulu, K.
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209. Subramania Ayyar, A. K., L. M. E.
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211. Subramania Ayyar, P. S., L. Ag.
212. Subramania Ayyar, T. V., D. A.
213. Subramania Kandar, P.
214. Subramania Sastri, V. S., D. A.
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216. Sundararamayyar, K.
217. Suryanarayana Sankarapalli.
218. Swami Rao, R., L. Ag.
219. Tilloo, K. B., D. A.
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224. Venkaswami Rao, T. R., D. A.
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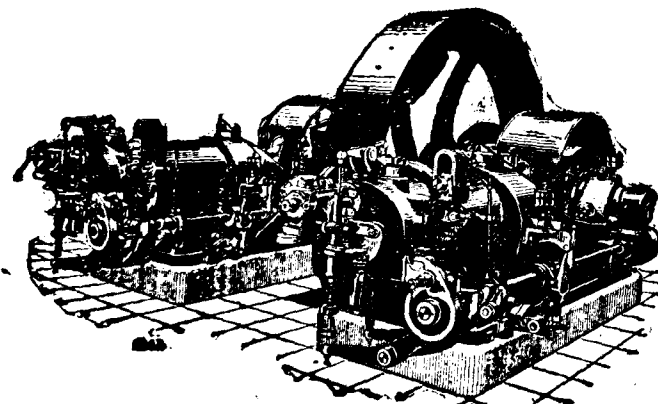
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| 272. | Janakiraman, P. | 3 |
| 273. | Krishnaswamy Dikshithar. | |
| 274. | Lakshmayya, J. | 1 |
| 275. | Mahabala Rao, K. | 1 |
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| 280. | Ramaswami Raju, K. A. | 1 |
| 281. | Rangayya, G. | 1 |
| 282. | Satyanarayana Gupta, K. | 2 |

283. Satyanarayana, K.
 284. Sitharamayya, R.
 285. Srinivasan, N.
 286. Subramaniam, K. K.
 287. Subramania Pillai, M.
 288. Subramania Pillai, V. R.
 289. Varadarajan, V. V. S.
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Associates.—1. Dhanappa Pillai.	1
First Class.—2. S. A. Sankara Ayyar.	6
Ordinary.—3. Ahmed Hussain.	1
4. Kondayya Sarma, A.	1
5. Neelakanta Ayyar, A. S.	2
6. Rangaswami Ayyangar, E. N.	1
7. Sitharama Ayyar, K.	3
8. Srinivasa Ayyangar, N.	2
9. Venkatachala Mudaliar, M.	1
10. Anantarama Ayyar, T. G.	4
11. Arulanandam Pillai, C.	1
12. Balaji Rao, K.	1
13. Balakrishna Ayyar, M. A.	4
14. Gopalakrishna Paul, M.	2
15. Govindan Nambiar, K.	3
16. Hanumanta Rao, P. V.	1
17. Hanumanulu, S. P. V.	1
18. Jacob, K. M.	3
19. Kanappa Pillai, P.	1
20. Kuriyan, P. K.	2
21. Krishnaswami Pillai, K.	3
22. Kutti Krishna Menon.	1
23. Lakshmipathi, Rao, T.	2
24. Maria Susai, A.	1
25. Narasimhachari, L.	4
26. Narayana Ayyar, L. K.	1
27. Nellakumara Pillai, P.	1
28. Paramanayagam Asari.	1
29. Rajagopala Ayyar, T. K.	1
30. Ramalingayya, A.	1

31. Ramana Rai, K. S.	1
32. Ramaswami Ayyar, A.	1
33. Sanjivi Rao, K. N.	2
34. Sankunni Menon, K.	4
35. Sankaram Pillai, K. S.	3
36. Sundaram Ayyar, C. V.	1
37. Sinnappa Tolar, B.	2
38. Subrahmanya Ayyar, S.	1
39. Subbayyar, S.	3
40. Veeraswami, B.	3
41. Venkatanarasimham, S.	1
42. Vridhachallam Pillai, U.	3
43. Vaidhyanadha Ayyar, M.	1
44. Yesudasan, A.	3
Estate.-45. Rangaswami Ayyangar, T. A.	4
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47. Venkatesha Ayyar, C. K.	1
48. Sreenivasa Ayyangar, C. R.	3
49. Wilson, A. J. (<i>Officer Member</i>).	1

College Day and Conference, 1917.

General Programme.

July 14th Saturday 3 to 7 P. M.	Sports.
	Union "At Home."
	Bonfire.
„ 15th Sunday 8 to 10-30 A.M.	First session of the Conference.
„ „ 5 P. M.	Football.
„ 16th Monday 8 to 10-30 A.M.	Second session of the Conference.
„ 1-30 to 4 P. M.	General meeting of Members.
„ 5 P. M.	Hockey.
„ 9 P. M.	Entertainment.

K. KRISHNAMURTI RAO,
General Secretary.

Subscriptions of over One Rupee received towards the expenses of the College Day celebrations of 1916.

	Rs.
Stuart, G. A. D., I. C. S.	30
Wood, R. C., M. A.	30
Couchman, Hon'ble M. E., I. C. S.	25
Barber, Hon'ble E. F.	15
Anstead, R. D., B. Sc.	10
Barber, C. A., M. A., F. E. S., Sc. D.	10
Chinnaswami Pillai, I., Rao Bahadur.	10
Carruth, A.	10
Ettiyapuram Rajah.	10
Fletcher T. Bainbridge, F. E. S., F. Z. S., S. R. N.	10
Harrison, W. H., D. Sc.	10
Krishna Ayyangar, N.	10
Krishnan Nayanar, Vengail.	10
McRae, W., M. A., B. Sc., F. L. S.	10
Parnell, F. R., B. A.	10
Ramabhadra Nayudu Garu, V., Hon'ble Dewan Bahadur	10
Ramalingam Chettiar, T. A., B. A. B. L.	10
Srinivasam Pillai, K. S., Rao Bahadur.	10
Thomas Roger, B. Sc.	10
Veerarayan Thirumalpad.	10
Zamindar of South Uyyur.	10
Chelva Ranga Raju, J. R.	7
Ananda Rao Garu, D., B. Sc.	5
Balakrishnamurti, D., D. A.	5
Deviah, K. C.	5
Ramasastrulu Nayudu Garu, K. R., B. Sc.	5
Ramaswami Sivan, M. R., B. A., D. A.	5
Ranga Raju, J. R.	5
Daniell, S., L. Ag.	3
Jogi Raju, G., D. A.	3

Kolandaswami Pillai, N. S.	....	3
Muthuswami Ayyar, V., D. A.	....	3
Narasinga Raju, C., L. Ag.	....	3
Rajagopalachari, T. V., D. A.	....	3
Rama Rao, Y.	....	3
Tadulinga Mudaliar, C., F. L. S.	....	3
Thirumuruganatham Pillai, A. V., D. A.	....	3
Vellingiri Gounder	....	3
Gopalakrishna Raju, L. Ag.	....	2
Govinda Kidavu, M., D. A.	....	2
*Jagadeesan.	....	2
Javarayya, R. C., L. Ag.	....	2
*Kuppuswami Ayyar, Y.	....	2
*Namasivayam Pillai.	....	2
Narayaniab, S., L. Ag.	....	2
*Raghavan, K. K.	....	2
Raghavachari, K., L. Ag.	....	2
Ramiah, K., L. Ag.	....	2
Rama Rao, A., Rai Sahib.	....	2
Ramachandra Ayyar, S., D. A.	....	2
Ramaswami Ayyar, T. S., L. Ag.	....	2
Ranganath, T. R., L. Ag.	....	2
Sitharamaswami Nayudu, N.	....	2
Subba Rao Pantulu, N., Rao Bahadur	....	2
Subrahmanya Ayyar, S., D. A.	....	2
*Viswanatha Ayyar, V. S.	....	2
Wilson, A. J.	....	2
Cheriyar Jacob, K., L. Ag.	1-8-0	
Krishnamurti Rao, K., D. A.	1-8-0	
Onkaram, P. J.	1-8-0	
*Ranga Reddy, C. M.	1-8-0	
*Srinivasa Rao, N.	1-8-0	
*Srinivasa Pillai, M.	1-8-0	
*Ayyaswami, U. S.	1-4-0	
Rangaswami Ayyangar, T. A.	1-4-0	

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