



The Second Conference of the Madras Agricultural Students Union 1912.

THE JOURNAL

OF

The Madras Agricultural Students' Union

Foreword

The literary enterprise on which the Madras Agricultural Students' Union is launching is a very humble attempt. It is the organ of the Union which is composed chiefly of the past students of the late College of Agriculture, Saidapet and of the new Coimbatore College, and of the present students of the latter institution. The Saidapet College and Farm had to be closed on account of the unsuitability of the soil for varied experiments, after a life of over 30 years, and the work begun at Saidapet is continued at the Coimbatore College with a larger staff and greater resources now at its command. It is conceded by no less an authority than the Principal of the new College that the present institution is a continuation and expansion of the older. The memories of those who worked at Saidapet are cherished with esteem at Coimbatore in several ways. The portrait of the late Mr. W. R. Robertson, the founder and first Principal of the Saidapet College adorns the big lecture hall at Coimbatore. The Robertson Prize instituted long ago at Saidapet, and the Keess Prize, endowed after the closing of the Saidapet College, and named after Mr. W. Keess, the successor of Mr. Robertson, are awarded in the younger institution at Coimbatore for proficiency in Agriculture and Agricultural Chemistry respectively. Some of the main roads in the large Central Farm at Coimbatore have been named after Messrs. Robertson, Keess, Benson and Subba Rao, all men who have been long connected with Saidapet. The newly organised Agricultural Department is still largely manned by the ex-students of Saidapet, both

at the College and in the Farms, and they have shown themselves equal to the increased work and responsibilities and their work has also largely been appreciated.

While the new institution has extended the hand of fellowship to the old, we shall see how far the alumni of the older College have reciprocated these feelings. There are some who have joined the Students' Union and believe in the possibilities and usefulness of joining the new and the old, and are even quite enthusiastic that the Union is probably the best medium by which they will keep in friendly touch with the new College. They consider themselves as though they were students of the Coimbatore College. There are some, we are afraid, who have actually lost touch even with their own old *alma mater* and would not be shaken from their indifferent attitude. They may be likened to some ungrateful sons who have neglected their parents in old age, a more heinous offence than this not having been thought of in India. There are others again and, by far, the greater number, who have not heard of this Union or who, having heard of it, do not know if any useful purpose will be served by their joining it. To these we beg to commend the story of "the old man, his sons and the bundle of twigs," a story which illustrates the proverb "union is strength." An *esprit de corps* can be created, and more useful work can be attained, only if a greater number join in doing it. To those who are sceptical of our doing any good work, we can only say "come and see," and we respectfully invite them to attend the annual celebrations and put forth Tug of War teams, teams organised not only to win prizes at the College Athletic sports but also, in a more extended sense, to wage war against ignorance and prejudice and to overcome the innumerable obstacles standing in the way of the agricultural advancement of the country.

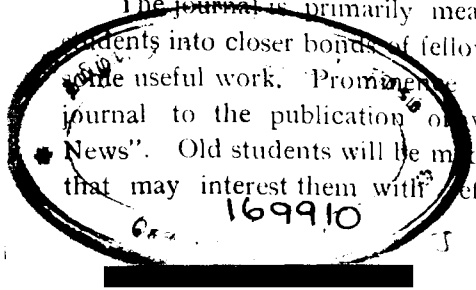
The journal is primarily meant to draw the old and the new students into closer bonds of fellowship with a view to turn out more useful work. Prominence will, therefore, be given in the journal to the publication of what may be called "College News". Old students will be made acquainted with information that may interest them with reference to what is taking place

in the College. Notes summarising the work of the experimental stations will be an important feature of the journal. It is proposed that the subjects treated of should, as far as possible, have a practical aspect and, with this object, old students and other correspondents will be requested to send contributions stating practical experiences and personal difficulties, omitting all subjects which may have the least political tinge in them. Those who have been entrusted with the conducting of the journal are Government servants who have very little leisure beyond their official duties and, as much cannot be expected from them as from a full-timed staff of editors and managers. It is chiefly for this reason that the publication is to be a small quarterly one. It is, however, hoped that the journal will supply a real need not only for the old students of the College, but as well for others who may be interested in the progress of the agricultural condition of the country, as for instance, the enlightened Zemindars, landlords and members of the agricultural associations of the Presidency and who, therefore, wish to be in touch with what is being done by the new Department of Agriculture for the welfare of India.

Horns; their diseases and injuries; dehoronation.

Hoofed quadrupeds form a very large section of mammals and are comprized under the order Ungulata. Most of the animals domesticated by man such as the horse, the ass, the ox, buffaloes, sheep, goats, camels, pigs and elephants belong to this order. Again most of these domesticated Ungulates belong to a suborder known as Ruminantia, which includes cattle, buffaloes, sheep, goats, camels &c. The domestication of these animals, particularly cattle and sheep, can be traced back, like the culture of land, to the very first family of man. Of the sons of Adam, Cain and Abel, it is recorded in the Bible that the former was a husbandman and the latter a shepherd.

Barring the rhinoceros, whose so-called horn is no horn proper, as it has no bony core but consists of a protuberance on the nose made up of hairs matted and agglutinated together, all the horned animals are ruminants. Ruminants are distinguished



from other mammals by some definite and peculiar characteristics. As a rule, there are no incisor and canine teeth in the upper jaw and their place is taken by a dense fibrous pad, called dental pad, against which the lower incisors cut. The lower jaw has 6 incisors and 2 canines, which last are small and resemble the incisors. There are 3 premolars and 3 molars on each side of each jaw. Between the canine and the incisor teeth on the one hand and the premolars and the molars on the other, there is a long edentulous space. The typical dental formula is as follows.

Upper jaw, on each side	0-0	0-0	3-3	3-3	
	incisors—	canines—	premolars—	molars—	total 32
Lower jaw, on each side	3-3	1-1	3-3	3-3	

Their feet are cloven, that is, they have two functional digits (Tamil:—Kolambu). There are besides two rudimentary toes (Tamil:—Sirukolambu) at the back of the foot but these do not touch the ground. Ruminants are so called on account of the fact that they ruminate or chew the cud, that is, the food is imperfectly masticated and swallowed, then it is sent up to the mouth again through the gullet, thoroughly masticated and swallowed. Associated with this is a complex stomach consisting of 4 compartments. The majority of the ruminants possess horns, which have for their base a protuberance of the frontal bone—core of the horn—(Tamil Kuruthu).

The principal families of the ruminants are the following:—

Camelidae, which includes the camels and also the llama or alpaca domesticated in America. These are hornless.

Cervidae, that is the deer tribe. The deer are absolutely distinguished from all other ruminants by the existence of antlers, which are invariably present in the male sex. They are absent in the female with the exception of the reindeer or Polar deer, in which they are present in both the sexes. The antlers are branched horns and are solid structures and not hollow like the horns of cattle. The antlers are cast annually and reproduced every year at or after the breeding or rutting season. At first the antlers are covered with a hairy sensitive skin, "the velvet," but later the skin dries up, splits and peels off or is rubbed off by the animal.

Giraffidae, represented by the interesting species giraffe. Their horns differ from those of the other ruminants. They are small bony prominences of the frontal bones, which are covered with a true and unmodified skin. The horns are not shed.

The remaining three families, *antelopidae*, *bovidae* and *ovidae* are closely allied to each other. Both the male and the female may have horns or the male alone may be horned. The horns are different from the antlers of the *cervidae*. They are not shed as in the deer but persistent. They consist of a hollow bony core as the base, which is covered by a hollow case of horn. Hence these three families are called '*Capicornia*'. In antelopes, as a rule, there are horns in both sexes. The horns are annulated and twisted and they curve back towards the neck. The nilgai of India belongs to this family. The family *bovidae* includes the oxen and the buffaloes. In the ox the horns stand out from the side of the skull, are round and smooth and are simply curved and not twisted. In the buffaloes the horns are flattened, marked with rings and depressions and are generally simply curved backwards but in the Delhi buffaloes are twisted towards the end. The family *ovidae* is composed of sheep and goats. In sheep the horns may be present in both sexes or only in the male. The horns are flat, ringed and spirally twisted. In goats the horns are comparatively more rounded. They are not spirally curved but arched backwards.

Presence of horns makes cattle liable to injuries from fights and from accidents. If young animals are dehorned, they are said to grow muscular and strong and become more docile. Hornless animals can be tied closer together and they can be safely trucked during transit by railways. There are breeds of cattle in Europe which are hornless. Horns can be removed or their growth prevented. In the Tanjore district the cattle locally bred are dehorned when young. Dehoration is an easy and not a painful operation in young animals. It can be effected by means of a hot iron or caustics. The best age to dehorn is 4 to 6 months or as soon as the budding horn can be felt on the head. Clip off the hair from round about the part and then run a heated iron over it forwards,

backwards and crosswise, until the part is roasted. Instead of the hot iron, some caustics can be used, such as caustic potash or soda. Burnt alum and burnt sulphate of copper, powdered and mixed with a little ghee, can also be used. The juice of the muddar plant (Tam :—yerukam) can also be employed. The above substances must be well rubbed on the part and the application repeated until the horny cap comes off and the part underneath is ulcerated. After each application some castor or cocoanut oil must be applied to the neighbouring parts. Dehoration of adult animals is a comparatively more difficult and painful operation and the wound takes longer to heal. The horn must be removed with a saw, tar must then be applied and a little cotton wool spread over and the part bandaged.

The following are the chief diseases to which the horns are subject and the accidents to which they are liable :—

Brittle horns :—The horn becomes dry, splits and comes off in layers. Rub the horn occasionally with a mixture of equal parts of tar, fat and wax. The substances must be intimately mixed over a slow fire.

Ulceration of the core :—The core may in some places be exposed and ulcerated as a consequence of 'brittle horns' or of the horns being shaved down to the quick. Cattle owners are often in the habit of shaving the horns when taking their cattle for sale. Apply to the part tar to which a little powdered alum or sulphate of copper has been added and put on a bandage. The ulceration may run on to a sort of fungoid growth, when the best thing would be to saw through the horn below the seat of the lesion.

Inflammation of the root of horn :—This is shewn by heat, hardness, swelling and tenderness of the root of the horn. The cause of this is very often a contusion or concussion of the horn from some accident. Foment the part with hot water once daily for three days, then put on a bandage and keep it continually wetted with cold water. Should the horn be noticed to gradually bend down, it is advisable to saw the horn away at the root, otherwise the ulceration may extend on either side to the frontal sinuses and to the core.

Fracture of the horn :—This often occurs from animals fighting or from some accident. The horn core may be fractured transversely without injury of the horn. The latter acts as splints and no particular treatment is necessary beyond rest and a cold bandage to the horn. In some cases the horn above is stripped off without the core being injured. In such cases clean the core gently with carbolic lotion and cover it with tarred tow and then with a bandage. When both core and horn have been broken off, the rough projections and broken fragments of bone must be removed and sawn level. The bleeding may be stopped with hot iron and the part dressed as above.

S. L. D'SILVA.

Departmental.

Mr. A. E. Castle-Stuart Stuart who was First Member of the Board of Revenue and Commissioner of Agriculture for several years has retired 3 months ago after a long and meritorious service in the Madras Presidency. It was during his tenure of office in the Board that the new Department of Agriculture was organised in Madras. He had the honour and privilege of welcoming H. E. Sir Arthur Lawley, Governor of Madras, both at the laying of the foundation stone and at the opening of the Agricultural College and Research Institute at Coimbatore. He was the moving spirit, along with the late Mr. H. K. Beauchamp, Editor of the *Madras Mail*, of the Central Agricultural Committee, Madras, and it was due to his exertions that the District Agricultural Associations were formed. He presided at most of the Cattle Shows and Agricultural Exhibitions of the Presidency during the last decade and the eloquent addresses he delivered on all these occasions showed the keen interest he evinced in the agricultural classes. We wish him a long lease of life in his well-merited retirement and hope he will continue to take an interest in the Agricultural prosperity of Madras of which he was a distinguished Civilian.

Mr. M. E. Couchman, I.C.S., who was the Director of the Madras Agricultural Department ever since it was newly organised about 5 years ago, having taken long leave from the end of last

year, Mr. G. A. D. Stuart, I. C. S. was acting as Director until about the middle of July 1912 when he took leave. Mr. H. C. Sampson, Deputy Director of Agriculture, Southern Division, is now acting as Director, and Mr. K. R. Ramasastulu Naidu, Assistant Director of Agriculture is acting for Mr. Sampson.

The Entomological work of this Department was until recently under the control of the Government Botanist in addition to his own duties. Mr. T. Bainbrigge Fletcher, F. Z. S., F. E. S. took charge in April last as Entomologist to the Government of Madras.

Mr. W. H. Harrison is on leave for 6 months from April last and Mr. M. R. Ramaswami Sivan, Chief Assistant, is acting as Agricultural Chemist. Mr. T. Lakshmana Rao, B.A., Librarian, Principal's Office, has been appointed an assistant in the Chemistry Section in the above leave arrangement.

Mr. R. Ramaswami Aiyar, who was Farm Manager on special duty in the Northern Division and who has had considerable teaching experience at the Saidapet College, is now in charge of the practical training of students of Class III at the Coimbatore institution.

Mr. D. Ananda Rao, Assistant Director of Agriculture, Northern Division who went to England in April last on 2 months' leave has extended his leave by 6 months.

Notes.

Regarding the Licentiates in Agriculture and others who passed out during the last two years, the following information may be of interest to our readers. Messrs. K. P. Sundaram Aiyar, K. T. Bhandary, K. T. Alwa M. K. Nambyar, C. V. Seshachari and C. S. Madiah have accepted appointments as Assistant Farm Managers, the first two being posted to Manganallur, the third to Palur and the others to Coimbatore. Messrs. N. Satakopa Aiyangar and T. V. Srinivasacharlu are Home Farm Superintendents in Parakimedi and Mirzapur Estates respectively. Mr. George M. Eapen is Chemical Assistant under the Director of Agriculture, Travancore. Mr. T. Ranganath is Assistant to the Mycologist at Coimbatore. Mr. S. Daniell has been appointed Assistant Curator at the Lal Bagh, Bangalore. Mr. T. A. Krishna Aiyar is Agricultural

Superintendent under the Madura District Agricultural Association and Mr. N. Sivaramakrishna Aiyar has taken service under Rao Bahadur T. Ratanasawmy Nadar of Tranquebar. Mr. P. K. Atchan is looking after his vast landed property in Cochin State and Mr. A. Chinnathambi Pillai is farming on his own account near Watrap in Ramnad District. Messrs. B. Dwarakanath and K. Jacob Cheriyan are now at Pusa undergoing a postgraduate course in Chemistry and Botany respectively.

Mr. F. R. Hemingway, I. C. S. Collector of Coimbatore takes a great deal of interest in the dissemination of agricultural improvements amongst the cultivators of the district and makes it a point to utilise the day after the District Board meeting, for going over the Central Farm, along with the District Board Members, Members of the Agricultural Association, and a large number of intelligent ryots who are brought by the Divisional Officers and Tahsildars. The Principal of the College, in his turn, organises some demonstration on the Farm, and the methods adopted therein are explained to the cultivators by himself and his assistants, sometimes assisted by the students. The cultivators ask questions freely which are as readily answered. These parties have come here on different occasions, at one time to see the improved jaggery boiling, at another to see the green maunre plants in different stages of growth, on a third occasion to see the thin sowing of paddy in nursery beds, and on a fourth to see the single transplantation of paddy seedlings, and so on. Occasionally mess arrangements are made for these parties in the College Hostel, and there were, on one occasion, nearly 300 of them.

Proceedings of the Board of Agriculture held at Pusa can be had of the Superintendent, Government Printing, Calcutta for 10 annas. It is a Blue Book containing the opinions of eminent experts working in the different provinces and is worth a careful perusal by all educated men. One of the subjects dealt with was "Agricultural Associations." Although Madras Presidency was foremost in starting District Associations most of them are now practically extinct and very little work has been turned out by them in the dissemination of agricultural improvements. Dr. H. H.

Mann, Principal, Agricultural College, Poona, who was the Chairman of the sub-committee appointed by the Board to consider this question has reviewed the subject fully in the July number of the Pusa Agricultural Journal and we commend the article extracted elsewhere, to the careful perusal of our readers.

Copies of the group photograph which was taken at the last agricultural Conference and a reduced print of which is attached to this number of the journal can be had from Mr. Gurusawmy Pillai, Photographer, Coimbatore at a cost of Rs. 1-0-0 for a silver print and Rs. 1-4-0 for a bromide print, exclusive of postage.

The Estate.

Water is pumped by an Engine on to a large and high masonry reservoir and supplied for the last one month by pipes to the several lines, and the flow of water in the taps is now regular. The want of a good supply of water was very much felt until now by every one on the estate and we are glad of the convenience, and hope that house gardens will once more be in evidence.

The recrudescence of plague in a mild form is reported from a few villages on the other side of Coimbatore but Coimbatore town is unaffected and there is absolutely no anxiety on the estate, especially in view of the excellent sanitary arrangements here.

With the help of voluntary donations, an elementary school for the children in the estate was maintained for the last two years, with Mr. K. Rangachariar as Secretary. We understand that the District Board sanctioned the opening of a Board Elementary School under the management of the Educational Department with two trained teachers and the school was formally opened on 16th September by the Principal.

The Officers' Club, open to all officers in Superior Service residing in or employed in the estate, has added a Tennis Court. Mr. R. V. Subramania Aiyar is the President and Mr. T. Lakshmana Rao the Secretary.

The College Branch of the Coimbatore Co-operative Stores is now located in a terraced building of its own. The success which has so far been attained in its working is due largely to Mr. P. A. Raghunathaswami Aiyangar who had to resign recently on

account of pressure of official work. The Secretary of the Head office is occasionally attending here and we hope that some one on the estate will soon be appointed to exercise immediate supervision.

Since the closing of the D. P. W. dispensary three years ago, the residents on the estate have felt the need of a local medical institution more than any other. We understand that a fairly large hospital is in contemplation of being constructed for the combined use of the Agricultural College and the Forest College. The buildings in the Forest College are in progress and we pray that the construction of the Hospital may be undertaken as soon as possible.

The new Dairy has been opened and is under the direct charge of the Principal. Cows are now being milked and the milk issued to customers in a more sanitary manner than before. There is at present just enough milk for the residents and any milk which is left over is separated and churned and a small quantity of cream and butter is also available for sale. The Agricultural Chemist has started the analysis of milk from the beginning of August.

The Hostel:—Mr. M. R. Ramaswami Sivan who was Hostel Warden for 3 years was relieved in April last by Mr. R. V. Subramania Aiyar. A large dining hall has been constructed for the Brahman boarders and a separate non-vegetarian mess has been opened. One of the spare dining rooms has been converted into a Reading Room for the convenience of the students in addition to the Reading Room reserved for the students at the College.

The Students' Club.

At the Saidapet College we had a number of clubs or associations going by the names of the Athletic Club, the Newspaper Club, the Agricultural Students' Association and the Boat Club. At Coimbatore we have only one club, the Students' Club, which has two branches, the games side and the literary side. All students of the college are compulsory members paying a subscription of Rs. 6 per annum. Officers may join on paying donations. The Principal is *ex-officio* President. The management of the Games is in the hands of the Games Captain, assisted by a Vice-Captain, and the Games Secretary. The Secretary in charge of the literary side, otherwise called the Club Secretary, is in charge of the

Reading Room which is supplied with some daily newspapers and periodicals, and he also arranges social gatherings and meetings for the reading of papers and the opening of debates. The finances are allotted by the committee at the beginning of every year for the different branches of work. The committee for the year 1912-13 consists of the following :—

President—Principal (<i>ex-officio</i>)	
Games Captain—T. Budhavidheya Rao,	Class II.
Games Secretary—H. C. Javarayya	" III.
Club Secretary—C. Ellappa Chetty	" III.
Vice-Captain—C. Narasinga Raju	" I.
Other representatives—N. V. Visvanatha Aiyar	" III.
M. U. Vellodi	" II.

Lectures are being arranged for the current year and a summary of these lectures will be given in the future issues of the journal.

We have entered for the Coimbatore Football League and have a number of fixtures in cricket, hockey, football and tennis. The results of these matches will be given in the journal from time to time. So far we have played two hockey matches with the Coimbatore Gymkhana, winning the first by 3 goals to 2, and losing the second by 1 goal to love. In cricket, we lost two matches and won one. The following are the detailed scores :—

Newington v. Agricultural College.

Newington.

1st innings.		*2nd innings.	
Z. Kavalapara, b. Mal ...	16	b. Madiab	1
M. Z. Parlakimedi,		b. Madiab	8
c. Govindarajan, b. Madiab	1		
Z. Kumaramangalam,		c. Vittal Rao, b. Madiab	5
c. Tadulingam, b. Madiab	32		
M. Z. Jarada		b. Govindarajan	4
c. Madiab, b. Mal	8	c. Govindarajan, b. Mal	24
Mr. T. Vasu, run out	0	b. Madiab	0
Mr. C. Morrison, b. Mal	1	b. Madiab	4
M. Z. Wuyyur, run out	19	not out	4
M. Z. Nandigam, b. Madiab	13		
M. Z. Tiruvur			
b. Govindarajan	0		
Chokra, c. Sivan,		did not bat.	
b. Govindarajan	9		
Chokra, not out	3		
Extras	0	Extras	6
Total	102	*Innings declared closed Total	56

Agricultural College.

1st innings.		2nd innings.	
U. Vittal Rao, b. Jarada	2	did not bat	
Mr. M. R. R. Sivan, b. Morrison	7	b. Nandigam	0
A. Govindarajan, b. Morrison	13	not out	4
H. C. Javarayya, b. Morrison	10	not out	24
Dr. C. A. Barber, c. Kumaramangalam, b. Morrison	24		
Mr. C. Tadulingam, b. Morrison	5		
Mr. C. S. Madiab, c. Kavalapara, b. Jarada	4		
R. G. Mal, b. Kumaramangalam	10	did not bat	
T. Budhavidheya Rao, c. Nandigam, b. Morrison	7		
C. Narasinga Raju, c. Parlakimidi, b. Morrison	0		
M. V. Raghava Rao, not out	0		
Extras	4	Extras	0
Total	86	Total	28

Agricultural College v. Combined Forest College and Coimbatore College.

Agricultural College.

1st innings.	
Mr. M. R. R. Sivan, b. Taylor	1
U. Vittal Rao, run out	43
Mr. K. T. Bhandary, b. Ganapathy	2
R. G. Mal, b. Ganapathy	7
Dr. C. A. Barber, b. Ganapathy	0
Mr. C. S. Madiab, b. Taylor	6
Mr. R. C. Wood, b. Ganapathy	19
M. V. Raghava Rao, not out	49
H. C. Javarayya, c. and b. Sundaravaradachari	31
T. Budhavidheya Rao, b. Ganapathy	0
Leo D' Silva, c. and b. Ganapathy	1
Extras	8
Total	167

Combined Forest College and Coimbatore College.

1st innings.		2nd innings.	
Taylor, b. Madiab	36	Substitute, c. Madiab, b. Javarayya	4
Iswaran, St. Vittal Rao, b. Madiab	2	run out	1
Ganapathy, b. Mal	4	c. Wood, b. Sivan	15
Lemos, b. Raghava Rao	2	I. b. w. b. Raghava Rao	5
Anantan, b. Madiab	0	b. Raghava Rao	0
Sundaravaradachari, I. b. w. b. Mal	1	b. Sivan	2
Budruddin, c. Javarayya, b. Madiab	1	c. Wood, c. Javarayya	3
V. Krishnamachari, b. Raghava Rao	3	b. Raghava Rao	3
Anantachari, not out	5	b. Raghava Rao	5
Narayana Aiyar, b. Madiab	0	c. Bhandary, b. Wood	0
Ramakrishnan, b. Madiab	0	not out	0
Extras	0	Extras	0
Total	54	Total	4

The Agricultural College v. The Coimbatore Gymkhana.
The Coimbatore Gymkhana.

1st innings.		2nd innings.	
Mr. Collyer, run out	... 11	not out	... 26
" Singara Aiyangar, b. Madiab	... 15	c. Bhandary, b. Tadulingam	... 0
" Hill, l. b. w., b. Mal	... 1	c. Mal, b. Madiab	... 19
" Hemingway, c. Javarayya,			
b. Madiab	... 15	c. Barber, b. Raghava Rao	... 71
" Hoile, b. Madiab	... 4		
" Gadsden, run out	... 8		
" Simon, b. Mal	... 1		
" Alexander, not out	... 6	did not bat.	
" Kunhardt, b. Mal	... 0		
" Rabjous, b. Mal	... 0		
Sherry, b. Madiab	... 0		
Extras	... 0	Extras	... 4
Total	... 91	declared closed	Total ... 111

The Agricultural College.

1st innings.		2nd innings.	
Mr. C. Tadulingam, c. Rabjous,			
b. Singara	... 9	did not bat.	
H. C. Javarayya, run out	... 0	c. Gadsden, b. Singara	... 1
Mr. C. S. Madiab, c. Kunhardt,			
b. Hemingway	... 1	b. Hemingway	... 4
" K. F. Bhandary, b. Singara	... 26	b. Hemingway	... 0
Dr. C. A. Barber, c. Sherry, b.			
Singara	... 0	not out	... 10
Mr. R. C. Wood, c. and b.			
Hemingway	... 7	b. Singara	... 0
M. V. Raghava Rao, c. Singara,			
b. Hemingway	... 10	c. Hemingway, b. Singara	... 3
R. G. Mal, c. Hemingway, b.			
Singara	... 1	c. Simon, b. Singara	... 28
T. Budhavideya Rao, b.			
Hemingway	... 0	did not bat.	
Clement D'Silva, b. Singara	... 7		
Narasinga Raju, not out	... 0		
Extras	... 6	Extras	... 4
Total	... 67	Total	... 59

On behalf of the Students' Club, a lecture was delivered by Mr. J. Chelvaranga Raju on the 9th of September 1912, with Mr. R. C. Wood, President in the chair. In addition to the staff and students of the College, Mr. H. C. Sampson, Director of Agriculture was also present. The subject dealt with was "a peep into the sugarcane cultivation at Singanailur." Mr. Raju had taken class II students on a day's tour to Singanailur and Mr. R. Ramaswami Aiyar had similarly gone with class III on a previous

date. Mr. Raju, with elaborate statistics and figures worked out on the black board, considered that the crushing and boiling factory recently installed by the Department of Industries did not manufacture jaggery at a cheaper rate than the country method. He also said that the Singanailur ryot, by intensive cultivation, realised up to 50 *pothis* (1 *pothi* = 250 lb) of jaggery. In a lively discussion which ensued Mr. Ramaswami Aiyar, on the other hand, had nothing but praise for the new installation and contended that the yield of jaggery varied between 30 and 40 *pothis* per acre, but not more at Singanailur. Mr. Wood drew the attention of the students to the fact that the information gathered in the same place by two tried men with such vast practical experience as Messrs. Raju and Ramaswami Aiyar were, varied so much that it served as a lesson to them to be very careful in enquiry and to verify the statements made by ryots by actual, personal observations. He considered that the new installation was sure to be successful in course of time, especially as the jaggery could be made in 4 or 5 days instead of the operation being spread over a month. He further said that the time saved could be utilised in pushing on field operations.

EXTRACTS.

Local Bodies as Agents in Agricultural Improvement.

BY HAROLD H. MANN, D. Sc.

Principal, Agricultural College, Poona.

In the organisation of agricultural advance in any country or under any conditions whatever, it had ultimately had to be recognised that the bulk of the work must be done by the farmers or cultivators themselves. A government, an agricultural department, a body of State servants, may point the way, may suggest the lines, —but until the people can be interested and become enthusiasts themselves, the advance will be slow, will be looked upon with suspicion and will be more apparent than real. This condition of things has prevailed in almost every country where changes have taken place as the result of the action of a State department. It has

been, perhaps, more strikingly the case in the United States of America, where the State action has been greater than anywhere else, but where, until comparatively recently, most farmers looked on the work of Government with amused interest and little more.

It is this fact that has made most of the far-seeing leaders in the development of agricultural departments in India very insistent on the necessity for developing local bodies composed of cultivators themselves or of others interested in agriculture,—who should be committed to advanced methods, should show them in action on their own land, should act as local emissaries of whatever in changed methods has been proved to be good. How to bring about the formation of vigorous local bodies for this purpose has been a matter of great difference of opinion. But that such bodies must exist, that there must be local centres doing what an agricultural department itself could never hope to do,—on this point, there has been little difference of opinion.

The results of endeavours to organise such local bodies have, however, as would be expected, been extremely varied. In the Central Provinces, on the one hand, they have become, and tend to become even more, the main link between the agricultural department and its investigators, and the people. On the other hand, in Madras they have been, as hitherto organised and carried on, of very questionable value, and it has been recommended that, in their present form, they may well be wound up. In other provinces, very varying success has been attained. But it is impossible not to recognise that there has been a great amount of local energy, public spirit, and enthusiasm devoted to these associations even where they have apparently been of the least value,—and this, put into the right channels, will be of very great assistance in development in coming days.

The amount of experience gained in India has now been, I think, sufficiently great to warrant a short statement of the conditions which have led to success in the organisation of local bodies for popularising and encouraging genuine agricultural improvements. This matter was, in fact, considered by a strong

committee at the last meeting of the Board of Agriculture, and the present article is, in essence, a summary of their report.

India stands in such a very special position in respect to the character of the vast mass of its cultivators and the greater part of its agriculture that it might be, and has indeed been often asked by men of small or limited experience, whether under the special circumstances of the case, it is either necessary or advisable to encourage such local bodies as we are discussing. Cannot the Agricultural Department communicate directly with the cultivators? Is not such communication with, and help given to, individuals of equal value to work done by and through a local association of any kind whatever? While this can be done, while it is possible to deal directly with every cultivator in the districts, it is becoming more and more clear that this is not generally the best or most economical way of proceeding. A local organised body is a far more efficient agent for the introduction of improvements than the few officers of the agricultural department, working individually, can ever be, for, being a body of local men, it carries considerable local influence if composed of the right people, the members can and do mutually encourage one another, while its educative value in combined work and co-operative effort is, if properly organised, greater than can be realised. Even if the same end can be gained, so far as the introduction of an improvement is concerned, without a local association, a better final result can often be attained if a local body, as such, takes a share in the matter; as tending to increase the co-operative spirit of the people and hence the likelihood of permanent advance.

Success with such associations can, however, only be reached by following certain lines which can now be laid down with some approach to certainty. However organised, it is necessary that

(1) every local association should have a definite work to do, and the members should feel responsibility for taking a share in it. In the past it has not been at all unusual for an association to fail because the members have not been responsible for any work. Again the first question by a local body, however got together, is "what shall we do?" Unless the

organisers of every single association, generally the agricultural department, have definite work which can be placed in the hands of the members, within their capacity, it is extremely unwise to attempt any organisation whatever.

(2) A local association should be composed of men who are really interested,—and practically interested in agricultural improvements in the area in question. Associations have perhaps more often failed on account of the neglect of this matter than for any other reason. The members had but an academical interest in the subject, became members for social or other reasons, and did not take its work seriously.

(3) The work of a local association should be regularly inspected, examined, criticised, and the association called together. Great stress must be laid on this matter, and it is probable, for instance, that considerable part of the increasing efficiency of the system in the Central Provinces has been due to the care which is taken in this matter. It undoubtedly involves on the part of the agricultural department (or a central body of some sort) a considerable expense for inspecting officers, but without this, it may be stated with certainty that the result will not be a success except in rare cases.

(4) The members of a local association must, even apart from inspection, be made to feel that the agricultural department is interested in them and their work. It is wonderful how regular correspondence, prompt attention, and general evidences of interest and support encourage both the individuals and the associations of which they are members. If local agricultural associations are to be a success, this must be arranged for at any cost.

With these principles accepted and in full operation, there is every chance of success: without these there is very little likelihood of local associations doing what they are capable of. The actual type of association may be very different,—and very different types of association have succeeded,—but success in every case involves a frank recognition of the principles laid down. And it is hence of the highest importance that associations should not be encouraged or organised unless these points can be

arranged for. In time past there has been in some cases a tendency to encourage or form associations when there were no definite lines of work to take up: when the men of whom they were composed were not men really interested: when no regular inspection could be arranged for, and when they were left for long months without any attention. It is not wonderful that such associations died or became moribund.

Passing on from general principles to successful applications, it may be noted that success has been attained by following several lines. In the Central Provinces, where perhaps the most valuable work has been done, the associations are bodies composed of nominees, limited in number, of the district officers for each district. These, say for instance, to the number of thirty, are called together to a convenient centre, appoint a secretary, and are met by a senior officer of the agricultural department, usually the Deputy Director, who has a number of pieces of work suitable for their district, ready to suggest to the members to take up. These are not experiments, but consist in carrying out some introduction of new seed, or the demonstration of better methods of cultivation and the like, in using their land as a seed farm, in distributing sulphate of copper for treating jari seed, in acting as agent for ploughs or in making arrangements for marketing and similar things. Each man is then supplied at once with the material he needs, and thereafter, is visited by an assistant once a month, and by the superintendent of the farm in that circle several times a year. Six months later all the members meet again: the Deputy Commissioner is in the chair; the Deputy Director is again present: the work done is discussed, causes of failures made out, accounts of success recorded, and a new lot of work arranged for, for the ensuing period. Once a year, the members of all the district associations in a tract are called and meet at a common centre, generally a farm of the agricultural department, when experiences can be discussed among a larger collection of cultivators, selected outsiders being invited. All the proceedings, in these larger meetings, as well as in the district associations, are in the vernacular.

Over and above the points already insisted on, the success in this case may be attributed to the careful selection and nomination of members by the local authorities, to the small number of members who thus esteem membership an honour, and to the lines of work being drawn up and carefully arranged beforehand by the agricultural department.

The Committee of the Board of Agriculture whose report is being summarised did not wish to suggest that the method of organisation just described is the only one which will succeed or which is even the best one under all conditions. It is possible, perhaps even probable, that this type of organisation is most suitable where the type of agriculture is backward or at any rate where there are large numbers of fairly obvious improvements capable of giving large and immediate results. In other cases it may be more advisable to have other units than a district, sometimes even as small as a village. It may (and the method has been successful in parts of Bombay) be wise to have much more independent bodies than those of the Central Provinces. It may be advisable to have a regular hierarchy of associations from those representing a very small area to one representing a whole province, and so on for many other variations which can only be determined locally.

But, however organised, the principles which have been laid down are essential. The time is now past when the agricultural associations can be created in every district in a province heedless as to whether there is work for them or whether they can be instructed and encouraged. If there is work laid down for each association and its members to do; if they are composed really of the men to whom agriculture is a vital interest; if they can be regularly inspected and meetings held; and if the association and its members can be made to feel that the agricultural department or some central body is continually interesting itself in the work going on and ready to give assistance, then it is almost certain that provided the local circumstances are properly taken into account, a local body will be created.—(Agricultural Journal, Pusa, July, 1912).

SUPPLEMENT

This Year's Celebrations.

The working committee of the Madras Agricultural Students' Union beg to submit the following report of the celebration of the Third College Day and the holding of the Second Agricultural Conference.

As the 14th of July, which is the usual day fixed for the celebration, was a Sunday, the College Day came off on Friday, 12th July and the Conference was held on Saturday, 13th.

The College Day Sports.

The programme began with athletic sports on the morning of the 12th when some of the events were gone through on the College Maidan in which a number of tents were pitched and the courses tastefully laid out with flags. The sports recommenced at 3 P. M., amidst a throng of spectators. A very large number of ladies and gentlemen, both European and Indian, were present. Mr. R. C. Wood, Principal of the College and President of the Union was *at home* to the European guests and Mr. M. R. Ramaswami Sivan, Acting Agricultural Chemist and General Secretary of the Union was *at home* to the Indian guests. Accommodation was provided for Indian ladies in a separate tent. College Day rosettes were worn by all students, ex-students and staff and by a large number of visitors. A band of volunteers from amongst the students attended to the reception and comforts of guests under the captainship of Mr. J. Chelvaranga Raju, assisted by Mr. C. S. Madiiah. A posse of police constables working under the immediate supervision of a Police Inspector and 3 Sub Inspectors was of great help in keeping the crowd of villagers who had come from the surrounding villages, out of the limits of the race course which was marked with wire fencing.

The sports were well contested and an addition was made this year, by a half mile race being left open to be competed for by the representatives of other Educational institutions in Coimbatore.

At the conclusion of the sports, the Hon. Sir J. N. Atkinson, who had specially come for the occasion, presented the prizes and delivered the following eloquent address :—

Mr. Wood, Ladies and Gentlemen :—The presentation of the prizes has brought to a close the very pleasant day we experienced. I think, and I may say for my part, that perhaps the most attractive event of the day was the obstacle race. I think we were provided with a sort of *bonne bouche* of amusement at the very end of a successful day's entertainment and we all owe great thanks to Mr. Wood and to his colleagues for the amount of trouble which they must have incurred in making the arrangements for these sports. Most of us, some of us at any rate, did not arrive here until this afternoon and we therefore did not see more than half of the sports, but we are able to understand the amount of labour and management made by Mr. Wood and his colleagues on behalf of the guests. I venture to offer to them our very hearty thanks for the most pleasant day's amusement and entertainment. (Loud Applause). Then, on your behalf, I should like to tender thanks, I mean, tender congratulations to all the winners of the prizes in the events of to-day. Prizes cannot be won except after a great amount of trouble and hard work, notably, as I said just now, in the case of the obstacle race. While congratulating the winners, it is only right that we should extend our sympathies to those who on this occasion have not been successful, but they may think that unless there had been people to enter for these various events, there would have been no races and no competition. Therefore while the winners have earned prizes, to those who took part in the races and on this occasion were not successful, to them also we offer our thanks. (Laughter.)

I do not know whether it was a mere coincidence that the sports at the Coimbatore Agricultural College should have immediately followed those sports, "The Olympian Games" at Stockholm at the other end of the globe. Perhaps some of you, who read the papers, have seen every day in the columns, the results of the many competitions at Stockholm

and perhaps one may be tempted to draw a comparison between the results of the races and the degree of skill displayed there and here, but though after all there was much cutting of records and the events were competed for by the best of the world, still we need not hang our heads because after all the principal thing to be attended to is the spirit in which these games are to be started and carried out. (Cheers).

What is wanted is not a mere cutting of records or the winning of prizes but rather a healthy and pleasant feeling of emulation without envy, and rivalry without ill-feeling. It is particularly appropriate that these sports should be held in a place like Coimbatore which, for so many years past, and in an increasing measure now, has been showing itself as a centre of sport of all kinds. (Hear, hear). It is a matter upon which all the inhabitants of Coimbatore may well congratulate themselves that there is that healthy sporting spirit throughout the whole of Coimbatore town and all its surroundings, including also the whole District and, to-day more especially, I would draw your attention to the sporting spirit of the Principal (Hear, hear). It is entirely due to his energy and to his enthusiasm that these games have been instituted and are carried out in such a successful manner but, it is not only due to Mr. Wood, I think, the whole district shares in the encomiums that you may pass upon him, and as an illustration of the spirit which animates the people of this district, I may read out a list of names of gentlemen who have, just now, on this very day, signified their intention of making money contributions towards the special prize funds of the College. The list includes the names of the Hon'ble Raja Vasudeva Raja Avergal, the Zemindar of Uthukuli, Mr. K. Srinivasa Rao, acting District Judge, Mr. Cowley Brown and Mr. V. Subramanya Aiyar, both of the Forest College.

Two cups have been received, as I understand to-day, both from former pupils of the College. This one intended as a football cup has been presented by Mr. B. Dwarakanath. It is explained that Mr. Dwarakanath won the Tennis Challenge cup on three occasions continuously and, in return for having won that cup, he has made the presentation of this in a sporting spirit to the

College. And secondly this cup which I hold in my hand has been presented by Mr. Vengail Krishnan Nayanar, another former pupil of the College, intended for presentation to the best athlete of the year, and on the present occasion the best athlete is Mr. Rajagopal Mal (cheers).

Mr. R. C. Wood was once again the recipient of prizes and the Honourable Member, in making a felicitous reference to the Principal's sporting abilities and organising capacities, called for three cheers for Mr. Wood which were vociferously responded to. Cheers were called for by Mr. Ramaswami Sivan for the Hon'ble Sir Atkinson and for the guests which were also most heartily given.

The committee's thanks are gratefully rendered to all the ladies and gentlemen who responded to our invitation, to Messrs. E. H. Gadsden and H. N. Collyer for judging, to Messrs. K. R. Ramasastrulu Naidu and C. Tadulingam Mudaliar for acting as starters, to Mr. McRae for keeping time, to the District Superintendent of Police for the help given by the police, to the Superintendent of the Central Jail for the loan of his tents, and to all the gentlemen who contributed towards the expenditure. Contributions were received from the Hon. Dewan Bahadur V. Ramabhadra Naidu, the Hon. Raja Vasudeva Raja, the Zemindar of Uthukuli, Rao Sahib M. Abraham Pandithar, Mr. P. Subbaraya Aiyar, Mr. Cowley Brown, Principal, Forest College, Mr. K. Srinivasa Rao, Ag. District Judge of Coimbatore, Mr. V. Subramania Aiyar, of the Forest College, Rao Bahadur Annaswami Tevar of Tanjore, from all the European and Indian staff of the College, from all the present students and from a very large number of ex-students.

The individual amounts are acknowledged in Appendix V.

Mention should specially be made of the presentation of a cup by Mr. Vengail Krishnan Nayanar, one of the old students of the Coimbatore College and an Honorary visitor thereof. Mention should also be made of the presentation of a cup made by Mr. Dwarakanath, also an ex-student of the Coimbatore College for football competition, which was announced at the time of the distribution of prizes. To both these our thanks are due.

Our thanks are also due to the Misses R. V. Subramania Aiyar for their kindness in making the College Day rosettes, to the members of the Students' Club for laying out the ground for sports, to the Principals and Head Masters of the Educational Institutions at Coimbatore for allowing their students to come and witness our sports and to the Principal and the Farm Staff for cordial help rendered from time to time.

Prize-Winners.

The following are the prize-winners :—

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| 1. Putting the Shot.
[1-7, II-4]. | 1. C. Ellappa Chetty [21 ft. 1 in]
2. M. Muthayya. |
| 2. Slow Bicycle Race. | 1. K. M. Gururaja Rao.
2. Mr. R. C. Wood. |
| 3. Long Jump.
[1-10, II-5, III-3]. | 1. N. R. Sreenivasachari [15 ft.
8 ins.]
2. R. G. Mal.
3. Yesudasan. |
| 4. Throwing the Cricket ball.
[1-7, II-4]. | 1. R. G. Mal [72½ yards.]
2. M. Muthayya. |
| 5. Quarter Mile Race.
[1-10, II-5, III-3]. | 1. R. G. Mal. [1 min. 2 sec.]
2. K. Manga Razu.
3. N. R. Sreenivasachari. |
| 6. Hurdle Race.
[1-7, II-4]. | 1. R. G. Mal.
2. N. R. Sreenivasachari. |
| 7. Hundred Yards Race.
[1-10, II-5, III-3]. | 1. R. G. Mal. [11 2/5] seconds.
2. T. Budhavidheya Rao.
3. N. R. Sreenivasa Chari. |
| 8. High Jump.
[1-10, II-5, III-3]. | 1. U. Vittal Rao [4 ft. 8 ins.]
2. M. Muthayya.
3. N. R. Sreenivasachari |
| 9. One Mile Race.
[1-10, II-5, III-3]. | 1. K. Ramiah [6 min. 5. Sec.]
2. C. Narasinga Raju.
3. C. P. Vyasaraajan. |
| 10. Obstacle Race. | 1. Yesudasan.
2. U. Vittal Rao.
3. C. Narasingaraju. |

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|-----------------|---|---|
| 11. Tug of War. | { | Farm Staff ;
Mr. R. C. Wood (captain) and
Messrs. J. Chelvaranga Raju.
C. S. Madiah.
D. Balakrishna Murthi.
K. Sankaranarayana Aiyar.
E.S.Pasupati Aiyar.
C. V. Sessa Chari and
T. Ramaswami Aiyar. |
|-----------------|---|---|

[Note:—Marks in brackets count for the championship].

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| 12. Championship medal for best athlete. | R. G. MAL. |
| 13. Half Mile Race (open only to students of other institutions). | 1. S. J. David, London Mission High School, Coimbatore.
2. Thillai Pillay do do
3. Jivanandan, Training School for Masters, Coimbatore. |
| 14. Boys' Race over 8 years. | 1. K. Rama Rao.
2. S. Narayanaswami. |
| 15. Do. under 8 years. | 1. Badsha.
2. Rajagopal. |
| 16. Girls' Race. | 1. Venkata Lakshmi.
2. Seethamma. |
| 17. Peons' Race (Quarter mile). | 1. Kasturi, Agricultural Chemist's office.
2. Lingam, Government Entomologists' office.
3. Mumman, Principal's office. |
| 18. Coolies' Race (castemen, adults.) | 1. Nanjundan.
2. Kuttai Perumal. |
| 19. Do (castemen, boys), | 1. Kuppan
2. Tille Rangaswami |
| 20. Do (pallars). | 1. Chinna Karuppan.
2. Olagan. |
| 21. Chokras' Race | 1. Annadan.
2. Sendirumakonam. |
| 22. Greasy Pole (Coolies). | 1. Dasi.
2. Maree. |
| 23. Obstacle Race (Coolies). | 1. Komali.
2. Perumal.
3. Kuttai Perumal. |

Students' Entertainment.

The students had organised an entertainment on the same night at the College at which the whole estate was present. The programme consisted of a recitation from Othello and the staging of the Mock Doctor in English, of a Telugu dialogue on post puberty marriage and of selected scenes from Lilavathi and Sulo-chana in Tamil, interspersed with a Laplander's visit, a drunken brawl, and an interview of an agricultural student with a local ryot. There was also a display of magic at intervals and plenty of music. Considering the short time and the smaller amount of leisure which the students could command, the performance was a splendid success and the students fully deserved the thanks proposed to them at the end by the General Secretary.

The Agricultural Conference, 1912.

The first Session of the Agricultural Conference, the second of its kind, was opened at 8 A. M. on Saturday, 13th July 1912 by the Honourable Sir J. N. Atkinson in the College Hall in the presence of a large and distinguished gathering. Among those present were Mr. Hemingway, Collector of Coimbatore, Mr. K. Srinivasa Rao, Acting District Judge, Mr. H. C. Sampson, Acting Director of Agriculture, the Hon'ble Rajah Vasudeva Rajah of Kollengode, the Hon'ble Dewan Bahadur V. Ramabhadra Naidu, the Hon'ble Mr. M. Sambandam Mudaliar, the Zemindar of Uttukuli, Mr. P. Subbaraya Aiyar of Madura, Mr. C. Venkatachariar, Mittahdar of Kadathur, Salem, Rao Bahadur C. Nagoji Rao, Rao Bahadur J. Dharmaranga Raju, Mr. T. A. Ramalingam Chettiar, Mr. R. C. Wood, Principal, Dr. C. A. Barber, Government Botanist, Mr. W. McRae, Government Mycologist, Mr. T. B. Fletcher, Government Entomologist, Mr. K. R. Ramasastrulu Naidu, Acting Deputy Director of Agriculture, Mr. Vengail K. Krishnan Nayanar of Malabar, all the officers of the Institute, about 20 ex-students and all the present students.

Immediately on taking his seat, Sir Atkinson opened the Conference with the following instructive address which was listened to with rapt attention :—

11. Tug of War. { Farm Staff ;
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The Presidential Address.

THE HON'BLE SIR JOHN ATKINSON'S SPEECH.

MR. WOOD AND GENTLEMEN,—

I do not know whether many of you know the old story of a clergyman in England who had been asked to preach in a country parish and who, in the morning, when he went to the pulpit, discovered that he had left his sermon in his house. So he commenced his sermon in the following words: "My brethren, unfortunately I have left my sermon in my house. Therefore this morning I can only say to you the words which the Lord puts in my mouth. 'This afternoon I will try to do better'". Whether due to indolence or want of time, I have had no opportunity to prepare anything in the nature of a speech or an address such as I should feel inclined to give to an audience of this nature. I stand here as an amateur of amateurs. I know that every member of this audience, certainly a very large proportion of them, are professional experts in the subjects which will be considered by this Conference. All of you in your actual life, at any rate, ever since the days of boyhood, have been delving into the secrets of nature—into the secrets of agriculture,—while for myself I can say I have barely scratched on the surface. My knowledge of agriculture is only that which can be acquired by what I may call wandering in the fields, such knowledge as, in the course of a fairly long service, I have been able to acquire in touring throughout the Presidency and in mixing, to the best of my ability, with the ryots of the country.

These people, as you know, are perhaps the very best examples of their kind. Their skill and their knowledge have been derived through countless centuries of experience in tilling the soil and I who stand here, having, in the course of my service, picked up a few scraps of knowledge, have some slight acquaintance with the practice of agriculture in this country. As an expert or professional man I know nothing. Therefore, when I was told by Mr. Wood that I must deliver an address to you, I must confess that I rather felt that it was quite impossible for me to deliver any speech or any address that could be of any assistance or instructive. I remembered of course, the old proverb, "the cobbler should stick to his last", and so I was in a dilemma. I did not like, in fact I was afraid, to take a lion's share in today's proceedings. Yesterday evening, after going

home from the sports here, I picked up this report of 1911 and began to glance at it. Then, on page after page I found the most scientific disquisitions on varied subjects connected with agriculture; but as I turned over and got towards the end of the book, I found printed as appendix 3 of the last year's report, the rules of the Madras Agricultural Students' Union and, glancing through these rules, I was struck by a certain rule which enumerated that the Union was intended to encourage an *esprit de corps* among its members. It seems to me perhaps that I might be able to say a word or two on this subject. On looking at this rule of your Union, I was struck by the object that the Union was intended to encourage an *esprit de corps* among its members. Now I take it that *esprit de corps* connotes two circumstances. First, it connotes service and secondly comradeship. I do not think that there can be any *esprit de corps* unless there is service to some common purpose, and of course there cannot possibly be any *esprit de corps*, unless there is a spirit of comradeship among those who are engaged in the service of the employer. I take it that you intend, all of you, to devote your lives and activities to the service of agriculture. That is the object with which you have come to this College, the Central Artery, and that is the essential object which this meeting is intended to serve to day. This is a meeting of the Madras Agricultural Students' Union, which means that you are going to devote your life and your service to the prosecution of the art of agriculture. The art of cultivation can be used not only in the narrow sense, the cultivation of the soil, but also you may find in it other meanings. There is the cultivation of the human body and there is also the cultivation of the human mind. There are other descriptive sorts of cultivation and science. There is the particular species approaching the training with which we are concerned here. I suppose that no science that is known to the human world is more important, more essential for progress, than that of cultivation.

I, for many purposes and especially for the purposes of this morning's address, define cultivation as the science which teaches us to make use of the forces of nature for the purpose of increasing or improving the output of it. If you examine it you find that the definition, to some extent, does fit the facts of the case as regards the cultivation of the body, of the mind and of the farm. I need not say anything specially on the cultivation of the mind, as you know that the science of edu-

cation is specially recognised as of utmost importance to the welfare of every race. Next, there is the science of the cultivation of the body. Yesterday we had an illustration in which the forces of the body were cultivated in the sports that were celebrated in the compound. We recognise, both in the case of the mind and the body, that the most satisfactory results can be achieved by cultivating, that is by endeavouring to improve and extend the powers of the mind and the body. The science of agriculture teaches us to improve or to increase the output from the earth and it is essential for the continuance of human existence. After all what is the measure of its value? It is a food grain. We can dispense with diamonds; but we cannot dispense with food grains. Of course you are especially in a favourable position because, as you saw yesterday, you have already an institution with the branch of the cultivation of the body, and I know that the Principal of the College is always careful that that principle is attended to; also here you see you are illustrating yourselves the facts of the cultivation of the mind, because here you are being educated; and thirdly you have that which ordinary educationists have not been given. You are applying the knowledge that you acquire here, the results of the education that you receive here, in that special form of cultivation, and it is the cultivation of the soil, that is, agriculture. Therefore, you as I say, are in a much more fortunate position than the persons who are entrusted with the duty of teaching the arts or teaching the mechanical sciences. There is no art and no science that could possibly be as old or date from such a primitive period, as that of agriculture. I suppose that even our first ancestors who have had no shelter must almost necessarily have scraped the surface of the ground. This particular science which you are learning here, we may take it, is without any exception the most noble profession in the world. I have nothing further to say to you but, having regard to the fact that you are here learning and hereafter in a position to practise this most ancient, most important and most absolutely necessary art, I have only to commend to you, the members of this Union, that you should always be most careful and most assiduous in making the best of the opportunities that are presented to you. (Cheers).

Principal's welcome address.

At the conclusion of the President's address, Mr. R. C. Wood, Principal and ex-officio President of the Students' Union welcomed

the old Students in the following words :—

Mr. President and Gentlemen,

It is again my privilege and, I may also say, my pleasure, to welcome the old Students of this and of the Saidapet College, at the annual gathering which we celebrate on the day when this College, was opened by H. E. Sir Arthur Lawley. The occasion is, I think noteworthy and one that you should remember for some time for the more or less official recognition of the Union, the Madras Agricultural Students' Union, which is signified by the presence of the Hon'ble Sir J. N. Atkinson whom, I think, we have to thank very much for managing to come down here and spend two days in this institution and whom we may take this opportunity of congratulating on his recent honours (Applause). The occasion on which we are here gathered is a meeting of the past and present. Now we are too young to have very much of a past, and for our past we depend upon another institution, the late College of Agriculture at Saidapet. There were no doubt faults which led to its closure, partly to the wrong system and partly perhaps to the fact that the time was not ripe, that the awakening enthusiasm which has done so much in recent years to help in matters agricultural was not then displayed. But we must remember that for many years we have to depend on Saidapet not only for carrying out the practical executions of agricultural investigations and demonstrations, but also for the more important training of the new men. The traditions of this college will therefore for many years be largely based upon Saidapet teaching, Saidapet tuition and Saidapet men, and I want therefore every old Saidapet student to realise that although Saidapet College is closed, still he must take interest in the activity which the more generous assistance and wider opportunities which have been given by the Government enable us to take part in now. To all students of Saidapet, it is my pleasure to accord a hearty welcome, and, as I said last year, I count it as one of my pleasant duties that I am privileged to represent this college in this respect.

The Agricultural Students' Union is, I hope, in a flourishing condition and it may be likened to a tree, to the old students who visit the college it may be likened to one of the numerous trees which we have planted here around the college. Every year, visitors come and they find the visible parts of the trees having increased. They know that the roots below have increased and

the branches above also increased. So the Union, supported and assisted by the help of the Government and by the members, will grow well from year to year and spread its branches further and more widely and tend every year to become more important and more useful. I wish the Union all success (Cheers.)

Report of the working of the Union during 1911-12.

The Principal's welcome address over, the General Secretary read the following report :—

The Working Committee of the Madras Agricultural Students' Union beg to submit the following report of the working of the Union during the year 1911—12.

This is the 2nd year in the life of the Union and it seems appropriate to recall the lines on which the Union was started. The Union is the outcome of the wishes expressed by a large number of ex-students, both of Saidapet and Coimbatore, to organise an institution which would keep the old students in touch with their *alma mater*, foster a spirit of brotherhood among the alumni of the College and afford scope for the exchange of ideas in matters pertaining to practical agriculture. The Union is primarily one of the past and present students of the College ; still from the very beginning it was considered essential for its successful working that the help and co-operation of gentlemen interested in the agricultural development of the country, should be secured. All the experts of the Agricultural Departments of Madras, Mysore and Travancore are our honorary members, as also are most of the honorary visitors to the college who are not all agricultural experts in the strict sense of the term, but are large land-owners and practical farmers withal. We beg to acknowledge, with thanks, the help we have received during the year from the honorary members, financially and otherwise.

The Union has set itself to do a number of items of work. And first and foremost is the celebration of the College Day, the second the holding of this Agricultural Conference, the third, the procuring of appointments, as far as possible, to old students and the fourth, the keeping of old students in touch with other *alumni* by issuing annually a corrected list of addresses of past men and by running a journal as an organ of the Union.

The funds of the Union are derived from several sources. Old students join the Union as Life Members and, according as they pay

Rs. fifty, Rs. ten, or Rs. five, they are styled Benefactors. First class members or Ordinary members. Gentlemen who are invited by the committee to associate themselves with the Union as Honorary members, out of the interest they evince in the welfare of the Union, also give voluntary donations for which there is no limit of subscription fixed. Both the above contributions go to make up our Permanent Fund which is invested in a Bank and the interest alone of which is used for the purposes of the Union.

The other sources of income are the voluntary donations given by the staff, ex-students, and present students, by the college honorary visitors and other gentlemen interested in our welfare which are collected once a year to meet the expenses of the annual celebrations of the College Day, Sports and Conference.

The affairs of the Union are in the hands of a Council, consisting of a President, who is the Principal, ex-officio, 4 vice-presidents and 12 members, all old students, of whom one vice-president and 3 members are resident members and all the others non-resident members. Working under the orders of the council, we have a Working Committee consisting of the above mentioned resident members, 2 more officers and 3 present students. It will thus be seen that, although the council or advising board, as it may be called, consists of old students only, the details of work are left assigned to the old students, present students and officers who may not be old students.

With the above resume of the constitution of the Union and the nature of work which it aims at doing, the committee now proceeds to relate what it has done during the year.

Membership.—The list of honorary members last year was 19. We now have 36, the gentlemen who have newly joined us being Mr. G. A. D. Stuart, Mr. C. Benson, Mr. H. C. Sampson, Rao Bahadur K. S. Srinivasam Pillai, Hon'ble Rajah K. C. Manavedan Rajah, Mr. P. Subbaraya Aiyar, Rao Bahadur Annasawmi Tevar, the Hon'ble Raja Vasudeva Raja of Kollengode, Mr. Ganga Razu Pantulu of Berhampore, Mr. Kannambra Valiya Ramunni Nair, Rao Saheb J. Seenam Bhat, the Hon'ble Mr. A. Chatterton, Mr. A.K. Yegnanarayana Aiyar, Mr. T. B. Fletcher, Mr. K. R. Ramasastrulu Naidu and Mr. F. W. R. Robertson.

We had last year 3 benefactors ; we have an addition this year in Mr. T. N. Virarayan Tirumalpad, 4th Rajah of Nilambur. There were 22 first class members last year ; we now have 31, an increase

of 9. We had 53 ordinary members last year and there are now 67, an increase of 14. On the whole the strength of the Union this year is 138 as against 97 at the time of the last Conference—an increase of 41 members.

College Day Celebration of 1911.—The details of the celebration of the last College Day which was a great success, have been published in the 1st Year Book 1911. The Committee takes this opportunity once more of thanking the Hon'ble Mr. A. Butterworth who presided and gave away the prizes last year.

Agricultural Conference.—The papers read at the last Conference together with the addresses delivered, have been printed in extenso in the Year Book of the Union referred to above, and no attempt will be made to recapitulate what has already been published. It was fortunate that the Committee secured Mr. Couchman, the head of the Agricultural Department, to preside at its deliberations last year and he had the good will of the Union very much at heart. Our thanks are once more heartily tendered to him and to the several old students who read papers at that Conference.

Regarding the procuring of employments to old students, besides vacancies notified directly to the Union by the parties, the Principal very kindly referred vacancies to the Union which, in its turn, sent circulars to old students whose names were registered as in need of employment. The salaries offered, especially by private persons not being sufficiently attractive, there was not a response equal to the vacancies communicated, but some of the appointments have been accepted.

In respect of the corrected list of addresses of old students, the Committee has secured the present correct addresses of several old students with the help of some of our members and a list will be published and sent to every member of the Union during the year 1912—13.

One of the most onerous responsibilities imposed upon the committee at the Business Meeting of the Union held in 1911 is the publication of a quarterly English Journal as an organ of the Union. Two causes have to be mentioned as having contributed to the committee's inability to publish the journal during the year. The one was that the Press at Coimbatore to whom the work of printing the journal was to have been entrusted had to close its work for some months on account of the prevalence of plague in the town. The other

arose from the fact that the members of the committee, being Government servants, could not conduct, manage or edit the journal, according to Government servants' rules, without the authority of Government. This was applied for but the sanction of Government was received about the middle of February. Prior to the receipt of the Government Order sanctioning the publication of the journal as a newspaper, the committee had decided to issue at once a Year Book comprising in detail all the proceedings of the College Day and Conference of 1911 and to postpone the issue of the Journal till after the Conference of 1912. With the view of not making the information stale, it is proposed in future years to publish a Year Book immediately after the College Day and Conference, in addition to the periodical Journal which will chiefly contain college news, farm notes etc.

That there is a need for an Agricultural Journal of this kind is shown by the fact that over 70 applications have been registered for copies of the Journal from people who are not members of the Union and we are bound to express our thanks to one of our old students and the Editor of the Krishikan, Mr. J. R. Ranga Raju, as a majority of these applications have been received through his influence. The Committee requires all its energy to successfully see the Journal through and, hopes to devote its earliest attention to this subject. The Committee is thankful to the Director of Agriculture for having placed the Union on the free distribution list for the publications of the Department. The financial condition of the club, as audited up to February 1912, has been published in the Year Book 1911 and the accounts, including this year's celebration, will be published in the Year Book 1912 as soon as possible.

The Committee cannot close its report without acknowledging the help rendered to it in so many ways by the Principal who has a devoted attachment to the Union.

Last year, the Commissioner of Agriculture gave away the prizes at the College Day Sports and the Director of Agriculture presided at the Agricultural Conference. It is a source of great pleasure and encouragement to the Union that the first member of H. E. the Governor's Council, in whose hands the destinies of this College are largely placed, should have come to perform the double function, that of presenting the prizes and that of opening and presiding at the Conference, this year.

Messages of Good Wishes.

The General Secretary next announced that a large number of letters and telegrams had been received from Honorary members and ex-students, regretting their inability to be present, and wishing all success to the Union.

Messages of good wishes had been received from the following Honorary Members of the Union:—Rao Saheb M. Abraham Pandithar of Tanjore, Hon'ble Rao Bahadur N. Subba Rao of Mangalore, Hon'ble Rajah K. C. Manavedan Rajah, Rao Bahadur V. K. Ramanujachariar, Hon'ble Mr. A. Chatterton, Hon'ble Mr. S. T. Shunmugam Pillai, Dr. N. Kunjan Pillai, the Zemindars of Chunampet, Singampatti and Chennappaickenpalayam, Rao Saheb J. Seenam Bhat, and Messrs. Kannambra Raman Unni Valia Nayar, W. Keess, G. A. D-Stuart, R. D. Anstead, M. Ganga Razu Pantulu, R. James, A. K. Yegnanarayana Aiyar, and F. W. R. Robertson.

Similar messages were received from the following ex-students :—Messrs. Vengail K. Raman Nayanar, K. R. Hayavadana Rao, T. N. Veerarayan Tirumalpad, M. S. Sankaran, R. P. Pundit, M. Panchapaksa Aiyar, V. P. Subramania Mudaliar, P. S. Parthasarathy Aiyangar, N. H. Patuck, H. Srinivasa Rao, A. Rama Rao, A. Seturama Aiyar, G. Rajagopala Naidu, G. Jogi Raju, K. V. Krishnaswami Aiyar, C. S. Ramalinga Vadiar, M. C. George, K. T. Alwa, P. G. Krishnan, B. Dwarakanath, S. V. Srikantiah, B. S. Narayanaswami Aiyar, K. B. Tilloo, George M. Eapen, T. V. Subramanyam, K. T. Bhandary, C. M. Muthusawmy Pillai, S. Raghava Aiyangar, T. A. Krishna Aiyar, T. V. Srinivasachari, W. J. John, S. Daniell, Y. Rama Rao, T. S. Lakshmana Rao, K. C. Deviah and Rao Saheb M. Rama Rao.

Dr. C. A. Barber, Government Botanist, next delivered an interesting lecture on "Seedling canes", based on his researches. The lecture was demonstrated with actual well grown sugarcane plants in pots raised from seeds and arranged on the dais. Messrs. F. R. Hemingway, J. R. Ranga Raju, R. C. Wood and J. Chelvaranga Raju asked a number of questions which were answered by the learned lecturer. A summary of the lecture, is printed as Appendix I later on. We may state that the lecture will be printed *in extenso*, illustrated by plates, in the next issue of the Pusa Agricultural Journal.

The President next called upon Rao Bahadur J. Dharmaranga Raju, Dewan Peishkar, Pudukkottai and one of the Vice-Presidents of

the Union, to read his paper on "a suggestion for accelerating the introduction of agricultural improvements in the Presidency." Mr. Raju's proposal was that the work of dissemination of agricultural improvements should be entrusted to one or two parties on the model of Settlement Parties,—in which he has had large experience as a Settlement Officer,—with definite programmes of work. While acknowledging the good work that was being done by the Department, he thought that a greater concentration was needed.

The paper was followed by a lively discussion in which Messrs. H. C. Sampson, F. R. Hemingway and R. C. Wood and the Hon'ble Dewan Bahadur V. Ramabhadra Naidu took part. The paper, along with the discussion, is printed elsewhere as Appendix II.

The first Session of the Conference closed at 11 A.M. with a hearty vote of thanks to the Hon'ble Sir J. N. Atkinson for having taken the trouble to come and preside at the Conference, thereby showing the interest he has in the welfare of the Union.

Agricultural Conference, Second Session.

The Conference reassembled at 2-30 P.M. under the Presidentship of the Hon'ble Dewan Bahadur V. Ramabhadra Naidu, Zemindar of Vadagarai and Doddappa Naickanur, and an Honorary Member of the Students' Union. The President opened the Proceedings with the following interesting address :—

Mr. Wood and Gentlemen,

It gives me very great pleasure to preside at this session of yours, for the interest I take in matters agricultural is very great. Though I had not the pleasure of getting the training that some of you are having here, my interest in agricultural improvements generally, as a landholder, has led me to take a special interest in this College. As you know, this is not the first time I come here. You also know that I am semi-officially connected with it. The ideals aimed at by the College are such as to secure the sympathies of every right-thinking man of India. That agriculture is the chief industry of India is a common place remark. The question of practical importance is how to make the land yield the maximum of profits with the minimum of labour. Labour saving appliances have done a great deal in England and America but a great deal that is useful in that direction in America and on the continent of Europe is of use only in the pursuit of agriculture on a large scale. The problem

in India is, how best to meet the requirements of the peasant cultivator, the ryot, as we call him. Even in large Zemindari areas, the question is not different. The Zemindar has necessarily to lease out and has, as a matter of fact, from time immemorial, leased out, his whole area amongst peasants enjoying in some cases varied degrees of proprietorship. Of course, some improvement in the condition may be sought for in the direction of co-operation in agriculture, but that is a question for the future. With the improvement of village life and the restoration of the old communal spirit in it, something of the ancient spirit that pervaded the samudayam of pre-British days may be looked for. But these are, as I have just said, the possibilities of the future and nothing more. To secure them much spade work is necessary. For one thing each particular villager must see that his profit lies in adopting a particular knowledge in action. Any education that is given to him must recognise this as a fundamental fact. For the present and for the immediate future, work lies in an entirely different direction. And in that work, an institution like this occupies an unique position. This is an institute intended to train practical farmers and to conduct research work in matters agricultural. I do not propose on the present occasion to go at any great length into either of these objects with which the College is so closely connected, but perhaps you will allow me to throw out one or two suggestions that have occurred to me during my visits to it. First to take the research work of the institute. While acknowledging the very good work that it is doing for some time past, I would suggest special investigations into paddy and cotton as they would be of the utmost value to this presidency. Any variety of paddy that could resist drought, if it could be brought into existence, would be of the greatest benefit to the country. For the present, scientific experiment should be directed towards this end. Paddy has been the staple food in this part of India and cotton is a necessity. An institute like this should contain a list of the varieties of paddy occurring in India. Then should follow a study of the existing literature. I see that a great deal has been written upon it by high class agricultural experts. I do not think it a waste of money if an officer is deputed to do all about paddy only. The life history of paddy varieties should be studied systematically and practically for the introduction of suitable varieties amongst our agriculturists. I understand from literature that is available to any inquiring person that the Japanese are at work on

these lines and what is possible in Japan ought, I think, to be possible in this presidency with an agricultural institute like this in it and a Government only too ready to render every help to forward the interest of agriculture and agriculturists.

Another suggestion I would make in this connection is this. This is a central institute of agriculture and as such it should exhibit water lifts of different kinds as an object lesson both to students in well irrigation and to the ryots, so that they might know the real advantages of economising bullock power. The last time I was here I saw an engine but I did not find the oil engine invented by Mr. Chatterton and advertised so widely by Messrs. Massey & Co. The institute would be doing a great service if it could purchase one of these, if it has not already done so, and also an aerometer so that they may be worked side by side and enquiries from ryots answered on the spot and to their satisfaction. Ryots would thus get the option of selecting such lifts as would suit their circumstances and their agricultural purposes. I do not think this will cost Government much money, while it would confer great benefit on both students and agriculturists. As regards research work, perhaps I might hazard a suggestion, that it might be separated from the actual teaching work of this College. That, however, is a subject which would require more time to enlarge upon.

Gentlemen, I have spoken thus far primarily with the intention of focussing attention on some of the facts that have come under my observation. I am satisfied that Government is sincerely anxious to do all it can to make the institute a success and through it to work the amelioration of the agricultural community—a practically beneficial work. It is because I feel sanguine that it is so, that I have ventured to offer these suggestions to the agricultural department. I am afraid I have taken a great deal more of your time than perhaps you could spare. I know too, there are some other speakers who are to address you on certain agricultural subjects. I wish you, members of the Agricultural Students' Union, success in your laudable work.

I now call upon Mr. Vengail Krishnan Nayanar to read his paper on "Agriculture and my experience on the working of my Farm."

Mr. Vengail Krishnan Nayanar is one of the ex-students of the Coimbatore College. He is a man of considerable influence and of position in Malabar and is for some years a member of the Malabar District Board. At an advanced age, he joined the Coimbatore College

as a special student and every one on the estate was struck by the very earnest manner in which he took part in all farm operations and learnt every practical detail. He is one of those who have a great belief in the possibilities of achieving improvements by personal work and supervision. During his stay at the college he had already begun to put into practice on his estate the various lessons taught here and, after his return, he has been enthusiastically working his Farm. He has a warm interest for the welfare of the Union which he has joined as a benefactor. In consideration of his interest in practical agriculture, the Government have nominated him as an Honorary visitor to the College. His paper, is printed in Appendix III.

At the conclusion of the paper Mr. R. C. Wood said that he had visited Mr. Nayanar's estate and praised him for the earnest manner in which he had begun to carry on the improvements which suggested themselves to him as a result of the training he had at the college. He exhorted other students and ex-students to follow Mr. Nayanar's example. He also said that he took that opportunity of thanking Mr. Nayanar personally for the hospitality extended to him when he went there, although Mr. Nayanar himself was absent from the estate at the time.

In the unavoidable absence of Mr. V. P. Subramaniya Mudaliar, Deputy Superintendent, C. V. D., the paper contributed by him on Improvement of the local cattle was read by Mr. M. R. Ramaswami Sivan. In the discussion which followed, Mr. R. C. Wood, while considering that the paper was a good one, was of opinion that he expected to hear more of the experiences of Mr. Mudaliar of the cattle shows of the Madras Presidency and especially of his personal attempts in raising a herd of Kangayam animals in his native village of Vellagal in the Tinnevely District. The paper is printed in Appendix IV.

The Hon'ble Dewan Bahadur V. Ramabhadra Naidu closed the proceedings with an interesting address in which he lamented the apathy shown by the Zamindars in agricultural improvement, although their prosperity depended completely on the proper tilling of the land and hoped they would send their sons for a liberal education at this institution. While the Government, through the newly organised Agricultural Department, was doing its best, he consider-

ed that the best results could not be achieved unless the students who passed out of this college exerted themselves to the utmost of their ability in disseminating new ideas amongst the masses both in their individual and official capacities. He once more wished the Agricultural Students' Union success in its laudable work.

The Second Session of the Conference closed at 4 p. m. with a hearty vote of thanks to the Chairman proposed by Mr. J. Chelvaranga Raju.

The members and visitors next sat for a Group Photograph, a reduced half-tone copy of which is sent along with this Journal.

There was then a most enjoyable social gathering arranged for by the committee which takes this opportunity of thanking Mr. R. C. Wood for providing refreshments to the European guests, and Mr. R. P. Pundit, one of the old students of the late Saidapet College for the large consignment of biscuits which he kindly sent for use at the gathering from his biscuit factory at Mangalore.

The next item was the **Business Meeting** at which only members were present.

Proceedings of the Business Meeting held at 5 P.M. on Saturday, 13th July 1912 :

Proposed by Mr. S. L. D'Silva, *seconded* by Mr. K. Raghavachari and *carried* unanimously that Rao Bahadur J. Dharmaranga Raju do take the chair.

The Chairman having taken his seat, the General Secretary gave a detailed account of the work done by the committee in the previous year.

The election of office bearers was next taken up for consideration.

Proposed by Mr. M. R. Ramaswami Sivan, *seconded* by Mr. S. L. D'Silva and *carried* unanimously that the election of office bearers this year be held in the same manner as in last year.

Mr. S. L. D'Silva was unanimously re-elected resident Vice-President.

Rao Bahadur J. Dharmaranga Raju and Messrs. D. Ananda Rao and G. Rajagopal Naidu were elected Mofussil Vice-Presidents by a majority of votes.

Messrs. M. R. Ramaswami Sivan, J. Chelvaranga Raju and D. Balakrishnamurti were elected resident members of Council by a majority of votes.

Mr. M. R. Ramaswami Sivan was unanimously re-elected General Secretary.

Proposed by Mr. K. Krishnamurti Rao and *seconded* by Mr. K. M. Gururaja that Mr. D. Balakrishnamurti be the Treasurer.

Proposed by Mr. M. R. Ramaswami Sivan and *seconded* by Mr. C. Tadulingam Mudaliar that Mr. J. Chelvaranga Raju be the Treasurer.

Mr. J. Chelvaranga Raju was elected Treasurer by a majority of votes.

Messrs. V. P. Subramania Mudaliar, V. Muthuswami Aiyar, K. C. Deviah, G. Jogi Raju, A. Rama Rao and K. B. Tilloo, all ex-students of Saidapet, were elected Mofussil Members of Council by the ex students present at the meeting.

Messrs. T. N. Virarayan Tirumalpad, Vengail K. Krishnan Nayanar and M. S. Sankara Aiyar, ex-students of the Coimbatore College, were elected Mofussil Members of Council by all the members of the Union present at the meeting by a majority of votes.

The Rules of the Union were next considered and the following changes were made :—

Under Rule 2 (iii) note, add, "A registration fee of eight annas shall be paid in advance by those who want their names registered in the employment register."

After Rule 7, add a new Rule :—

"*Patrons* :—Gentlemen who are interested in the welfare of the Union and contribute a sum of not less than Rupees one hundred to the Permanent Fund of the Union shall be styled *Patrons*."

In Rule 8, omit the words "at least."

In Rule 8, for "three members" read "five members."

For Rule 10, substitute the following :—

"All members of the Council shall be elected at the General Meeting on the occasion of the College Day. The resident Vice-President and the five resident members of the Council including the General Secretary and the Treasurer, shall be elected by all the members of the Union, including student-members. The mofussil members of the Council including the three mofussil Vice-Presidents

shall be elected by all the ex-student members, the votes of mofussil members being also obtained."

For Rule 9, substitute the following :—

"Rule 11. *The Working Committee*.—The resident Vice-President and five members of the Council, including the General Secretary and the Treasurer, shall form a Working Committee with two resident officer-members and three student-members, the election of the former being done by all the resident officer-members and that of the latter by all the student-members. The Working Committee so formed shall appoint one of the student-members of the Committee to Joint Secretary."

Proposed by Mr. K. Krishnamurti Rao, *seconded* by Mr. B. K. Venkata Rao and *carried nem con* that a sum of Rupees fifty be allotted for the purpose of obtaining the addresses of old students and for getting more old students to join the Union.

It was proposed that the Union should encourage valuable contributions on agricultural matters to the Journal and, to this end, it was also proposed that a prize should be awarded for the best essay on any subject named. Mr. K. R. Ramasastrulu Naidu announced his willingness to award a gold medal for the best essay on a subject to be named by him. Mr. Sastrulu was heartily thanked for his kind offer.

The proceedings of the *Business Meeting* closed with a vote of thanks to the Chairman who exhorted the members to take increased interest in the work of the Union *throughout the year*.

The members, with their guests, next adjourned to the College Hostel where an excellent dinner was provided, by the kind courtesy of the Hostel Warden and the Hostel Manager.

The dinner was followed by a music party and the distribution of *pan suṭari* and the members retired at a late hour after responding to cheers called for His Majesty the King Emperor and for the Principal.

Next morning some of the ex-students were taken round the estate by the resident members; and thus ended another successful celebration organised under the auspices of the Madras Agricultural Students' Union.

APPENDIX I.

The following is a summary of the lecture delivered by **Dr. C. A. Barber**, Government Botanist.

Sugarcane Seedlings in India.

The sugarcane has, from time immemorial, been planted by cuttings, that is to say, by pieces cut off from the parent plant and put into the ground. This mode of propagation, without the aid of seed, is called "vegetative." In the case of plants reproduced in this way we not infrequently find that the seed is more or less infertile as if, from long disuse, there has been a gradual loss of germinating power. In some extreme cases no seed is formed at all, as in the plantain and the best varieties of pine-apples. The idea among sugarcane planters that the seed of the sugarcane was infertile was therefore not unreasonable. This loss of seed in plants is by no means an unmixed evil. There is in fact a distinct advantage in vegetative reproduction. It is by this means and by this means alone that the whole of the parental characters are transferred intact to the offspring. And this again need cause no surprise, for propagation in such a way simply prolongs the life of the individual indefinitely. A bud or branch of the parent plant is removed and, by suitable treatment made to form new roots and to grow on for a further period. There is no reason for any change of characters in plants whose life is thus prolonged, beyond the gradual adaptation of the organs and tissues to the climatic surroundings. Viewed from this standpoint, the sugarcane is perhaps one of the oldest plants existing on this globe, having an uninterrupted life of at least 4,000 to 5,000 years. We know at once that, if we plant pieces of a cane with rich juice, we shall get the same character in the crop and, if we are content to plant one with poor juice and producing a thin cane, we shall get a crop of the same kind. Hence also has arisen the whole art of grafting, where plants have been found to be deficient in the power of forming fresh roots on detached branches, but have shown that their tissues will readily fuse with those of other similar varieties. And we are thus sure of preserving the good qualities of the best kinds of apples, pears, mangoes and oranges.

In raising plants from seed, or by "sexual" reproduction, the position is reversed. Instead of one parent there are two and this union of two parents has been observed to result in much variation in the offspring. This is readily noticeable in any seedbed where, beyond a general resemblance, any number of minor variations can be easily seen. It seems probable that this variation is even greater in plants usually raised by the vegetative method, in that no trouble has been taken to select such forms as are "true to seed". As examples, might be mentioned the orange and common croton of gardens. The seedlings obtained in both these cases appear to be of the most various nature, many of them "reverting" to useless types. Now, in this variation, lurks as great an advantage to the plant grower as that noted above in vegetative reproduction, for it is at once evident that by raising seedlings we can obtain new varieties, and by crossing two plants of different character we can obtain a wider range of variation. We can, in fact, obtain hybrids uniting the characters of the two parents in different degrees and, so to speak, rearrange the sum of characters present in the two types. It has been a great advance in recent years to demonstrate that liability to disease is sometimes one of these transferable characters. Biffen has shown this to be the case with rust-resistance in wheat and it would seem probable that a similar immunity from disease may be introduced in other cases by appropriate crossing.

The possibility of raising canes from seed becomes thus a matter of some importance, for thus alone can we hope to obtain new varieties in quantity. The fertility of cane seed was first demonstrated in Java in 1887 and, independently, in Barbados in the following year. The industry at this time was passing through a very severe crisis. The good, old kinds were being subjected to a very heavy strain through their increasingly intensive cultivation caused by the rivalry of beet sugar. Year by year the area under beet was increased and its sugar content intensified, while the canes in different parts of the world were becoming more and more diseased. The constitution of the canes was, to all appearance, breaking down and it soon became a question whether this formerly profitable industry would be able to hold its own against the beet cultivation or would gradually die out. The chance of obtaining new canes was therefore eagerly seized in all sugarcane countries and the agricultural departments in Java, the West Indies, British Guiana and Mauritius, as well as many private

planters in these and other countries quickly raised a mass of seedlings. But much of this work turned out to be of little ultimate value in that it was soon discovered that the great bulk of the seedling canes were of very inferior character if not altogether worthless, many apparently reverting to some ancient condition resembling what one might suppose to be the original wild form of the plant. In one or two places, however, the work was carried on with greater vigour than ever, coupled with great care in checking the results and with a careful system of weeding out the unprofitable seedlings as early in their career as possible. One or two cases may be quoted to show both the necessity and the arduousness of this weeding out. In Barbados we read that, in five years, some 20,000 seedlings were raised and that it was considered that less than 1% of these were likely to be of ultimate value. In British Guiana as many as 3,30,000 were raised in the same period: 26,000 of these were grown on for further study: 50 were sent out to be tested on a field scale by planters and it was thought that, finally, some dozen only would be added to the canes of the country. Among the interesting facts which came to light in these investigations may be mentioned two. Many of the seedlings were found to be much less liable to disease than their parents and showed more or less immunity to the common fungus diseases. There was also noted a great increase in the fertility of the flowers of some kinds. While, in the first stages of the work, it was considered satisfactory to obtain 20 to 30 seedlings from one arrow it is recorded that in one case nearly 1,000 healthy seedlings were raised from one inflorescence of a seedling cane. This latter fact need not surprise us, for it would be the natural result of selecting for propagation such plants as developed fertile flowers, long neglected before the discovery of the germinating power of the cane seed.

A glance at the literature of the subject abundantly justifies this laborious work and the cane industry has in many countries profited greatly by seedling canes. In place of the former despairing attitude, the growing of canes has received a new impetus and, in Java, the West Indies, the United States of America and Mauritius the rivalry of beet sugar is no longer a pressing question. I have selected Java for a more careful study in that a short account of the influence of seedling canes on its sugar industry has recently come to my hand. Before 1850 there was practically only one cane in the island, the White Cheribon. In that year an enterprising planter noted among

the white canes a new, red one and carefully separated it. It turned out to be of value in that it yielded a greater tonnage of canes, had juice of greater purity and was capable of withstanding more unfavourable conditions. It was a hardier and better cane and was quickly taken up by the planters. There arose thus a period of prosperity in the cane industry of the island. In 1882, however, a planter in extreme west of Java noted that his canes were stunted, developed many aerial roots and multitudes of side branches which never grew beyond a few inches in length and consequently did not produce any canes. The plants were otherwise healthy enough. This will remind many cane growers of a curious bunching habit not infrequently met with in the fields especially where the water is alkaline or the canes are ratooned. Around Coimbatore this appearance is known as "shuleh kutteh" and in Java the disease was called "sereh" because that was the name of the common lemon grass and the cane shoots resembled that grass rather than normal canes. Each year this disease spread further eastwards, all the fields in the plains being attacked while only those in the hills ran free. As it was the western fields that were diseased, a constant stream of sets passed from the eastern estates and Government took the matter up, divided the cane estates into definite circles and allowed rebates on all canes sent by rail. In 1888-9 they went so far as to carry all cane sets free. But this seemed to have little effect on the gradual spread of the disease which, in 1892, had traversed the whole island and even entered the island of Bali off the eastern corner of Java. Two main facts were noted regarding the disease. It was seen that it was much worse in ratoons and that the hill estates were free from it. Although carefully studied from a scientific point of view no one could definitely say what caused the disease. A number of fully equipped laboratories were founded and the canes were for the first time carefully studied in all their aspects. The only solution arrived at was to give up ratoons and found hill nurseries from which fresh seed could be imported year by year. It was found that such seed took two years to be infected. But this disaster overtook the Java industry just at the time when the beet was challenging the supremacy of the sugarcane as a sugar producing plant, and the planters found themselves unable to bear this heavy additional expense. The attention of the station was therefore turned to the introduction of canes from other

countries in the hope that they might find some to replace the old dying Cheribons. This acclimatisation work was partially successful and the industry was enabled to lead a struggling existence. With the discovery of the fertility of cane seed, however, things took a different turn and the whole strength of the experimental stations was directed into this new channel. To cut a long story short, the seedlings proved to be of the greatest value and lifted the industry finally out of danger. The result of this work may be described as eminently satisfactory. Many places now exist in Java where the seedlings have completely ousted the old and introduced canes. Some of them ripen early and some late : some can resist drought and others can stand waterlogging : most of them are very hardy and some have excellent rich juice. There is in fact so great a selection of canes in Java at the present day that a planter may plant up each field or portion of a field with its appropriate cane. He can also arrange matters so that during the whole of the milling season he can have fresh canes for his mill, thus rendering the work in the factory extremely economical. Java is in a better position today than it was ever before and this fact may be ascribed almost entirely to the work of the experimental stations and their careful selection of the many cane seedlings raised during the last twenty years. The exports before the serah disease appeared were some, where about 600,000 tons a year and today they are over double that quantity, Java being second only to the great island of Cuba as a sugar exporter.

It is hardly necessary to emphasise the fact that the cane industry in India is in a very unsatisfactory condition. Although the greatest sugar producer in the world, none is exported : such good canes as are present are grown on a very small scale or are heavily diseased : and the vast majority of the cane growing tracts have perhaps the worst canes in the world to rely on. The raising of seedling canes in India seems therefore to be a very necessary proceeding. This has indeed been tried on more than one occasion in the past. But the only successful result recorded is that obtained at Samalkota some years ago. There, it will be remembered, after many experiments two seedlings were actually raised but these died in early infancy. Just as in Java, the main work of that station was an attempt to introduce canes from other countries in the hope that some might be found to take the place of the local dying ones. And this was so far

accomplished that the canes of Madras are at the present moment the best in India and can compare with those of many cane-growing countries. But they are unsuited to the conditions of the great cane areas of the United Provinces, Bengal and the Punjab and, for the industry to be able to hold its own against the increasing quantities of beet sugar imported year by year, a new set of better canes must be produced suited to the peculiar conditions of northern India.

It was resolved at the recent meeting of the Board of Agriculture that this work should be undertaken, and I was instructed to make such preliminary enquiries as seemed likely to lead to a successful result. The work was transferred to Coimbatore. There were several reasons for doing this, in that it was thought that Samalkota was unsuited, the canes at Coimbatore were known to arrow very freely and the place had the advantage of well equipped laboratories. The first piece of work was to study the cane arrows in order to determine the reason for the former failure. Unfortunately, when the Pusa meeting was over, most of the flowering season had passed at Coimbatore, but in the Christmas holidays there were still some arrows left and these were submitted to a careful examination. At first it was thought worth while to examine the arrows to see if they contained seeds on them, but this proved a very difficult task because of the peculiar feathery nature of the arrow. After some hundreds of them had been examined the net result was only one doubtful specimen. Turning to the flowers, it was seen that these were typically formed ; the stigmas and stamens were apparently normal. The stigmas were fresh and had the power of causing the pollen of wild canes to stick to them and even to put out pollen tubes. But the anthers, on closer examination, were seen to be closed and no experiments which we could devise caused them to open. When dissected out there was very little if any normal pollen contained in them. The absence of fertile pollen was therefore considered to be the cause or at any rate a sufficient cause for the infertility of the flowers. Arrows were collected from other places where the season for flowering appeared to be later, and those received from Palur, Samalkota, Taliparamba, Mysore and the United Provinces were examined as to open anthers. Three kinds were found to have open anthers in varying amount, but in fair quantity. Of these further specimens were asked for, but it was only from My-

sore that a second sending could be obtained. All of these were at once planted, it being surmised that the stigmas might have been dusted with this pollen and the ovaries fertilised. The result was an instantaneous success and soon some fifty strongly growing seedlings were obtained. The difficulty was thus solved and it was proved that the absence of fertile seed in South India was not so much due to unsuitable climatic conditions as to the poorly developed anthers or male sexual organs. Altogether some 300 pots were sown with arrows. Among these about a dozen seedlings were obtained from Coimbatore arrows and more than fifty from Mysore. The rearing of these seedlings has been a very arduous piece of work and here the climate appears to be really a great bar to progress. They are excessively delicate and at first very slow growing, and many were lost in the earlier stages before the correct method of raising them was arrived at. There are now nearly fifty healthy seedlings planted out in the Botanic garden at Coimbatore, the first in India. The predominance of the stamens with regard to fertility was not altogether a surprise. It will be remembered that something of the same kind has transpired with regard to the pepper vine. The only way to tell whether any particular vine is a fruitful one is to pick up some of the fallen spikes and note whether stamens are present. Those plants without stamens although capable of occasionally yielding large crops, cannot be relied on to do so year by year. In both the sugarcane and the pepper the anthers remain attached to the inflorescences long after these have fallen or are dead and the work is rendered the easier on this account. Such arrows as had been preserved were accordingly rigorously examined under a lens and the following are the results thus far obtained. The following canes were noted as arrowing during this year :—Ashy Mauritius, Striped Mauritius and the Red and Green Sports from it, Red Mauritius, Purple Mauritius, Fiji B and Fiji C, Barbados 1529, Java 36 and 247, Vellai, Namam, Poovan, Kaludai Bootnan, all from Madras; Cheni from Mysore and Chin, Desi Sarethi and Dhaula Sarethi from the United Provinces. The arrows of these were not all preserved because it was not known in what direction further work would extend, but such as were available gave the following results :—No open anthers were seen in Java 36 and 247 and in Chin, Desi Sarethi and Dhaula Sarethi. From 1.4% were found open in Striped Mauritius and its two sports, Barbados, 1529 Fiji B and Vellai. 20.30% in Purple Mauritius, 50.60%

in Cheni and 60.70% in Red Mauritius. These results were obtained by shaking the stamens out of the arrows and examining 200 of each kind under the lens, a very tedious process because many of the stamens had to be turned over to see if the anthers were open or not. We see from the figures given that, while a fair number of canes produce open anthers, there are only three at present met with which produce these in decent quantity. And of the latter only one is native to the country. And this at once explains former failures to obtain fertile seed in India. This simple discovery not only solves our great difficulty in raising cane seedlings but even places us at an advantage as compared with other countries. We can, for instance, be fairly sure of the parentage of the seedlings raised, a matter of great difficulty in the sugarcane. For by bringing the arrows from kinds with open anthers and placing them on those without fully formed stamens we can obtain new crosses and the matter is further satisfactory in that the Cheni and Red Mauritius are excellent hardy varieties which are less attacked by disease than most of the local kinds. Our work in the cane-breeding station will therefore in future be circumscribed, less by the actual difficulty in raising seedlings, than by the lack of time to properly grow them on and submit them to the long testing period before we can say whether they are good or bad. As was to be expected most of the seedlings in the sugarcane are worthless, and it will need considerable patience coupled with a good deal of scientific knowledge to determine which are likely to be useful. It is essential that this decision shall be arrived at at the earliest possible moment as, otherwise, the number of separate seedlings on our hands will soon take up all the available space and energies of the section. Examples are exhibited to-day of the extreme variation of these seedlings long before they have begun to form canes, a variability shared by the wild *Saccharums* which are also being studied. In the majority of cases it will be too late to wait for the actual canes themselves, and every effort is being made to find criteria by which it may be decided in early life which seedlings are likely to be of use and which will not repay further trouble.

APPENDIX II.

Paper read by **Rao Bahadur J. Dharmaranga Raju**, Dewan Peishkar of Pudukkotta on

A suggestion for accelerating the introduction of Agricultural improvements in the Madras presidency.

Mr. President and gentlemen,

I thank you for the honour you have done me in inviting me a second time to address you at this Conference and in giving me this time an opportunity for expressing my views on the subject of accelerating the introduction of agricultural improvements in this Presidency. That the agricultural practices of the country are in a more or less primitive condition and that they need a careful study and a more careful modification may be taken for granted. This need for improvement was felt by Government all along and action was taken as far back as 1854 as the result of "the recognition of the absence of agricultural progress, of the absolute necessity for such progress and of the duty of Government to foster and guide it." Attempts were made in several directions during half a century but, for want of continuity of work, the subject was, in the words of the Hon'ble Mr. Butterworth who presided at the sports last year, more or less being played with. It is only after the reorganisation of the new Agricultural Department that more serious and concentrated attention is devoted to the matter. The objects of the Department for the purpose of my paper may be considered to consist of studying the local practices, evolving more paying methods and devising suitable ways and means of reaching the cultivators; in other words, local enquiry, experiments and research, and dissemination of the results of experiments. All these aspects of the question have received and are receiving attention in the new department,—at the college, in the research laboratories and in the different experimental farms,—and I mean proposing for your kind consideration, one single suggestion regarding the *modus operandi* of the dissemination of the results of experiments. A more rational system of cultivation is expected to be adopted by the cultivators in a number of ways e. g., through the exertions of the passed students of the Agricultural College, through the practical examples set at the district Farms, through the broadcast

circulation of vernacular leaflets, bulletins and calenders and through the lectures delivered and demonstrations held at cattle shows and agricultural exhibitions. These methods are all in the right direction and probably, in the infancy of the Department, much more cannot be done. All the same I request you to consider the limitation to this work.

First of all, the college sends out of its portals less than 20 students every year, and granting that all of them take to the profession of agriculture, it is but a very small number to successfully and widely disseminate the new ideas. The Farm managers and assistant managers who are occasionally told off for district work have many difficulties to contend against. They have often an unmanageably large area to tour in with profit to the cultivators, and their personal influence in the villages is practically nil for, as I pointed out in my last year's address, the good-will of the village headmen is difficult to obtain without official pressure. It is also possible that these itinerant officers cannot be supervised and advised as constantly as may be necessary. The work done by them may, in individual cases, be very good but for want of concentration upon small areas, the results obtained do, by no means, appear to be tangible and commensurate to the time and labour spent.

I have been taking an interest, in my own humble way, in the working of the Agricultural Department during the past 25 years and, from my knowledge of the people with whom I have been moving on intimate terms as a Revenue officer all the time, I am of opinion that the ryots cannot easily be coaxed to copy the methods followed in Government Farms. They are naturally shy, averse to all changes, conservative in this as in everything else and I may also add that they often consider that good results are obtained in Government Farms by the expenditure of larger sums of money than they can ever afford. Our accounts of field cultivation are of no moment to them for they are generally illiterate. To illustrate my remark, the late Saidapet Farm at least established the truth of a few ideas; e. g., advantages of deep tillage, the growth of fodder crops and green manuring. None of these was accepted or followed by the neighbouring ryots. The Central Farm has been in existence for 5 or 6 years now and how many acres of green manure have been grown in the adjoining villages? The ryot is not after all so stubborn as not to take advantage of a new idea if the demonstration was made in his village on his or his

neighbour's lands and under conditions exactly prevailing in the village. I may point out that, wherever improvements have been adopted on a large scale by the ryots, it will be found that the system was first adopted by an individual ryot on his land and then gradually spread outwards.

The work of the Agricultural Department will be very much more prominent if means were devised to demonstrate improvements in the villages. For the most part the ryot's world is his village. He is in nature immovable and the prophet has to take his message to the mountain. Our suggestions should be brought home to him. He should be able to see with his own eyes the efforts made on his or on his neighbour's fields and once he realises the utility of the proposed changes he will take to them without diffidence. A spirit of emulation sets in amongst the villagers and the ideas spread. Where efforts were concentrated in small localities and made in ryots' own fields with his co-operation, success has been achieved, for instance, the introduction of pure Karunganni cotton in parts of Tinnevely and of Mauritius sugarcane near Nellikuppam.

There are some who are of opinion that the introduction of agricultural improvements in the country should depend on the economic condition of the cultivator and not on the intrinsic possibilities of the land. It is considered that, if a ryot be in straits, he will naturally be forced to seek for light and improvement and that improved methods should be suggested only to such ryots; in other words, that modern methods are in advance of the times and that the ryots will come to adopt these methods only when they feel the need to get more out of the land than they get now. This may be true enough in the west. Here the shoe may pinch the wearer and yet he will not bestir himself beyond cursing his fate and blaming his God. They would rather emigrate to the colonies in search of increased wages than take the trouble of evolving better methods of growing crops.

Leaving alone all these opinions, we are all agreed, I hope, that it is absolutely necessary, if quick and tangible results are expected, to bring such methods as have been experimented upon and accepted as safe, nearer home and with easier reach of the ryots. As far as I can see, the following have passed the stage of experiment and may be safely introduced :—

1. Thin sowing of paddy in seed beds.
2. Lessening of seed rate of paddy.

3. Green manuring of paddy lands.
4. Better storage and preservation of Farmyard manure.
5. Seed selection.
6. Introduction of tillage implements, like the gorru and guntaka in the south.

7. Growth of fodder crops.

8. Introduction of more paying crops where facilities exist, e.g., sugarcane, groundnut, Cambodia cotton and turmeric.

After this rather long introduction, I beg to propose, gentlemen, with your permission, the following scheme:—"That the present scope of the Department be enlarged by the inclusion in it of a new Branch whose activities are to be concentrated upon small areas at a time, namely the formation of a couple of parties on the model of the Settlement and Survey Parties." My proposal, I once more beg to point out, is, in addition to, and not in lieu of, the work now being done in the Farms whose existence is absolutely essential for evolving methods which have to be popularised by the parties mentioned above. The lower subordinate staff of these parties will live and work in villages and on ryots' lands, with their co-operation. These officers give the ryots the benefit of their skilled supervision which, in its turn, is ins-regulated by officers of a higher grade. My expectation is that a large number of small, but flourishing village Farms will soon be established and that these will serve as object lessons to the other villages and at least one important idea will take practical shape and settle in the selected area.

In order that the activities of the Department may not be sporadic, and fail for want of continuity of work, I propose the organisation of two such parties working in different centres in this Presidency, that their spheres of influence may be felt in the most distant places. The Presidency might be divided into two parts for this purpose, and as one party with, say, Chingelput, as the starting point extends its operations northwards, the other party should move northwards from such a place as Tinnevely so that as the first party approaches the termination of its labours in the northern portion of the Presidency the other would have done the same in the southern. In this manner continuity of work will be secured and the good seeds sown in the country will not fail for want of care.

I shall now request you to enter with me into the details of my scheme, and bear with me as I lay it out before you as I am particularly

anxious to show that mine need not get wrecked on the rock of financial or other similar difficulties. I shall, with your permission, view the proposal under the following aspects:—

(a) Staff and personnel of the party.

(b) Cost.

(c) How the cost is to be met.

(d) Plan of work.

(e) Government orders to facilitate the work.

(a) Now supposing that one of the parties begins its operations at Chingleput, its personnel may consist of:—

1. An Assistant Director on Rs. 250—15—400.

2. A Sub-Divisional Officer on Rs. 150—20—250.

Assistant Director, :—Chingleput, Conjeevaram and Maduran-takam Taluks with Chingleput as Headquarters.

Sub-Divisional Officer :—Tiruvallur, Ponneri and Saidapet Taluks with Tiruvallur as centre.

3. Under each of these officers there are 3 first grade managers on Rs. 100—10—150 for each Taluk.

4. Under each of these first grade Managers there should work 3 Assistant Managers on Rs. 35—3—50 (*viz.*) on the grade of and corresponding to the Firka Revenue Inspectors.

5. 2 clerks each to the Assistant Director and Sub Divisional Officer on Rs. 30 and Rs. 25 and one clerk on Rs. 25 to each of the Farm Managers of the first Grade.

6. 4 peons on Rs. 8 to each of the officers, 2 peons to each of the first grade Managers and one to each Assistant Farm Manager.

If possible I would attach an Assistant Entomologist on Rs. 50—10—150 to each of the Sub-Divisions, but I do not press this point.

(b) Summing up, the expenditure required for the maintenance of the staff will be as follows :—

Salaries :—		Average	Total.
	Salaries.	Salary of each.	
1 Assistant Director	... 250—15—400	350-0-0	350-0-0
1 Sub-Divisional Officer	... 150—20—250	225-0-0	225-0-0
6 Managers, 1st Grade	... 100—10—150	137-8-0	825-0-0
20 Assistant Managers	... 35—3—50	16-4-0	925-0-0
2 Clerks	... 30	30-0-0	60-0-0
8 Clerks	... 25	25-0-0	200-0-0
40 Peons	... 8	8-0-0	320-0-0
			2,905-0-0
	Add for rounding.		95-0-0
	Total Monthly Salary.		3,000-0-0
	Total Yearly Salary.		36,000-0-0

Travelling Allowances :—

Per annum

Assistant Director	...	1,000
Sub-Divisional Officer	...	600
6 Managers at Rs. 30 per mensem, fixed allowance.	...	2,160
20 Assistant Managers at Rs. 15 per mensem	...	3,600
Clerks and Peons	...	1,000
Total		8,360
Salaries.		36,000
Total Travelling allowance.		8,360
Total.		44,360
Office expenses and contingencies at 10%	...	4,436
Total.		48,796
Add for sundries and rounding	...	1,204
Total Rs.		50,000

(c). Next as to how the cost is to be met :—

It will thus be seen that a total cost of Rs. 50,000 for one party or of one lakh for both the parties will be required for carrying out my scheme, and the provincial Government may, should my proposal be found acceptable, make a special allotment thereof. Probably the Government of India will be glad to place this amount at the disposal of the provincial Government. In any case, it should be easy to persuade a Government that has sanctioned lakhs of Rupees for Elementary Education to grant this comparatively small amount to be spent on the most beneficent work of reform and progress.

(d). Plan of work :—

The work for the year in a particular area should be decided upon at a conference of experts presided over by the Director of Agriculture, to which I would propose that the following members may be added:—

1. The District Collector and the Revenue Divisional Officers.
2. The Assistant Director and the Sub-Divisional Officer.
3. A few enlightened land holders of local influence to be nominated by the Collector.

My object in proposing a mixed conference of experts and local

men is that suggestions may be complementary, the former laying down the modern and scientific lines of agricultural advancement, and the latter acquainting them with the urgent needs of the locality as well as the available facilities therein, such as the possibility of securing the co-operation of willing ryots and the existence of suitable central villages to start the agricultural operation farms.

The scheme of work having been settled, it is printed in extenso and distributed broadcast in English and the vernacular to all the village headmen and other concerned parties. A programme is drawn up for each firka and placed in the hands of the Assistant Farm Manager. In my scheme the Assistant Manager is the most useful unit on the staff for, on him rests the actual carrying out of the scheme on the spot. His work does not stop with lecturing to the ryots and treating them to long drawn out precepts in forming, to be more honoured in the breach than in the observance. On the other hand he remains in the village with the ryots as one of them, and sees the programme carried out. Having secured the hearty co-operation of a willing ryot in a village he sees that the manure pit, for instance, in that place is properly prepared and maintained. Or he sees that the guntaka and the gorru are introduced into another village which may be in sad need of them, and trains the farmer in the use of them and the local mechanic in their manufacture; or he sees that a portion, however small, of the lands belonging to a willing land lord is grown with green manure or transplanted with single seedlings. Nor does he stop with having merely introduced a new idea in some place. He returns to that place at least once again within a month of starting the operation and hammers away at the idea till it takes deep root in that locality.

In addition to farm operations, the Assistant Manager selects samples of soil or manure for analysis when there is a necessity and sends them on for examination. He selects areas for crop experiments; recommends the grant of land improvement and agricultural loans under the Act. He reports on insect pests and such other matters which he could not personally look to. And last but not least, he becomes thoroughly conversant with the agricultural practices and conditions of his firka. Practices in this country differ so much from place to place, and even from village, to village that even the best of suggestions offered by the Departmental experts may stand in need of revision in the light of local conditions. Consequently the Assistant Manager in charge of a

firka, by collecting information on local conditions, indigenous ways, means and methods will, in course of time, individually and with the rest of the party, have advanced the cause of agriculture to a considerable extent. It will thus be seen that the Assistant Farm Manager is a most useful unit in my scheme, so important indeed are his duties that he may in course of time require the service of an all round maistry to assist him.

Now for the rest of the staff. The 1st Grade Farm Managers move from village to village and supervise the work of the assistant managers, give them instructions wherever necessary, and meet all the firka Assistant Managers at monthly conferences at their headquarters to exchange ideas and concert measures. The Sub-Divisional Officer and Assistant Director move through Taluks and supervise the work of the subordinate staff. These officers, I may tell you, should be sufficiently enthusiastic, coolheaded and, let me add, level headed, with a supreme faith in what they are preaching. They may hold conferences occasionally with the managers, and enlist by persuasion and tact, the co-operation of influential landlords. It may be left to the Assistant Director to apply for expert help if necessary. The Director of Agriculture under whom the entire party works may, considering the importance of the work, tour as often as he could find time in these tracts and satisfy himself as to the progress that is being made by the party.

The whole party will generally remain in a particular District for one full official year. The official year is recommended because April and May are the preparatory months, and the party may, by moving about during these months, get acquainted with the actual needs and conditions of the tracts it will have to work in, so that, by the beginning of June, villages will have been selected wherein improvements are urgently called for or are practicable, local co-operation secured, and the programme of work for the Assistant Manager definitely settled. From June to January, that is, during the entire cultivating season, the party severally carry on their work, and from January to March continue engaged in taking stock of what has been done. It may be that a second year will have to be spent by the party in the same District to fix or complete the improvements introduced in the first year; but I am confident that at the end of the 2nd year with an expenditure of a lakh of Rupees we shall have produced tangible results in one well defined tract, acquired current information on

local practices and helped the ryot in a thousand ways, for instance, by showing him how to save money in purchasing seed, and how to grow or prepare his manure, instead of sitting with folded hands and complaining against the Forest Department.

(c) Government orders on the subject:—

I do not propose on behalf of my scheme to invoke Government or Legislature to coerce an unwilling ryot to the adoption of new and, so far as the ryot is concerned, novel methods, for I know that such enactments would considerably set back the hand upon the dial of progress by resistance and indifference on the part of the agricultural classes to the infiltration of new ideas. But a G. O. should be issued defining exactly the nature and scope of the parties and informing the people that the work that has been undertaken by the Government is more or less altruistic in the sense in which medical or educational aid is, and is calculated to promote the prosperity of the people on the advancement of which it is most anxious. It is possible that in spite of the G. O. of assurance and sympathy, people may look askance at the scheme on the ground that Government may increase the assessment at the next Settlement; but this is always far off and at best or worst the ryots have to contribute only a portion of the *increase in price* of field products to meet the increased expenses of Administration and even this demand is not made always. I have been connected with Settlement parties for some time and may be supposed to know the principles on which periodical Settlements are based. I know that the Government does not increase the assessments where improvements have been effected by the ryots themselves with their own money. I therefore believe that a clear G. O. of the kind referred to above will dispel all suspicion concerning the new Agricultural Party I advocate. A clause in the G. O. may direct the District officers to render all possible help to this party in addition to investing them with certain powers of supervision over the village staff. But this is a matter of detail.

I have now placed before you the various aspects of my proposal in outline. The *raison d'être* for it arises out of the peculiar nature of the Indian ryot who, too indolent and ignorant to take care of himself has to be advised at Government cost while the agrarian classes in the West would seek and pay for such advice. I do not suggest the curtailment even by an iota of the existing scope of activity

and usefulness of the present Agricultural Department, for I know that at its conferences, imperial and provincial, in this College and at the several farms, a good deal of beneficent work is being carried on. On the other hand I plead for an extension of its sphere of activity by taking the new ideas to the ryot and by practising the new method of cultivation with him at his home. I should like to point out that, whatsoever farms we may have, central or model, with howsoever an efficient and enlightened staff to work them, we will not have effectively, unobtrusively, and fraternally reached the ryot as by going to his own doors and dispelling the mist of ignorance in him by rubbing shoulders with him and labouring side by side on his farm, thereby enabling him to see for himself the possibility of his carrying out the suggested improvements. The scheme I have proposed may be liable to a number of modifications in the staff and methods of work, but I once more beg of you to bear in mind that the central principle underlying it is *concentration of work in a small area which should be on the ryots' own field and which should aim at winning his co-operation*. There are two circumstances fatal to all new schemes, first that they are new and second that they are expensive. But I claim that mine should have a better fate inasmuch as it is not entirely new, being a combination as it is of the principle of the model farm and the Settlement parties, and it is further not likely to be considered expensive by a Government whose biggest revenue is Land Revenue and whose interest has already caused it to spend as much as Rupees 38,000 on a single Central Farm. In the year 1910-11, the Land Revenue realized by the Madras Government was Rs. 6,65,20,000 that is there was an increase of over 20 Lakhs over the collections of the previous year. The seasonal remissions granted by Government in the year amounted only to 2·8 lakhs as against 12·5 lakhs in the previous year. The amount of expenditure advocated by me in this new scheme is only one lakh for a year. A Government that is so liberal as to grant seasonal remissions to the extent of several lakhs of Rupees in bad years may not hesitate to allot a lakh of Rupees annually for the improvement of agriculture considering that its Revenue depends mostly on agriculture and that, with the introduction of improved practices, the amount of seasonal remissions is sure to decrease in due course. It may be that mine is a scheme whose merits could not be thoroughly gone into at a conference of this kind, but it is a happy coincidence that I have the honor

of expounding it before the Honourable Sir J. N. Atkinson who, as the Senior member of His Excellency the Governor's Council, is in charge of the Agricultural Portfolio.

The paper was followed by a lively discussion in which Messrs H. C. Sampson, F. R. Hemingway, and R. C. Wood and the Hon'ble Dewan Bahadur V. Ramabhadra Naidu took part.

Mr. Sampson was of opinion that the Department was not yet in full possession of the agricultural needs of the country and that it would take some more time before definite suggestions could be made for the general acceptance of the ryots. He thought that improvements which had not been sufficiently well tested, when suggested to the ryots for adoption, might put back the cause of progress.

Mr. Hemingway, in a vehement speech, characterised Mr. Raju's proposal as unnecessary, as the Department was doing all it could with the resources and staff now at its disposal. He also took objection to some of Mr. Raju's statements about the ryots' economic condition and thought that they were exaggerated.

Mr. Wood, while agreeing with Mr. Raju that concentration of work was essential, said that, in view of limited reliable information available at present, concentration to one or two fully recognised improvements might be acted upon in disseminating agricultural knowledge amongst the ryots and that a continuity of policy should be kept in view.

The Hon'ble Dewan Bahadur V. Ramabhadra Naidu said that he did not agree with what Mr. Hemingway said which might be true of the industrious Coimbatore ryot, but that the cultivators as a class, being illiterate and conservative, could be approached much more easily if the improvements suggested were brought to their very doors instead of their being left to learn what they could from the experimental stations. He was of opinion that Mr. Raju's proposal was worth consideration subject to any modifications which may be deemed necessary by the Department so long as the principles were kept in view, namely the concentration of work in a limited area and the carrying out of the suggested improvements within easier reach of the ryots.

Rao Bahadur Dharmaranga Raju said in reply that he had mentioned in his proposal only such improvements which have been proved successful and which alone he advised for adoption for suggesting to the ryots. New ideas which may be evolved hereafter by the

Department could be introduced when the parties work in those districts in their subsequent tours.

Sir J. N. Atkinson, in concluding the Proceedings, said that he would await the progress made by Rao Bahadur Dharmaranga Raju and the Hon'ble Dewan Bahadur Ramabhadra Naidu in Pudukkotta State and Doddappanaickanur and Vadagarai Zemindaries respectively on the lines suggested in the paper and hoped that they would set an example to the Madras Government.

Papers read at the Second Session of the Conference by Mr. Vengail K. Krishnan Nayanar on "Agriculture and my experiences on the working of my Farm" and by Mr. V. P. Subramania Mudaliar on "Improvement of local cattle", will be published in the next issue, along with the financial statements and lists of members, as appendices III, IV, V and VI.—*Editor*.

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Conservatism

It has been customary from all times and in all countries to ridicule the farmer as a conservative individual. The common picture drawn of the farmer is that of a simple being, slow of speech and slower of thought, unwilling to take advice and more unwilling to act upon it—the picture, in short, of conservatism of the worst kind. But it may be enquired whether conservatism is not to be admired and whether the farmer is not only justified in his disinclination to change but whether conservatism ought not to be inculcated in any course of agricultural training as a necessary part of the farmer's mental equipment.

The reason of the farmer's conservatism is not far to seek. We read of manufacturers ruthlessly scraping machinery worth many thousands of pounds because a recent discovery or the adaptation of some new system has, without warning, made their machines out of date, and put them at a disadvantage when compared with their more progressive competitors. No business man now would think of going back to the machinery of fifty years, nay of even a decade ago—and yet the farmer is held up to scorn, or rather a patronising ridicule, by the too-clever townsman because he uses a plough which his grandfathers used, and grows the same crops which have been grown for the last century or more.

It is often considered by the ignorant, that farming is easy, that the farmer lives an idle life—that he has in fact little to

a very ready disposition to change his practices when the *advantages of any change are thoroughly and convincingly proved to him. More than this, he is willing to be convinced.* He needs help, he needs constant reminding, but he is open to conviction. One of the most encouraging signs to those who have the welfare of the ryot at heart, is the rapid spread of the co-operative movement in this country, a spread relatively more rapid than in England, where the well wishers of the farmer are for ever deploring that he will not change his methods to meet new conditions.

We have been much struck by the rapid spread of Cambodia cotton in the neighbourhood of the Central Farm, not in small patches, but in big fields and on the best lands. It has been sown this year not only on the garden lands where its success was to be expected, but on dry lands where the owner may almost have said to have speculated, so little reason had he for supposing that it would succeed.

This conservatism has a real use for those who, like ourselves, are advocating, by word and deed, the spread of new practices in the Agriculture of the country, since it serves as a screen whereby the good may be separated from the bad. A conservative man needs to be convinced before he will change, and unless any suggestion of Agricultural improvement, whether it be the cultivation of green manure crops, or the introduction of the big cotton soil plough, can be thoroughly proved and shown to have a reasonable chance of success, it will get no chance. There is thus little risk of workers introducing unsound practices. Let a reasonable and moderate conservatism then be our watchword. The new is often good, the old is perhaps more often the better. There is great need of progress, and in no direction more than in Agriculture, but let us see that our progress is based step by step upon the best scientific knowledge available combined with the results of actual trial. "Practice with Science" runs the motto of the Royal Agricultural Society of England.

The Ox—Defects in the conformation of the feet and diseases and accidents to which the feet are liable.

Amongst the Arabians, who have owned one of the finest races of horses from the earliest times, there is a saying 'no foot, no horse.' This means, However well shaped and sound a horse may be in other parts of the body, if he has not sound and healthy feet, he is of no use. An ox too must have well formed and compact feet, and also a strong and healthy neck, as he has to carry the yoke in almost every kind of work he is employed in, and we can say with regard to the working cattle, 'no foot and no neck, no bullock'.

If we carefully examine the body of an ox or of any other animal belonging to that class of animals (Mammalia) which bring forth their young alive, we will find that its body is constructed upon the same plan as that of man. Strictly speaking, the feet of the ox are the parts below the knees in the forelimbs and below the hocks in the hindlimbs, but, ordinarily, the feet are taken to mean the parts in the fore and hindlimbs from the fetlock joints downwards which correspond to the fingers and toes of man, and it is in this sense we will speak of the foot of the ox. While man walks on the feet properly so called, the ox walks on the tips of the toes. Again, while man has 5 fingers or toes in each limb, the ox has only 2 toes. Further still, while the fingers and toes of man are separate throughout, the toes of the ox are separate only at the end, where they are covered with hooves. The fingers and toes of man carry nails, which do not cover the extremities fully. In the place of nails, the ox is provided with hooves, which completely envelope the extremities of toes.

Besides the two principal digits in each limb, the cattle have two other rudimentary toes attached to the hinder part of the fetlock. Each of the principal digits is composed of 3 bones placed one below the other. The lower part of the second bone and the whole of the third are contained within the hoof. The

rudimentary toes have rudimentary hooves, each containing a small bone unconnected with the bones of the limb.

We will now consider the defects in the conformation of the feet and the disease and accidents to which the feet are liable.

Defects in conformation.—The feet of the ox are obliquely joined to the fetlocks, so that the weight of the body and concussion during progression are shared by the fetlock joints and the feet. If the obliquity be excessive, there will be undue strain on the joints and they will be liable to various disorders, while, if the feet be set quite straight, they will be subjected to pressure and concussion. The hooves must be large and the inner and outer hooves of each foot equal in size. The cleft between the toes should not be too wide. As a rule, a very obliquely set foot has divergent toes and *vice versa*. The feet should run down straight from the fetlocks and should not be turned out or turned in.

Diseases and accidents.—The ox is used for various draught purposes. He has to work at the plough, the mule and the cart. He has to convey heavy weights to great distances along hard roads, and he is subjected to rapid progression in carriages. His feet have to be shod. All these, in addition to the disorders incident to the feet of cattle generally, make the working cattle liable to a great number and variety of diseases and accidents of the feet. A short account of these is given below.

Foul.—This is an affection of the foot originating in the cleft and giving rise to the formation of abscesses, ulcers &c. This disease may be due to specific or common causes. Amongst the former is the foot-and-mouth disease. Specific disorders affect the whole body and they are generally accompanied with certain sores or eruptions, which appear in different parts of the body. In the case of foot-and-mouth disease, the sores appear in the mouth and in the clefts of the feet. The common or non-specific causes of *foul* are the presence of foreign bodies fixed between the toes and various kinds of injuries. The affected animals must be kept in a dry place. The feet must be carefully washed. Any dead or loose tissue must be removed. Abscesses, if any, must be opened

and the pus let out. The feet must be dressed daily or every other day with the following powder:

Sulphate of copper	} Take equal parts of each powder and mix.
Sulphate of iron	
Alum	

If there be any maggots in the ulcers, dress the feet with the following once a day:

Cocanut oil $\frac{1}{2}$ ollock	} Mix and gently heat until the camphor dissolves. When cool take 3 pies worth of snuff and stir in.
Turpentine oil $\frac{1}{4}$ "	
Camphor powdered $\frac{1}{2}$ tola	

The above is a very effectual dressing for wounds affected with maggots and one or two applications will destroy the maggots entirely.

Fever in the feet.—This is inflammation of the sensitive structures within the hoof. It is a very painful affection owing to the pressure of the unyielding hoof on the inflamed, swollen and tender structures within. Working cattle are subject to it. It may affect one or more or all feet. It arises from overdriving, from prolonged and fast work and from long continued standing. The affected feet are hot and tender and the animal persistently lies down. Give a purgative (1 lb. common salt dissolved in 2 measures of water and a little powdered ginger added). For the first two or three days, foment the feet for about an hour twice daily with hot water. When the animal is a little better and is able to move about, apply cold water to the feet freely or make the animal stand for a few hours morning and evening up to the fetlocks in water in a tank or pool. This must be done for about a week.

Loss of hoof.—This may arise from 'Foul' and from 'Fever in the feet' and also from accidents, such as the wheel of a cart running over the foot. Clean the foot gently with cold water and remove any sand or other foreign matter adhering to it. Besmear the foot with tar and cover it with a piece of gunny bag. Keep the animal in a clean, dry place. In the course of a month a new hoof will be produced but the animal should not be put to work for at least 3 months.

Sore feet.—This results from excessive wear of the hoof from working on hard ground without shoes. Make the animal stand in puddle or in water for a few hours daily. Moisture promotes the growth of hoof. In about three or four days the animal can be shod. In cases like this it is best to place, while shoeing, a piece of soft leather between the hoof and the shoe.

Overgrowth of hooves.—This may arise in working cattle from the superfluous horn of the hoof not being pared away when they are shod. This condition is not a disease but may make the animal liable to diseases of the feet, to accidents and to tripping. Treatment consists in having the superfluous growth removed by the shoeing knife and the rasp.

Pricks and other penetrating wounds of the feet.—These may arise from various causes and accidents. They may be caused during shoeing. Remove a little of the horn round about the prick or wound, so that the discharges may flow out easily and freely. If this is not done, the pus may bore its way up to the coronet between the sensitive structures of the foot and the hoof and cause great trouble. In case of this occurrence, pare off the horn round about and from over the seat of injury below and thus provide a dependent orifice for the discharge of the pus. Protect the foot with a bandage of gunny bag. Dress the wound with coconut oil slightly heated with a little camphor dissolved in it. When the wound is closed, apply a little sulphate of copper powder to the mouth so as to harden it and then shoe the animal carefully.

Monstrous growth of the rudimentary toes.—Sometimes these digits become over developed and bear large and long hooves causing impediment to progression and becoming liable to accidents. A portion of the hooves must be chopped off. If from any accident the digit is badly injured, it must be cut off and the sore touched with hot iron. This operation is easy and free from danger, as the bone contained within the rudimentary digit has no connection with the bones of the limb.

Fibrous tumours in the clefts of the feet.—These are sometimes seen in cattle. As they grow in size they cause lameness and ulceration of the cleft and may lead to Foul. They should be removed with the knife and powdered blue stone must be applied to the wound.

Ulceration of the heels.—The heels, that is, the hinder parts of the toes are sometimes affected with fissures and ulceration. The horn at the part becomes detached and a sort of fungoid growth forms on the sensitive structure. The part affected must be touched with hot iron, dressed with tar and protected with a bandage.

Brittle hooves.—These become easily chipped away. A dressing made up as below must be well rubbed on them once or twice a week.

Mutton fat	4 parts	} Add together, warm and thoroughly mix by stirring.
Lamp oil	2 "	
Tar	2 "	
Oil of Turpentine	1 "	

It is very difficult to shoe animals with brittle hooves. They must be carefully shod with clips at the toes. The nails must be fine; coarse nails are apt to chip away the hoof.

Split hooves.—The chief varieties of these accidents are :—

- (1) A vertical crack starting from the coronet and extending downwards.
- (2) A vertical crack commencing on the ground surface of the hoof and extending upwards to the coronet.
- (3) A vertical crack starting in the middle and extending upwards and downwards.

- (4) A horizontal crack about an inch or less in length.

Animals with flat soles are predisposed to these fissures. Alternate wetting and drying, as in the case of animals used for ploughing wet lands, may also make the hooves prone to splits. Concussion on hard ground is also one of the causes. If the fissure is deep, blood may ooze out from it when the animal walks, in consequence of the sensitive parts underneath being pinched. In such a case the fissure must be opened freely with the shaving knife and dressed with a strong

solution of sulphate of iron. In severe cases the animal may go lame but, ordinarily, it does not. The cracks will gradually grow out, that is, as the hoof grows, the cracks will descend lower and lower and eventually disappear. The feet affected with, or having a tendency to, cracks must be rubbed with the ointment recommended above for 'Brittle feet'.

Brushing.—This is caused by the edge of the inner hoof striking the fetlock of the opposite leg. It may occur in any animal occasionally from weakness or fatigue. As a rule, brushing is due to defective conformation, especially when the toes are turned out. When the toes are turned in, bullocks do not brush as a rule but a few may. When the toes are turned out, make the shoe of the inner toe thicker than that of the outer. If the toes are turned in and if the animal brushes, the thicker shoe must be put on to the outer toe. The clenches of the nails of the inside shoe must be well rasped off as well as the hoof and the edge of the shoe at the offending part.

S. L. D'Silva.

THE MADRAS AGRICULTURAL STATIONS.

As stated in the Foreword of the first issue, one of the prominent features of the Journal of the Union will be "Farm Notes", summarising the work of the Agricultural Stations and drawing attention to any experimental data which may have been evolved at these places. With a view to our readers following closely the current farm notes, it is proposed in this article to give a brief resume of the stations in Madras, the objects with which they were originally started and further subjects taken up for study from time to time in them.

These farms, or Agricultural Stations as they are called, are under the immediate control of 2 Deputy Directors, one for the Northern Division, chiefly comprising the Telugu Districts and another for the Southern Division, comprising the Tamil and West Coast Districts. Only the Central Farm at Coimbatore is under the control of the Principal of the Agricultural College. Working under these three officers, there are a number of Farm Managers

and Assistant Farm Managers, either in immediate charge of farms or doing special duty in district work, popularising, amongst cultivators, such methods as have, been proved suitable by experiment.

Under the Dy. Director of Agriculture, Northern Division, there are now three farms stationed at Samalkota, Nandyal and Hagari. Three farms originally started at Bellary, Hindupur and Bezwada have been given up for various reasons. A new farm is proposed to be opened at Anakapalle in the Vizagapatam District.

The Samalkota Agricultural Station. (Godavari District) :—

The history of this farm may be briefly stated as follows :—

A disastrous disease appeared among the sugarcane in the Godavari delta, which was caused by a fungus, *Colletotrichum falcatum*. Healthy canes were imported from Hospet and distributed to the ryots in 1901 with very little success. The Government Botanist, to whom the matter was referred at the time, proposed that a small area should be rented and all the available varieties should be collected and grown for comparison and study with a series of experiments in manuring and cultivation. The origin of the station, therefore, was to discover the causes underlying the severe attack of the fungus above referred to, popularly known as the *red rot* fungus. The work was extended in later years to the cultivation and manuring of paddy and of fibres, chiefly jute.

The Nandyal Agricultural Station. (Kurnool District) :—

This station was opened in April 1906 and is situated on a well defined flat basin called the Nandyal valley between two ranges of hills, the Erramalais and the Nallamalais. The soil consists chiefly of regur and, except a small portion irrigated by the Kurnool-Cuddapah Canal, the area is under dry crops, cotton and cholam (Sorghum) being the most predominant. The object of this station was the improvement of the local cottons known as the 'Northerns' and the investigation of the cholam crop, with the possibility of a wider introduction of a leguminous crop into the rotation. The farm consisted of 40 acres but an addition has been made this year.

The Hagari Agricultural Station. (Bellary District) :—

The circumstances which brought into existence this farm and the problems which were sought to be solved by it are the following :—

When the erection of a number of pumping stations was sanctioned by Government in 1905, the officer in charge of the pumping stations was asked by Government to erect one on the banks of the Hagari River with a view to the water so raised being used to irrigate black cotton soil, a large area—nearly 4 million acres—of which was to be commanded by the proposed Tungabhadra Reservoir. Questions relating to cropping and yield were to be studied and assessment and the duty of water were sought to be fixed by such study. The main object of this station was, therefore, to discover the most profitable method of applying water to black cotton soil and the two crops taken for study were paddy grown as a wet crop and cotton as an irrigated dry crop. The soil consists of 225 acres, made up of 100 acres of regada, 80 acres of mixed soil and 45 acres of sand dunes. The mixed soils were chiefly used for growing fodder crops for the stock and it was chiefly in the black soils that the experiments were conducted. A few experiments on warping or basin irrigation were also started. The Tungabhadra Reservoir Project has been abandoned, and the irrigation experiments have now been given up and experiments on dry crops on lines similar to those at Nandyal are now chiefly carried on, along with some garden cultivation.

Under the Deputy Director, Southern Division, there are now 4 agricultural stations, located at Palur (South Arcot District), Koilpatti (Tinnevely District), Taliparamba (N. Malabar District) and Manganallur (Tanjore District) and one farm started at Attur (Chingleput District) on the Palar river has been abandoned:—

The Palur Agricultural Station. (South Arcot District) :—

The Palur Farm, as its original name, the South Arcot Groundnut and Sugarcane Farm, indicates, was started with 2 well defined objects. The one was to make a general study of the groundnut industry including the collection of new varieties and

to examine the local methods of cultivation and the diseases affecting the crop. The other was that the farm was intended to be a nursery from which the improved varieties of sugarcane raised at the Samalkota Farm might be distributed to the southern districts. The local cane industry was to be studied and inferior varieties were to be replaced by superior ones. The area consists of 20 acres of wet land and 32 acres of dry land, a portion of the latter being irrigable from wells, so that the cropping can be considered under 3 main headings, viz:—Wet crops, dry crops under well irrigation and dry crops under dry cultivation. Experiments on paddy have since been added and useful results have been obtained on single seedling transplantation, green manuring and application of mineral manures.

The Koilpatti Agricultural Station. (Tinnevely District) :—

The Koilpatti Farm was acquired as early as 1901 and consists of 2 blocks, a red soil area of 25 acres and a black soil tract of 115 acres, the two blocks being more than a mile from each other. Each block represents a typical agricultural tract of the Tinnevely District, known locally as sevval and karisal. The red soil contains a number of wells in which the water supply, however, is scanty and is cultivated usually with the hardy cereal and pulse crops. Cotton is the principal crop on the black soil area. The most important work achieved here is the obtaining of good strains of *karunganni* cotton by careful seed selection and the introduction of Ceded District implements like the *gorru* and the *dantulu*. A number of cotton seed farms have been established in the villages in co-operation with the ryots and pure seeds are collected from these seed farms and sold to ryots, along with Cambodia cotton seed for which there is now a great demand.

The Taliparamba Agricultural Station. (North Malabar District):—

The Taliparamba Farm was opened in 1905 for a study of all the aspects of pepper cultivation. The lines on which the pepper crop was proposed to be investigated were (1) the seasons and how they effect the setting of the pepper, (2) the varieties and

strains of pepper, (3) standards and shade, (4) cultivation and method of propagation and (5) marketing. In addition to pepper, a study of the conditions affecting local agriculture in general was added on from time to time and experiments on the cultivation of paddy, sugarcane, groundnuts and other crops have been taken up. The land consists of a picturesque hilly tract which contained, at the time of purchase, some areas under pepper in various stages of growth and bearing.

The Mangamallur Agricultural Station, (Tanjore District):—

This Farm was started just a year ago for an experimental study of the cultivation of the paddy crop in the deltaic portions of the Tanjore district and consists of about 87 acres of alluvial land leased for a period of 7 years from a Mirasdar.

The Central Agricultural Station, Coimbatore.

This Farm, as already stated, is under the direct control of the Principal of the College who is also Superintendent of the Farm, *ex-officio*. The objects of this Farm are many-fold :—

first:—it serves the purpose of affording facilities for students of the college for performing different field operations and making observations of crops ;

second:—it contains a large area of black cotton soil on which dry crops of cotton, cholam or Bengal gram are grown ;

third:—there is an area of red soil part of which is irrigable from wells ;

fourth:—there is a portion of black soil, typical of the Coimbatore garden soil, commanded by well irrigation ;

fifth:—there is a large area of wet land under tank irrigation, growing paddy and sugarcane, in addition to green manure crops ;

sixth:—the farm herd consists largely of Kangayam cattle and there is a well-equipped Dairy attached to the Farm.

The work on the Central Farm is, therefore, partly educative and partly experimental. Most of the crops of the Presidency can be grown here and that is its chief advantage over the old Saidapet Farm.

Notes.

We respectfully beg to express our abhorrence at the dastardly outrage perpetrated on the body of His Excellency the Viceroy on the memorable occasion of the State entry of His Excellency into the new, but historically old, capital of Delhi. We are glad that His Excellency has been spared to continue to govern us and pray that His Excellency will be speedily restored to his original health.

We beg to offer our respectful welcome to His Excellency Lord Pentland on his assumption of the exalted office of the Governor of Madras. Both as a prominent Cabinet Minister and as Secretary of State for Scotland, His Excellency has done much for the agricultural classes in his mother country and we are therefore hopeful that His Excellency's regime in Madras will give a further impetus to the rapidly increasing activities of the Madras Agricultural Department and there is no doubt that the welfare of the ryots of Southern India will be His Excellency's most constant care.

We are gratified to see that there will be at least four elected Members of the Legislative Council who are ardent exponents of agricultural reform, and they are more or less connected with the Agricultural College. The Hon'ble Dewan Bahadur V. Ramabhadra Naidu is one of the Honorary members of the Union and an Honorary visitor to the Coimbatore College and he presided at the 2nd Session of the Agricultural Conference last year. He has been re-elected unopposed to represent the Zemindars in the South. Mr Vengail K. Raman Nayanar is a Benefactor of the Union and was an old student of the Saidapet College and an Honorary visitor to the Coimbatore Institution. He has been elected to represent the landholders of Malabar. Mr. Ch. Jamburamatha Mudaliar of Shiyali who has been elected to represent the landholders of the southern districts has been taking a practical interest in agricultural improvements from the time of the late Mr. Roberts. Rao Bahadur V.K. Ramaniujachariar who has been elected by the most enlighten-

ed districts of Tanjore and Trichinopoly is another acquisition to the Council on behalf of agricultural progress, as there will be plenty of scope in it for him for giving the results of his ripe experience as a Revenue officer, chiefly as the Secretary to the Board of Revenue in the Agricultural Department. Let us hope that they will all further the cause of the agricultural development of the country.

The first Provincial Co-operative Conference was opened by His Excellency Lord Pentland on 21st December 1912 and presided over by the Hon'ble Sir J. N. Atkinson. A number of papers were read on Co-operative subjects and Messrs. D. T. Chadwick and H. C. Sampson took prominent part in the proceedings. Mr. Sampson contributed an article on the subject of Agricultural Co-operation which, for want of space in this issue will be extracted in the next.

DEPARTMENTAL.

The Hon'ble Mr. A. Butterworth, I. C. S., is the present Commissioner of Agriculture in the Board of Revenue.

Mr. D. T. Chadwick, I. C. S. who was Settlement Officer in Tinnevely and who was on special study leave in England assumed charge of the Office of Director of Agriculture on 18th October 1912; and Messrs. H. C. Sampson and K. R. Ramasastrulu Naidu reverted as Deputy Director and Assistant Director respectively.

Mr. D. T. Chadwick has been appointed to the grade of Acting Collector, 3rd grade.

Mr. W. H. Harrison, M. Sc., Government Agricultural Chemist, returned from leave on 15th October, 1912, and resumed charge from Mr. M. R. Ramaswami Sivan, B.A., D.A., Chief Assistant, who has been acting for him.

The services of Mr. T. B. Fletcher, F.Z.S., F.E.S., Government Entomologist, have been placed with the Government of India, for appointment as Imperial Entomologist at the Research Institute, Pusa, vice Mr. M. Lefroy who has been appointed Professor of Entomology in the College of Science, South Kensington.

In pursuance of a resolution passed by the Board of Agriculture at its meeting held at Pusa in February 1912, a Sugarcane Breeding Station for the whole of India has been established by the Government of Madras at Chettipalayam, about a mile west of the Central Farm, Coimbatore. Dr. C. A. Barber, Government Botanist, has been appointed Sugarcane Expert on a salary of Rs. 1500 for a period of 5 years. The staff consists of Mr. T. S. Venkataraman, B. A., Assistant in Botany, Mr. K. Krishnamurti Rao, D. A., Assistant in Chemistry, Mr. M. Mangesha Rao, D. A., Farm Manager, Mr. M. Raman, D. A., Assistant Farm Manager and 2 Fieldmen. A sum of Rupees 65,000 has been allotted and work has begun. Sugarcanes of different varieties have already been received from various parts of the country and planted in the College Botanical Garden and they are being transferred to the new Sugarcane Station. Of the varieties there are several good specimens of canes raised from seeds.

Mr. K. Rangachariar, M. A., L. T., Chief Assistant to the Government Botanist has been appointed to act for Dr. C. A. Barber.

Mr. G. N. Rangaswami Aiyangar, B. A., of the Cocanada College, has been appointed Assistant in Botany in the place of Mr. T. S. Venkataraman, B. A. transferred to the Sugarcane Station.

Mr. C. Narayana Aiyar, D. A., who was Farm Manager at Mangallur, has been appointed Assistant in the Entomology Section in the place of Mr. K. S. Padmanabha Aiyar, M. A., resigned.

Mr. T. Lakshmana Rao, B. A., Librarian, Agricultural College, has been appointed Assistant in the Chemistry section in the place of Mr. K. Krishnamurti Rao, transferred to the Sugarcane Station.

The services of Mr. C. S. Madiah, Assistant Farm Manager, Central Farm, have been placed at the disposal of the Court of Wards for three years as Agricultural Instructor on Rs. 75 to the Minor Zemindars at Newington. In addition to his technical qualifications as a Licentiate in Agriculture, Mr. Madiah is a good cricketer and an all-round sportsman and will be an acquisition to the Newington Team.

Mr. D. Srinivasa Rao, Head Clerk, Government Botanist's Office, has been appointed Hostel Manager in the place of Mr. V. N. Nanjappa Aiyar who has been relieved, on being appointed Librarian at the College.

The Government having sanctioned the creation of the appointments of a number of Second Grade Farm Managers, the following Assistant Managers have been promoted to that grade :—Messrs. K. Sankara Aiyar (Manganallur), K. Unni Krishna Menon (Tali-paramba), V. S. Narayanaswami Aiyar (special duty, Chittoor District), M. V. Raghavulu Naidu (Nandyal) and K. Narayana Aiyangar (special duty, Kurnool District).

The course in Agricultural Botany having been finished with the 2nd term of the 2nd year, a salutary change was made this year by holding the Diploma Examination in that subject immediately after the course in December, instead of holding it as usual three months hence. The examination was conducted by a Board consisting of Mr. E. J. Woodhouse, Government Botanist, Bengal and Mr. K. Rangachariar, acting Government Botanist, Madras. 9 students appeared for the Examination, of whom 8 passed :—K. Ramiah (1st class), K. Gopalakrishna Raju and M. K. Siteram (2nd class) and M. U. Vellodi, P. S. Subramania Aiyar, T. Paramanandam, Badami Siva Rao and T. Budha Vidheya Rao (3rd class).

Mr. F.G. Sly, I.C.S., late Inspector General of Agriculture in India, who had come to Madras to serve on the Royal Public Service Commission inspected the Agricultural College and Research Institute, Coimbatore, accompanied by the Director of Agriculture, Madras, on 19th January 1918.

Mr. M. Ganga Razu Pantulu, Proprietor, Potuluru Estate, Berhampore, paid a visit to the College in his capacity as Honorary visitor in the first week of January.

ESTATE.

The Officers' Club is located at present in a thatched shed. The members desiring to have a pukka building of their own, opinions were divided on the point whether funds were to be raised by debenture loans or by donations, and it was finally resolved that members contribute a donation of about one-fourth of their monthly salary, payable in 6 monthly instalments. Although the contribution at this rate was optional, practically every one has subscribed more than this limit, Messrs. J. Chelvaranga Raju and K. Rangachari joining as Life Members with a donation of Rs. 100 each. The total amount promised comes to about Rs. 700 and the first instalment has already been collected. It is proposed to apply to the Principal for a new site, closer to the Tennis court and to apply to Government, through the Director of Agriculture, for a grant towards the building. We heartily congratulate the members on the readiness with which they entered into the spirit of subscribing liberally for the construction of a building worthy of the Officers' Club. We also fervently hope that the Principal and the Director will be able to obtain from the Government a grant of not less than half the amount of the donations collected, such a precedent obtaining in the Educational Department for the building of schools and reading rooms by the public; and after all, the land here is Government land and the members Government servants compelled to reside on the estate.

The bungalow which was being constructed for the Government Mycologist having been completed, Mr. Mc Rae has occupied the house and a separate bungalow is also being built for the Government Entomologist.

Owing to the insufficiency of accommodation for the rapidly increasing Indian staff of the college, a large area has been acquired on the eastern side of the maidan and the building of 6 B type and 8 C type quarters has been sanctioned and work has commenced.

The twelfth day of December, being Coronation day, was celebrated in the estate with great enthusiasm. The Union Jack was hoisted in the clock tower. The Students' Club had organised a basket ball tournament, a ping pong tournament, sports for children and a social

gathering. The finals in the basket ball tournament were played off in the morning, the winning team consisting of Badami Siva Rao, P. S. Subramania Aiyar, N. V. Visvanatha Aiyar, K. Raghavachari and C. Narasinga Raju. Races were run by boys and girls and sweets were distributed to them. Mrs. Harrison kindly gave away the prizes. There was a social gathering in the quadrangle opposite to the new dining hall in the afternoon when the finals in the ping-pong tournament were played between H. C. Javarayya and U. Vittal Rao, the former winning by 6—2; 6—4. Mrs. D' Silva gave away the prizes, the prize for the winner being awarded by Mr. Badami Siva Rao and that for Vittal Rao by the Officer's Club. The occasion was also utilised for the formal opening of the new dining hall by the Principal which he did in a few well spoken words. There was, after sunset, a magic lantern exhibition on the maidan, some of the houses facing which were well illuminated. The celebration closed with cheers to Their Majesties, the King Emperor and the Queen Empress.

THE STUDENTS' CLUB.

At a meeting of the Students' Club held on 15th November 1912, under the presidency of Mr. D. T. Chandrasekhar, I. C. S., Director of Agriculture, a paper was read by Mr. K. Raghavachari, Student, class III on "Cultivation along the Cauvery River." The Students of class III were taken for an agricultural tour by the Principal and Mr. R. Ramaswami Aiyar to portions of tracts irrigated by the Cauvery. The following is a summary of the paper which is based on actual observations made by the student during the tour:—

The party met the Principal at Erode, immediately on returning from the Michaelmas holidays on 1st October and they travelled down the river, visiting Noyel, Pugalur, Karur, Kulitalai, Elamanur, Trichinopoly, Tanjore, Ayyampet, Manganallur and Koratacheri, returning to Coimbatore on 15th October.

The cultivation round about Erode is fairly intensive and, on account of the ever flowing supply from the Kalingarayan channel, 3 crops are ordinarily raised, one long duration and two short duration varieties of paddy, or one long and one short duration varieties followed by a crop of gingelly, being the rule. Plantains and turmeric are also largely cultivated. Pugalur has an excellent irrigation channel,

called the Pugalur channel and as much as 60% of the total wet land area is under plantains, the remaining portion being occupied by paddy. At the junction of the Noyel with the Cauvery, two crops are grown—2 crops of paddy, or ragi followed by paddy. Turmeric is also largely grown here. Karur represents the tail-end of the Amaravati river and one crop of samba paddy is ordinarily grown, although double crop paddy lands are here and there met with. Round about Kulitalai, ryots generally get 2 crops in a year and sometimes 5 crops in 2 years. Coconut fibre coir industry is largely carried on here. At Elamanur 2 crops of paddy are usually grown and the peculiar practice obtains here of what is locally known as *sathu-nathu* (சாத்து நாத்து), i.e., the seedlings about a month old are planted out and these again are pulled out at the end of another month and transplanted a second time over a larger area. It is curious also, that the transplanting is done here in much larger bunches than at any other place visited, from 20 to 50 seedlings having been counted in a single bunch.

At Tanjore the students were the guests of Rao Saheb M. Abraham Pandithar whose son, Mr. A. S. Pandyan, was one of the party. The Karunanandapuram Farm is an excellent example of what patience, industry and enterprise can achieve out of an apparently unpromising land. A large amount of capital has been spent on this farm in laying out, in well sinking and in the purchase of pumping engines. In addition to useful selected fruit trees, several industrial crops are grown. The farm is now a highly profitable concern and this is largely due to the personal supervision of Mr. Pandithar and all the members of his family.

Many of the students who were under the impression that bamboos chiefly grow wild in the forests of the Western Ghats were agreeably surprised to see that these were regularly cultivated with some care in the padugai or alluvial lands of almost every village in the Tanjore district and especially round about Ayyampet. Limes of excellent quality are also grown in profusion on the same padugai lands. The party stayed a day at the Manganallur Farm which, having only been recently started, has not yet established any definite methods for the adoption of the ryots. In the deltaic tracts of Tanjore, the crop everywhere is paddy and the cultivation commences in June when the freshes come in the Cauvery. Transplanting

is over before the end of July and the paddy is harvested in January or February. Where greater facilities for irrigation exist, two crops are grown, the first crop being harvested in September and the second in February. It was noticed that the seedrate of paddy was very much reduced and large areas were planted with single seedlings round about Manganallur and Kordacheri, apparently owing to the exertions of the Agricultural Department one of whose Farm Managers, Mr. C. Narayana Aiyar, was stationed there for about 2 years.

The party enjoyed the tour immensely and profited very much, learning things first hand.

In the discussion which followed the reading of the paper, Mr. J. Chelvaranga Raju sought to explain the failure of green manures in some of the Manganallur soils and pointed out some defects in the cultivation in Tanjore delta based upon his actual experiences.

The Chairman, in closing the Proceedings, complimented Mr. K. Raghavachari for his well written paper full of direct observations and Mr. J. C. Raju for his suggestions. He remarked humourously that, having just returned from a course of special study in Agriculture in England, he should be considered as a recent ex-student. He also said that he was specially struck with the system of observation notebooks maintained by the students at the College several of which he closely perused with great satisfaction. Referring to the success of Rio Saheb Abraham Pahlithar's Farm, he pointed out the necessity for personal supervision and, to make it clear, said that "the master's foot was the best manure to the soil".

The Proceedings closed with a vote of thanks to the Chairman and to Mr. K. Raghavachari.

Under the auspices of the Students' Club, an interesting lecture was delivered by Mr. H. C. Sampson on "Cattle in Southern India," with Mr. R. C. Wood in the chair.

Mr. Sampson divided the working cattle, according to the work they were capable of turning out, into 4 classes:—1st, the better class of animals for heavy work on black cotton soils, e.g., the Ongoles and the Kangayams, the demand for these animals being just met; 2nd, a slightly smaller class of animals for bandy and mhoite work, the demand for them constantly increasing everywhere with intensive cultivation; 3rd, dry land cattle for which the demand was decreasing;

and 4th, the dregs of cattle used for wet land cultivation for which there was a constant demand.

Next he classified cattle, according to breeds, into *country cattle* characterised by promiscuous breeding and in-and-in breeding met with throughout the Presidency from Ganjam to Cape Comorin, and *superior cattle* of which there were three distinct types. The *Ongole type* is met with in the N. Circars and deteriorates from Ongole towards the north and towards the south. An important subtype known as the *Dufad cattle* which was nearly extinguished in the famine of 1868 is met with east of Kurnool and is apparently a cross between the Lambadis and Ongoles. The second type consists of the *Hill or Plateau cattle* met with in the Mysore plateau and in its slopes all round, e.g., in Kollegal, North Salem, North Arcot and the Ceded Districts. The third type is made up of the *improved country cattle*, apparently a cross between the Kangayams and the country animals, met with in S. Chingleput, S. Arcot, Trichinopoly, Salem, Tanjore and N. Madura, these being hardy animals thriving on minimum feeding. In addition to these types, there are several other types met with in various parts of the Presidency, for instance, the Mysore Cattle, the cattle found in the Yerramalais, those found in the forests of Cuddappah and those met with in the Cumbum valley below the Palni hills.

Mr. Sampson, in detailing the experiences of his tour on the cattle survey of Southern India on which special duty he was engaged in 1911-12, expressed his opinion that there was now a general tendency amongst cultivators to keep better cattle and adduced 2 chief reasons for this. The first one was the increase in the price of cattle which had doubled itself within the last 5 years, better cattle fetching even higher prices and mhoite cattle now costing nearly thrice as much as formerly. The second reason given was the curtailment of grazing due to the increase in the area of cultivation necessitating a better feeding which was more costly with the increased price of cattle food. He also noticed, he said, almost in every district, even in Tanjore, cases of individual ryots attending to better cattle-rearing which was usually done by purchasing young calves and feeding them well.

Mr. Sampson next pointed out the reasons for better types of animals being met with in Ongole, Mysore and Kangayam, and these

were the attention to grazing and the maintenance of good breeding bulls. In Ongole grazing is to be had in temporary pastures and the animals have more of handfeeding and do not generally possess the same stamina as the Kangayams. Good breeding bulls are kept, but these are not available for sale, being Brahmani bulls. In the Mysore plateau, bulls are purchased at 2 years for breeding purposes, saleable at 7 years. Although there is not much grass during the hot weather, there is very good pasture in the monsoon in the forests which are not, after all, very thick, the main variety of grass growing being what is commonly called spear grass, which, in a young stage, forms probably the best pasture. In Kangayam, breeding bulls are not Brahmani bulls, but are the private property of the Pattagar. Grazing land is best in Kangayam, patta land being fenced, sown with grass and kept for 7 to 10 years and sometimes 20 years under pasture.

For the improvement of live stock, Mr. Sampson said that it was absolutely necessary to have good breeding bulls and animals should be gradually *graded up*. He instanced the case of a short horn breeding bull which fetched a price of £1,000. He also cited examples of grading followed in some tracts of the Presidency. For instance, the Dupad Lambadi cattle have been graded up by the Ongoles, the Vizagapatam cattle by Ongole bulls maintained in the proprietary estates and the Kangayam animals by the Baragurs from Kollegal in former times and by the Ongoles in recent times. A general improvement was noticeable in the size of the Kangayams as a result of the grading. He recommended that country cattle should be graded up by bulls of suitable size and that poor patta lands might be put down by owners to temporary pasture.

With regard to the cows, Mr. Sampson was of opinion that there were no milch cows proper in Southern India, beyond the Nellores.

In the discussion which ensued, Mr. J. Chelvaranga Raju said that the Pattagar graded up his breed with the Alambadis or Baragurs with the double object of infusing spirit into the animal and of increasing the milking capacity, but that the smaller ryots around Kangayam did not care to use the Pattagar's bulls for service. He also thought that, with the increasing mania for industrial crops like groundnut and Cambodia cotton, it would be difficult to induce cultivators to put down lands, however poor, to pasture, temporary or permanent.

Mr. S. L. D' Silva mentioned that the local cattle around

Kangayan were not much changed and were smaller animals with a fairly good milking capacity but that the Pattagar's animals were bigger and constantly changing.

The President corroborated the statement of Mr. Sampson with regard to the absence of milking capacity proper in South Indian cows. He gave his experiences on the Central Farm on the subject of grading up and said that, although country cows of all sizes were kept on the Farm, their progeny, born to the breeding bull, Mappillai, which has, what may be called prepotency characteristics, were remarkably similar to the sire. With reference to grazing, he considered that the fencing of pastures was necessary and suggested that different pastures might be maintained by different ryots under hedges and the joint cattle driven, say, first week into one tract, second week into another and so on, allowing time and facilities for the grass to grow. The area of grazing need not be large. More than 130 animals were maintained on the Farm on a pasture area of less than 50 acres. The chief point was to give the animals some exercise and a bite of fresh grass. He closed the proceedings with a hearty vote of thanks to Mr. Sampson for his interesting lecture.

Variety Entertainment :

With a view to relieve the financial position of the club which was involved in debt, the members of the Students' Club organised a Variety Entertainment on Monday, 25th November 1912, admission to all except students being by tickets which were priced Rs. 3, Re. 1, and annas 8. The officers on the estate were present with the ladies of their families and tickets had been purchased by several well-wishers of the club at Coimbatore and a large number of ladies and gentlemen, both European and Indian attended, in spite of the distance and the late hour. A sum of over Rs. 200 was collected and a decent surplus has been left, after paying off the debt and expenses.

The entertainment consisted of 4 items, namely, an English drama (The Dumb Man of Manchester), a drama in Telugu (Syama-latha), a conversation between a local ryot and an agricultural student and a Tamil Drama (Athirupa-Amaravati). Although the characters were amateurs, the acting was in no way inferior to that of professional men. When every part was well rendered, it is difficult to pick out who did best, but mention has to be made about at least some of them.

In the English drama, Kunhi Sankaran Nair acted the dumb man to perfection. Gopalakrishna Raju, as proprietor of the Boot Shop and Vittal Rao, as milk-maid, and lovers in turn, kept the house in roars of laughter. Vellodi, as the villainous nephew, beggar and murderer, Narasinga Raju, as his secretly married wife and Govindarajan, as the rich heiress who was stabbed, also did well. Javarayya, as Lord Chief Justice and Manickam, as barrister, acted the Judge and prosecuting vakil in a realistic manner. The Principal took considerable pains in training the actors during the rehearsals.

The plot of the Telugu drama was this :—An old, orthodox, but greedy father whose first daughter was already a virgin widow, now marries his accomplished young daughter, Syamalatta, to an one-eyed, lame man of 55, having received Rs. 5,000 as *kanyasulkam*. The old bride-groom dies and Syamalatha, with the help of her friend and her husband, is re-married to the man of her choice in Viresalingam's house at Rajahmundry. The enraged father appeals to the Swami of his sect who cordially approves of the remarriage and the old man becomes reconciled to the course the events had taken. Parammandam, as the greedy and enraged father, acted his part excellently. The heroine was Subbanna and Patruku was the hero and they both acted very well. Panakali Rao was a typical Komati merchant and later acted as the friend who brought about the remarriage with the help of his wife which part was taken by Ramanujachari. The latter also took the part of the Swami, with Manga Razu, as his disciple. Srinivasa Das was the one-eyed lame bridegroom and Budha Vidheya Rao was the young bridegroom's sympathetic father. The actors were coached by Mr. B. V. Nath of the Chemistry Section.

The next item was the conversation between Local Ryot and an Agricultural Student, the parts being taken by Javarayya and Yesudasen respectively. The dialogue was realistic and showed the kind of enquiries which a student under training is expected to make for his observation notebook and the difficulty he experiences in getting the information he is after.

The most entertaining portion of the Tamil drama was the worship of the Kali and thieves' dance excellently executed by Vellodi, Sankarakumar and Srinivasachari. Visvanatha Aiyar was the princess Amaravati who was left alone in the jungle by the orders of her stepmother, the latter part being taken by Govindarajan, for the

offence of refusing to marry the latter's stupid brother Alagan which was played by Srinivasachari. Gopalakrishna Raju acted the part of prince Athirupan who rescues Amaravati from the jungle and marries her.

Ellappa Chetty played the Sergeant and postman in turn and Sivarama Rao, as usual, proved an excellent clown.

It might also be mentioned that the success of the entertainment was due largely to A. S. Pandyan who was Entertainment Secretary and Stage Manager.

At the end of the performance, Javarayya thanked the audience for their sympathetic help and appreciation and Mr. Ramaswami Sivan thanked the members of the Students' Club, on behalf of the audience, for the excellent entertainment.

The following are the scores of the last cricket match of the season, played between the College and the Coimbatore Gymkhana :—

The Coimbatore Gymkhana v. The Agricultural College The Coimbatore Gymkhana.

1st innings.		2nd innings.	
Mr. Hemingway, b. Madiab	... 64	b. Mal	... 3
" Hill, b. Mal	... 4	b. Javarayya	... 9
" Coliyer, c. Javarayya, b. Mal	... 15	did not bat	
" Singara Aiyangar, c. Wood, b. Madiab	... 2	c. Madiab, b. Mal	... 0
" Simon, b. Raghava Rao	... 7	not out	... 26
" Carmichael, c. Madiab, b. Raghava Rao	... 1	c. Wood, b. Mal	... 14
" Stanes, l. b. w. b. Raghava Rao	... 9		
" Parker, run out	... 0	did not bat	
" Alexander, c. and b. Raghava Rao	... 3		
" O'Reilly, b. Mal	... 9		
" Rabjons, not out	... 10	b. Mal	... 9
Extras	... 5	Extras	... 0
Total	... 111	*Total	... 61

* Innings declared closed.

The Agricultural College.

1st innings.		2nd innings.	
Mr. Sivan, c. Hemingway, b. Singara	... 4		
Vittal Rao, c. and b. Singara	... 13	did not bat	
Javarayya, b. Singara	... 5		
Mr. Wood, c. Hill, b. Hemingway	... 3		
Mal b. Singara	... 12	c. and b. Hemingway	... 23
Raghava Rao, c. Coliyer, b. Hemingway	... 7	c. O'Reilly, b. Hemingway	... 3
Mr. Madiab, b. Singara	... 16	c. Rabjons, b. Hemingway	... 16
Leo D Silva, b. Singara	... 9		
Clement D Silva, c. and b. Hemingway	... 2	did not bat	
Vellodi, c. and b. Hemingway	... 0		
Narasinga Raju, not out	... 1		
Extras	... 10	Extras	... 5
Total	... 63	Total	... 47

There were six entries in the Coimbatore Football League open to all recognised clubs. The College Football team, it is regrettable, sustained defeat in all the matches played. The Podanur Railway team, securing the highest number of marks, are the winners for a second time.

Extract.

Messrs. W. H. Harrison and M. R. Ramaswami Sivan have published a paper in the Memoirs of the Department of Agriculture in India, Chemical Series, on "A contribution to the knowledge of black cotton soils in Southern India". Based on a study of these soils *in situ* with reference to the underlying geological formations and on experiments conducted with these soils in the laboratory, they arrive at the following conclusions in regard to their *origin and nature* :—

1. The black cotton soils of India are not derived from any specific geological formation, such as trap, but are formed from many diverse formations and, generally—when not alluvial—bear a close relationship to the underlying rocks.

2. Titaniferous magnetite is not a constant factor in the regur soils of the Madras Presidency, and, even when found, the amount is small, but its presence in quantity is characteristic of the soils of the trap area. It cannot, therefore, be looked upon as the cause of either the colour or the physical properties of these soils, but only as a modifying agent.

3. The colour and peculiar physical properties of black cotton soils are associated with the compound particles of low specific gravity, which are found in all these soils.

4. Two classes of substances have been recognised as conferring the colour and physical properties. One is probably a colloidal hydrated double iron and aluminium silicate, which is mainly concerned with the formation of compound particles and which possesses, in a modified form, the properties of ordinary clay. The other is organic in character and may probably be an organic compound of iron and aluminium.

APPENDIX III (a)

PERMANENT FUND.

RECEIPTS.

By donations from Honorary members :—

	RS.	A.	P.	RS.	A.	P.
Acknowledged in Year Book 1911	...	...	...	149	0	0
Received in 1912	...	...	...	70	0	6
				219	0	6

By Subscriptions from Benefactors :—

Acknowledged in Year Book 1911...	...	...	...	125	0	0
Received in 1912	...	...	...	75	0	0
				200	0	0

By Subscriptions from First Class Members :—

Acknowledged in Year Book 1911	...	...	...	125	0	0
Received in 1912	...	...	...	91	0	0
				216	0	0

By Subscriptions from Ordinary Members :—

Acknowledged in Year Book 1911	...	...	...	147	0	0
Received in 1912	...	...	...	133	0	0
				280	0	0

By interest on investments :—

18 0 0

Total ... 924 0 0

EXPENDITURE.

Invested in District Urban Co-operative Bank, Coimbatore at 6% Fixed deposit	...	...	...	618	0	0
Advanced to College Day Account	...	...	...	23	0	10
Advanced to Journal Account	...	...	...	153	9	6
				794	10	4
Cash on hand with the Treasurer	...	...	...	129	5	8
				924	0	0

Audited and found correct.

(SIGNED) T. R. RANGANATH,

8th December 1912,

Accounts, College Day, 1912.

EXPENDITURE.

RS. A. P. RS. A. P.

APPENDIX III (b)

COLLEGE DAY ACCOUNTS, 1912.

RECEIPTS.

	Rs.	A.	P.
Brought forward from last year's College Day account	...	...	22 0 7
<i>Donations from—</i>			
The Hon'ble Rajah Vasudeva Rajah of Kollengode	...	...	30 0 0
The Hon'ble Dewan Bahadur V. Ramabhadra Naidu	...	...	20 0 0
Rao Bahadur A. Annaswami Tevar of Tanjore and the Zemindar of Uttukkuli, Rs. 15 each	...	...	30 0 0
Rao Sahab M. Abraham Pandithar and Messrs. R. C. Wood, W. Mac Rae, T. B. Fletcher, T. N. V. Tirumalpad and M. S. Sankara Aiyar, Rs. 10 each	...	...	60 0 0
Messrs. Cowley Brown and K. Rangachariar, Rs. 6 each	...	...	12 0 0
Mr. K. Srinivasa Rao	...	...	5 8 0
Dr. N. Konjan Pillai, Dr. C. A. Barber and Messrs. S. L. D'Silva, K. C. Deviah, Vengail K. Raman Nayanar, J. Chelvaranga Raju, M. R. Ramaswami Sivan, S. Subramania Aiyar and Rao Bahadur J. Dharmaranga Raju, Rs. 5 each	...	...	45 0 0
Messrs. P. Subbaraya Aiyar, R. V. Subramania Aiyar, K. Ramaswami Aiyar, C. Tadulingam Mudaliar, K. R. Hayavadana Rao, Y. Rama Rao, B. K. Venkata Rao, G. Jogi Raju, J. R. Ranga Raju and A. S. Pandyan, Rs. 3 each	...	...	30 0 0
Mr. V. Subramania Aiyar	...	...	2 8 0
Messrs. H. Srinivasa Rao, G. Rajagopala Naidu, K. B. Tilloo, B. Audinarayana Chetty, H. C. Javarayya, Badami Siva Rao, K. Palaniyandi Pillai, R. Subramaniam, D. B. Sivarama Rao, T. S. Ramaswamy Aiyar and M. Muthayya, Rs. 2 each	...	...	22 0 0
Messrs. B. Viraswami and D. Panakala Rao, Rs. 1-8 each	...	...	3 0 0
Messrs. K. Krishnamurti Rao, T. S. Venkataraman, T. Lakshmana Rao, P. A. Chengappa, A. Seturama Aiyar, T. V. Narayana Rao, S. Sundararaman, T. S. Lakshmana Rao, C. Ellappa Chetti, M. U. Vel-lodi, K. Ramiah, P. S. Subramania Aiyar, V. Ratnaji Rao, T. Budha-vidheya Rao, K. Sankaran Nair, P. S. Venkateswami, Sitaram Patrudu, L. Raghupathi Sarma, K. Raghavachari, K. Gopalakrishna Raju, Manickam Mudaliar, K. P. Sankunni Menon and R. G. Mal, Re. 1 each	...	...	23 0 0
Messrs. B. V. Nath, P. A. Raghunathaswami Aiyangar, C. S. Madiar, M. K. Nambyar, T. V. Ramakrishna Aiyar, P. A. Subramania Aiyar, R. Venkataramiah, L. Srinivasa Das, Bhairya Siva Rao, L. Sankara-kumar, U. Vittal Rao, N. V. Viswanatha Aiyar, T. Paramanandam, K. R. Govindarajan, M. K. Sitaram, S. Pranatartihara Aiyar, M. Veeraraghava Rao, Manga Raju and A. Yesudasen, 0-8-0 each	...	...	9 8 0
Mr. K. S. Subramania Aiyar	...	...	0 6 6
Messrs. P. N. Ramaswami Aiyar, Pasupati Aiyar, V. N. Nanjappa Aiyar, M. R. Venkatarama Aiyar, T. J. Sethuayiah and N. R. Srinivasachari, 0-4-0 each	...	...	1 8 0
By Sale of rosettes	...	...	43 12 0
„ Entrance fees for Sports	...	...	6 0 0
Total	...	...	366 3 1
Deficit	...	...	20 0 10
Total	...	...	389 3 11

Preparation of ground for Sports :—

Purchase of materials, bamboos, ropes etc.	...	...	19 15 1
Flags	...	...	3 5 0
Cooly labour	...	...	8 0 0
			31 4 1

Prizes :—

Messrs. Barton & Sons, Bangalore for medals, including

charges for engraving.—	...	...	57 7 0
Purchased at Madras	...	...	85 14 0
Money prizes	...	...	17 0 0
			160 5 0

Ribbons for rosettes, with safety pins...	...	...	21 6 0
Postage and Telegraph charges	...	...	16 2 0
Printing and Stationery charges	...	...	17 14 0

Refreshment and dinner charges :—

Paid Hostel warden for Dinner and Refreshments on Con-

ference Day	...	...	72 14 9
„ for mess charges of guests	...	...	12 9 4
Aerated waters	...	...	5 10 0
Pan supari	...	...	2 15 3
			94 1 4

Students' entertainment :—

Music	...	...	14 0 0
Magician	...	...	5 0 0
Other charges...	...	...	25 11 6
			44 11 6

Miscellaneous :—

3 8 0

389 3 11

Audited and found correct.

(SIGNED) T. R. RANGANATH.

8th December 1912,

APPENDIX III (c) JOURNAL ACCOUNT, 1912.

RECEIPTS.

		Rs.	A.	P.
By Subscriptions for the Journal in advance ...	...	5	0	0
Obtained Advance from the Permanent Fund ...	...	153	9	6
Total...		158	9	6

Expenditure.

Shown in year Book 1911 :—

{ Postage ...	...	20	8	0			
{ Printing and Stationery ...	...	35	13	10	...	56	6 4
Printing and Parcel charges of the Year Book 1911.	...				...	69	8 2
Postage ...	...				...	15	0 0
Printing charges, in part, of the 1st issue of the Journal	...				...	11	11 0
Stationery and miscellaneous ...	...				...	6	0 0
						158	9 6

Audited and found correct.

(SIGNED). T. R. RANGANATH.

8th December 1912.

[Note:—The accounts have all been made up and audited up to 8th December 1912.]

JOTTINGS.

No greater evil can be done to a young man than to dull his enthusiasm—Sir J. J. Thompson at Winnipeg.

The landowner depends for his living upon the success of his tenants; and the tenant depends to a great extent upon the success of the man under whom he farms—Hon. A. L. Stanley, M. P. at Chester.

The shepherd's is one of the few rural occupations which have not been much disturbed by machinery—Arthur Way at Wendover.

APPENDIX No. IV

* IMPROVEMENT OF THE LOCAL CATTLE

BY

Y. P. Subramania Mudaliar, G. B., Y. C.,

Dy. Supdt., Civil. Vety. Dept., Madras.

By far the greater portion, about 80 per cent., of the population of South India subsists directly by Agriculture. The remaining population also thrives or suffers according to the varying conditions of Agriculture. The ryots are mainly dependent on cattle for carrying out the agricultural operations.

2. It has been truly said that "Agriculture is the backbone of India" and "Cattle in India are the backbone of Agriculture".

3. The extreme importance and usefulness of cattle to the ryot are such that they will bear repetition and it will not be out of place here to enumerate in brief the uses of cattle. They are the chief motive power of agriculture and are likely to remain so in this country for a long time to come, in spite of the rapid marches of the science of mechanics. The bulls and bullocks are employed for ploughing, interculturing and thinning crops, lifting water for their irrigation, treading out the cut crops on the threshing floor for separating the grains and conveying the grains and other agricultural products, as draught or pack animals, to the market. They work oil and sugar mills and are used as coach animals also. The generality of the cows produce every year a calf and yield milk from which curd, butter-milk, butter and ghee can be made.

4. The males and females of the bovines provide dung and urine which, together with the refused fodder, constitute the general fertilizing agent known as farmyard manure.

5. In all Hindu religious ceremonies, auspicious as well as inauspicious, cattle are useful, as on those occasions, they are given away as donations to Brahmins and deities. Bulls are dedicated to temples in honour of, or for the benefit of the departed souls of deceased persons by their heirs and relations. Such bulls are

* Paper read at the 2nd Agricultural Conference held on 13th July 1912.

considered to be sacred and allowed to roam freely and graze even the cultivated crops and serve the useful purpose of stud animals.

6. *Pina hagavyam*, a mixture of the five products of the cow, consisting of milk, curd, ghee, dung and urine is used in the '*Punyavachanam*' or purificatory ceremony.

7. Even when they are dead, cattle do not cease to be useful. The whole of the carcass is useful as manure. The manurial value of the carcass of a cattle has been estimated to be equal to that of thirty cart loads of farmyard manure. The several parts of the carcass, the hair, the skin, the bones, etc., are, in addition to their being used as manure, put to various other economic uses enumerated by Dr. Shortt in his "*Manual of Indian Cattle*" as follows :—

"When slaughtered, the flesh supplies beef to the greater portion of the world; the skin furnishes leather, and the uses to which leather is put are manifold; the hair is valuable in various manufactures; the horns are wrought into boxes, combs, knife-handles, and drinking vessels; the bones furnish a fair substitute for ivory; glue is made from the cartilage, gristle and refuse of the hide; the sinews are used by saddlers and others instead of thread; the feet yield a valuable oil termed neat-oil from "*Neat*," the generic name of these animals, which oil is of great utility in preparing and softening leather; and the fat is converted into candles; so that no part of the animal is rejected."

8. I have often seen ryots mourning for the loss of their cattle more than for the loss of their children. This strikingly shows how much useful cattle are to the ryots.

9. The agricultural cattle do the harder part of the farming operations and usually get the poor straw as their portion of the crop, while the farmer reserves the rich grain for his use. A Tamil poet has humorously said that cattle, having done the former part of the agricultural operation of ploughing, received the former product of the crop, the straw, while men who performed the latter operation of sowing got the latter product, the grain. The substance of a stanza of the same poet sung in praise of the cow is as follows :—

The cow resembles no less a being than the supreme God, Siva, as the recompenses of both of them are out of all proportion to what they receive. Siva, for the simple valueless grass and water offered to him in worship, confers on the worshipper, beatitude, the highest of

heavenly rewards and the cow for the same gifts yields in return to the owner and donor, the invaluable milk, the most useful of the earthly products.

10. A ryot desirous of having a fine herd of cattle can adopt one of the following methods.

- (1) He may purchase all at once a few cows and bulls of any well-known breed and so form the herd. This method is the quickest.
- (2) He may buy a few female and male calves of a good breed and rear them. This method is more slow.
- (3) He may buy a good bull of the same type as his cows but stronger, better shaped and bigger sized than his animals, and have his cows served by the new bull only and feed his cattle more liberally than before. After a few years, another good bull of the same type should be purchased and made to supersede the first bull. In this way, a third or even a fourth bull may have to be introduced, before the herd becomes uniformly well shaped, strong and big. Afterwards, bulls may be chosen from among the herd itself, but occasionally an outside bull of the type may be required for keeping up the excellence of the herd, and preventing in-and-in breeding.

11. By the first two methods, the herd already possessed by the ryot is not affected. It is the third method that benefits the existing herd. It is this method which is practicable and applicable, for the improvement of the local cattle in all parts of South India.

12. Before describing this method in detail, it is better to state the present condition of cattle in South India and the knowledge possessed by the ryots regarding methods of breeding and rearing cattle.

13. All the cattle of South India may be roughly divided into two classes (I) big and (II) small.

14. Class I, consists of the well known breeds of cattle, that are big, well shaped, less numerous, more uniform in size, features and colour and more valuable. These cattle are found in the different centres of breeding and also in possession of well-to-do people in all districts. They are more employed as cart and coach animals

and rarely used for ploughing except in black cotton soil tracts. They are met with in large numbers in annual cattle fairs and rarely in the ordinary weekly cattle markets.

15. Class II consists of the rest of the cattle. These are the common village cattle. They are small, compact and much varied in colour. They are found in larger numbers everywhere not excluding the breeding tracts and form the bulk of the agricultural stock. They constitute practically the whole of the cattle exposed for sale in the weekly markets, and are numerous in the annual fairs also.

16. The chief breeds that constitute class I are Mysore or Alumbadi, Nellore or Ongole, and Kongu or Kangayam. Other breeds, as Punganoor, Pulikulam, &c., though to some extent distinct, are more or less varieties or sub-breeds of the said three main breeds. Punganoor and Pulikulam cattle resemble, and may be said to be, varieties of Mysore and Kangayam respectively. Similarly, other minor breeds are allied to some one of the three breeds.

17. It may be observed that Nellore and Kangayam breeds have greater resemblance to each other than either of them has to the Mysore. Thus, if Nellore and Kangayam breeds were considered by virtue of their comparative similarity of features, to constitute one group, Mysore breed would form another separate group. The type of Mysore cattle is so peculiar and unique, that even in other parts of India, any breed resembling them is difficult to be found, while it would be easy to find several breeds more or less resembling the Nellore and Kangayam cattle.

18. The cattle of class II, though smaller, have more or less the same features as the typical breeds in their neighbourhood. Thus the small cattle found in and around the breeding centres of Mysore breed have more or less the same features as the Mysore breed itself. Similarly, the small cattle found near the breeding centres of Nellore and Kangayam breeds resemble the respective breeds. As the small common cattle are further and further away from the breeding centres, their resemblances to the respective breeds become more and more distant. In the outlying tracts far away from the breeding centres, the non-descriptness of the small cattle becomes more pronounced.

19. Ryots in the breeding tracts as well as those in the non-breeding areas have a fairly good knowledge of the points of cattle.

If one hears the discussion among the ryots in the breeding areas, specially when they select a breeding bull, one can understand that those ryots have a good knowledge regarding the points of cattle. Similarly, if we pay a visit to any of the large cattle fairs, and listen to the remarks made by purchasers of cattle, we can see that they have not only a general knowledge of the points of cattle but also possess discriminative understanding as to the essential features of animals suited to various kinds of works, as heavy draught, light but speedy coach work, ploughing in wet fields and in light and heavy dry lands and so on.

20. Long before I joined the Sridapet Agricultural College in 1881, I had collected a few stray Tamil Stanzas oft-quoted by ryots each of which contained certain good points of cattle, and several sayings of people regarding the same. I composed one long Tamil stanza including all the good points of cattle so collected for easy reference and remembrance. When I heard lectures and read books on cattle in the Agricultural College, I was surprised to see that most of the points considered to be good by the Tamilians were deemed so by the European breeders also. I need not say that the Telugu and Canarese ryots have the same views regarding cattle points.

The stanza I composed will be found in the appendix and its substance in English is given below :—

HEAD :—Should be like that of an iguana.

EYES :—Black, prominent and lustrous.

HORNS :—Thin, well matched, black, hard and free from the defect termed 'Koli-Kombu' (literally burnt stick) having burnt appearance.

EARS :—Like those of hares.

NECK :—Broad and stout.

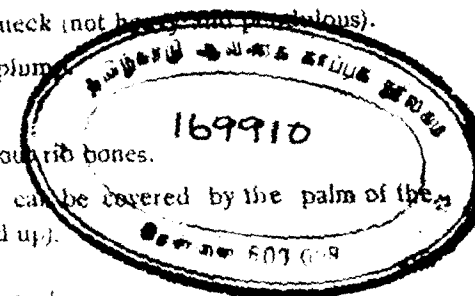
DEWLAP :—Adherent to the neck (not hairy and protuberant).

HUMP :—(Literally double) plump.

BACK :—Convex and broad.

RIMS :—Well arched with stout ribs.

FLANK :—Only so much as can be covered by the palm of the hand (well ribbed up).



CROUP :—Level, (not drooping).

TAIL :—Thin and high set and like the tail of 'Aranai' a lizard like animal.

PERENIAL LINE :—Black and like a dark snake.

SHEATH :—Adherent to the abdomen (not pendulous) and free from the defect of "sengoal" (literally red rod, that is, constantly protruding penis).

BRISKET :—(The part between the two fore legs) divided into two folds (and consequently broad).

LEGS :—Short, straight and like well turned pillars and free from the defect of turned out toes and brushing.

HOOFS :—Close, well set, black and hard as flint.

HIDE :—Moderately thick.

COAT :—Short and close.

COLOUR :—Grey, darkish, white or fawn.

GAIT :—When the animal walks, the impressions of the hind feet on the ground should precede those of the front, denoting speed.

21. While the ryots in the breeding as well as nonbreeding areas equally know the points of cattle, there is immense difference in their knowledge as well as practice relating to the conditions of breeding. In the breeding areas, professional breeders whose sole business is breeding and well-to-do ryots who interest themselves in the industry, carefully select bulls for stud purposes and allow them alone to serve their cows and they either castrate their bull-calves before they become inclined to cover cows or rigidly separate them from their cows and heifers. They also take care that no other bulls have access to their cows. They always see that their cows graze separately from the village cattle. Each herd has a bull. When the bull gets old, it is replaced by a young one. Some breeders do not allow their young heifers to be served till they attain proper age. In addition to grazing available during the rainy and cold weather, provision is made, as far as possible, for feeding the animals during the hot weather by storage of straw, cholum stalk, &c, whichever is available in the localities and by growing fodder crops. Even special foods are given to superior animals in a few cases.

22. In the non-breeding areas, the ryots are ignorant of the principles of breeding. Cattle are more or less left to nature. There are no separate herds with separate bulls. All the village cattle graze together and are allowed to promiscuously mingle with one another. Diminutive and deformed cows and bulls, instead of being weeded out, are allowed to breed. Grazing is often deficient even during rainy and cold months. Provision is seldom or insufficiently made for hot weather when no natural pasture is available. All that most of the ryots in the non-breeding areas care for is, that the cow that breeds gives some milk and a calf. "To them a calf is a calf whatever its form or quality and is of some little value either as a plough animal or for milking and manure". Whether it is not possible, by proper selection and care of breeding bulls and cows, to increase the milk in quantity and quality and to improve the calf in size and shape, is a conception unknown to them. Yet it should be noted that the blame for want of selection and care of breeding animals does not entirely rest with the ryots. In these non-breeding areas, natural conditions are generally unfavourable to breeding. Scarcity of pasture lands and costliness of fodder in such areas are prohibitive against breeding and rearing of cattle. There are some places where, the cost of maintenance of cattle is such that it has become customary for the ryots to purchase cattle just before ploughing season and dispose of them soon after ploughing is finished.

23. As already stated, there are three main breeds of cattle, Mysore, Nellore and Kangayam in South India and all common cattle have more or less the same features as one or other of the three breeds. The fact seems to be that, from time immemorial, those people who cared for good animals selected, from among the animals already existing in the locality, the best ones, especially bulls, formed the selected animals into separate herds, grazed them separately, and made provisions for droughty season by removing the herds to places where fresh pastures were available or by storage of fodder. This is the procedure which is, now a days followed with more or less modifications by any one who wishes to form or maintain a good herd of cattle; and it may be inferred that the same course was adopted in ancient times. Thus, from the cattle naturally existing in the respective localities, the present breeds have been evolved by careful selection

and judicious management persistently continued for centuries, if not, thousands of years. It may be that occasionally some foreign animals, were introduced in former days ; but if there were such introduction the result of the mixture has become lost or fixed in the existing breeds. The breeds are naturally fitted for the areas where they are found as they have adapted themselves in the long course of centuries to the climatic conditions, existing pasture and available fodder, prevailing diseases and other local peculiarities. Thus, in supplying bulls for improving the common local cattle of any area, we cannot do better than selecting bulls from the well-known breed of that area. This principle has been adopted by the Civil Veterinary Department in the distribution of Government stud bulls to several Districts. Kangayam bulls have been supplied to Tinnevely, Ramnad and Tanjore Districts, Mysore bulls to Anantapur District and Ongole bulls to Guntur, Godavari and Vizagapatam Districts.

24. In attempting to improve the local cattle, the following points have to be borne in mind.

25. The improvement of local cattle depends equally on two main factors ; Nurture and Nature, that is, Feed and Breed. Unless both of these two factors are had in view and equal attention is paid to them, no proper improvement of the livestock can be effected.

26. Suppose, a first class bull of the proper type is introduced into a herd of the ordinary village cows and that all other bulls are excluded, but no improvement is made in the feed of the animals. Under such circumstances, the calves born to the bull will be better shaped and bigger sized, but they would not grow to their full natural size on account of the absence of improvement in feeding. Proper improvement in feeding should commence with that of the cow, as soon as it conceives, if not earlier, and not merely with the feeding of the calf. We often see that calves of ordinary villages cows born to the local bulls, when well fed and cared for, develop into much bigger animals than their fellows. Again ill bred, diminutive calves, however well fed and cared for, are at their mature age decidedly smaller than the well bred adult animals.

27. Owing to the extension of cultivation, and forest conservation, pasture lands which were open to the grazing of cattle in former times have become narrowed. Even the existing pasture lands are

not properly utilized. Soon after the grass just springs up after rains, the whole village cattle are turned upon them and the grass, which, if allowed to grow undisturbed for a month or so, would support larger number of cattle, is eaten up very soon. Further, such first growth of grass, when grazed by animals that had more or less starved during the preceding hot weather causes tympanitis, diarrhoea and other diseases from which many cattle die. Thus, it would be in many ways advisable to reserve the pasture lands until the grass has time to grow well and then allow cattle to graze them. Again, the villagers would do better to divide whatever pasture lands they possess into convenient blocks, and allow their cattle in one block only at a time and remove them to the next block when the grass in the block has been eaten up. If they thus graze one block after another, the grass in the previously used block would have had time to grow and be ready for grazing again. In this way, much more grass can be made available for cattle from the same area.

28. Again, owing to the increased cultivation of industrial crops, the production of straw, stalks of Cumbu, Cholum etc., has been diminished. To meet the deficiency of cattle food thus and otherwise caused, it is desirable to grow such fodder crops which, while occupying a small area, would produce abundant supply of cattle food. We have such crops in lucerne, and guinea grass. Under high cultivation, these crops have been stated to yield as much as one hundred tons of green fodder in one acre in a year. (Vide Woodrow's Gardening Manual regarding lucerne and the Year Book recently published by the Madras Agricultural Students' Union regarding guinea grass). Even if the yield be 30 per cent. or so less under ordinary cultivation, it will go a long way to supply the deficiency of fodder.

29. In the report above referred to, one contributor has stated that lucerne does not agree with cattle. I have to say that my experience has been otherwise. I have two herds of cattle numbering together about 103. One of the herds consists of high bred animals and the other is composed of common village cattle. I gave some of my well bred animals lucerne for about a year. To begin with, I gave each adult animal 5 lbs. of lucerne along with other fodder. Gradually I raised the ration to 10 lbs. and finally the animals were allowed to consume as much as they liked. When

the animals became accustomed to the new fodder they ate only so much as they could digest and I found no bad result following the use of this fodder. One of my neighbours who followed my example of growing lucerne brought to me one of his calves suffering from tympanitis for treatment. He told me that the disease was caused by the animal eating too much of lucerne. I treated the animal and it recovered. I need not say that lucerne being a leguminous crop is very rich in nitrogen and should not be given alone to animals, but mixed with other fodder as paddy straw or stalks of cholum, cumbu &c.

30. Experiments may be made in the Government farms with several fodder crops, and such of them as are found to be suitable may be recommended for adoption by the ryots to whom good seeds of the fodder crops may be supplied.

31. Some ryots set apart a portion of their dry lands for growth of natural grasses, or Kolukkatti grass (as in Coimbatore District); or special fodder crops as *cholanathu* (as in Tinnevely District). Again in dry lands, ryots leave out a margin, say 6 to 12 feet broad, on all sides of the fields for the growth of grass and the grazing of their animals. These practices may be adopted where they are at present not in vogue.

32. In wet lands, guinea grass may be grown on the bunds of the fields. It may also be planted in the vacant spaces in topes, as it grows even under the shade of trees.

33. Old worn out and otherwise useless animals should be disposed of, so that the food unprofitably consumed by them may become available for other useful animals.

34. I have stated in para 23 that bulls of such and such breeds are suited for the improvement of the cattle of such and such localities.

35. All bulls not intended for breeding should be castrated or rigidly kept separate from the cows and heifers. In the villages it would be easier to carry out castration than separation.

36. Opinions differ as to the advisability of early castration of cattle. From my experience I can confidently recommend that bull calves may be castrated after they are a year old. In some parts of India, castration is performed at 6 months (vide page 4 "Breeds of

Indian Cattle, Rajputana"). At any rate if they are not intended for breeding, they should be castrated before they develop any breeding propensity. In this connection I may say that the western method of castration by incision is by far preferable to the country method of mulling (vide the article on castration by Mr. F. Ware, Superintendent, Civil Veterinary Department, Madras, in the Agricultural Calendar for 1912).

37. Animals that are unsound and those that show any tendency to weediness should not be bred from.

38. It is better not to allow very young animals to breed. If, with the object of quick return they are bred from, they should be very liberally fed so that they may not suffer in growth.

39. Liberal feeding is more necessary in the case of females that breed to enable them to grow themselves and to supply nutriment to their offsprings while in the womb and after their birth.

40. The custom of hobbling and tying up the young animals which interfere with their proper development should be put a stop to.

41. The inhuman practice of firing the skin of cattle for keeping off evil eyes or other fancied evils, or for the supposed cure of diseases, or for wrong adornment should be discontinued. Excepting the cases of branding the initials of the owner or breeder and the number of the animals, burning the skins of animals is not only meaningless but also lessens their value. Major F. S. H. Baldrey, Superintendent, Civil Veterinary Department, Central Provinces and Berar, says in "The Indigenous Breeds of cattle in Rajputana" that "it is a well known fact that 'Cattle in India are the back bone of Agriculture' in fact they are the only stock, as a rule, which has any interest for the farmer. India being essentially an agricultural country and cattle being so important to that industry, it is not a little extraordinary to find that horses which really do not form a part of the agricultural stock of the country and are therefore only of secondary importance to the farmer, have always received far more attention than has cattle breeding. Many lakhs of rupees have been spent on the encouragement of the breeding of horses and but little on cattle. The formation of cattle breeding studs in all centres where good indigenous breeds are present would be a very beneficial measure," and Colonel H. T. Pease, late Inspector-General, Civil Veterinary

Department, says in "Breeds of Indian cattle, Punjab" that "the methods to be employed in either resuscitating, or improving a breed, are to breed bulls in that locality in which the breed already exists; these bulls to be got from selected cows and not to be used for stud purposes until three years old."

42. In order to improve conditions in the local cattle, I would suggest that fairs be held and that prizes be given for one, two and three year old bulls, and from this class, suitable animals could be selected and reared for stud purposes. I would also give prizes to young heifers in addition to the ordinary classes for bullocks in singles and pairs.

43. To derive full benefit from the keeping of the cattle, they should, in addition to their being well fed and well bred, be maintained in good health.

44. The practice of allowing cattle to eat any mouldy, rotten or otherwise unhealthy food and drink foul water should be stopped.

45. Well-cared for cattle rarely become diseased. But even strong and healthy animals, when exposed to contagion, are liable to be infected. When disease breaks out in a locality, cattle owners should strictly adopt the rules of prevention explained in chapter I of the book entitled "More Deadly Forms of Cattle Diseases in India" which has been translated into the several vernaculars of the Presidency. A copy of the translation costs only three annas and every Village Munsif has been supplied with a copy of the translation in the local vernacular. The ryots should have the outbreak reported without delay by their Village Munsif to the Tahsildar who will procure the services of a Veterinary Assistant to attend to the outbreak. If the Veterinary Assistant does not arrive in reasonable time, they should apply to the Superintendent, Civil Veterinary Department, Madras.

வர்கொண்ட மாட்டுக் கிலக்கணம் யாதென்னில் எழில்பெறும் உடுப்புத்தலை இனிதாய்க் கறுத்துத் திரண்டொளிருகின்றகண் இணைத்துச் சிறுத்தகற்கொம் பிசைபெறும் முயற்செவி இரட்டைக் கழுத்ததில் இசைத்தொட்டி உள்ளதாம் இலகிரட் டைச்செய்தொடுக்கன லுற்றுயர் இரட்டைமுது கருப்புத்தம் வர்கொண்ட மைத்தும் பருமென்பு தங்கிய வனப்பொந புடைத்துமீய்வா மன்னும்உள் எங்கையின் அடங்கத் தகுந்தகடை வயறுயன் ஏறுசட்டம்

மருவாரண வால்பொற் சிறுத்தபே ருட்கேறு வால்கரும் பாம்புதன்னை மாணங் கருந்தாரை ஒட்டிகொ சம்பெரிய வசிருறும் இரட்டைநாடி கூர்கொண்ட கடைதலுந் திந்தம்ப மொத்துக் குலாவும் குறும்பருங்கால் குலவுக் கருங்கலொத் திணைமறுங் குத்துக் குளப்புமுத லாம்அவயவம் கொண்டிடலம் நீண்டுறு போமம்செறித்ததோல் கூறுமத் திமதிண்ணமாய்க் குலமயிலை கரியமால் வெள்ளைகரு வெள்ளைமெய் குளிர்த்த நைப்புல்லையாஞ் சீர்கொண்ட நிறமொன்று கொண்கொள் ளிக்கொம்பு செங்கோல்வெட் டிக்குள தேய்கின்ற அனாரகுளம் பிணையகன் காத்துகால் திரியுமந் திக்கால்முதல் முடி தீக்கலாம் நீங்கமுன் காற்சுவட் டெக்குமுன் செய்யபின் கால்சுவடுறத் திடநடைகொள் வெகமுறம் தூடபம்இட பங்களுட் செப்பும்அர சென்னலாமே.

V. P. S.

DISCUSSION.

Mr. Wood expressed his opinion that the information given by Mr. Subramania Mudaliar was useful, and that it would have added very much to the utility of the paper if Mr. Subramania Mudaliar gave more of his *actual experiences* of the Cattle Shows of the Presidency and of his *personal efforts* in rearing the breed of Kangayam animals in his own village of Vellagal.

APPENDIX V.

* AGRICULTURE AND MY EXPERIENCE ON THE WORKING OF MY FARM

BY MR. VENGAIL KUNHI KRISHNAN NAYANAR, KUTTOOR,
N. MALABAR.

I consider it a great privilege and pleasure to respond to the request made to me for a paper to be read before this conference, describing my recent personal experiences as a practical agriculturist. These experiences, I must state at once, have been most encouraging, educative and, to a large degree, novel. I had for many years practically interested myself in all the agricultural works on my estate at Kuttoor, Chirakal Taluk, North Malabar; but it was for the most part a case of groping in the dark.

When the agricultural associations were established, we of the landed class, were afforded a considerable incentive, but I must confess that what the associations had to teach was truly practical only to a very limited extent. However, they paved the way for the introduction of modern and rational ideas and principles, and this, in itself, is something for which they deserve the thanks of the agricultural community. The Taliparamba agricultural station has had object lessons for me and many of my fellow land-holders. It was the excellent work done on this farm that stimulated me to open an experimental farm of my own on my Kuttoor Estate. This farm consists roughly of 25 acres of double crop wet and 5 acres of one crop land, and I grow on this farm from April to September, Paddy—10 local and 7 imported varieties. From September to March I grow a second crop of paddy (Puncha) on the wet land, and in the one crop land, then I raise pulse and green manure varieties of crops to be puddled in during the transplantation season. Besides, on my garden lands I grow ground-nut (Mauritius), sugar-cane (three species), and also I maintain a rotation plot putting Maize, Cumbu, Cholam, Thenai and Ragi after the paddy has been reaped. This has been one of the results of my course at the Coimbatore Agricultural College and the incidental agricultural tour I made under the guidance of Mr. R. Cecil Wood, the Principal of the College and Mr. H. C. Sampson, Deputy Director of Agriculture.

I joined the College in June 1909 and remained till November 1910. The chief impression on my mind was that any one desirous of joining the College must be prepared to work very hard. It is not mere playing at agriculture. It is thoroughly practical in every respect. It unconsciously insists on and fosters a taste for the dignity of manual labour. The underlying idea is that just as you cannot learn to swim without entering the water, you cannot learn anything of agriculture unless you put your head, your eye and your hand into

the business. Looking on, with a course of book study, will not suffice. In saying all these, I do not want to discourage the gentlemen farmer classes from going to the College. To these, I say that so far from being scared, they ought to give the life and the training a trial. If there is any spark of agricultural earnestness in them, they will soon find the life and the study positively fascinating. They will realise the new pleasure which the landed gentry in this country have yet to know and enjoy, doing actual agricultural work instead of simply seeing it at a distance or hearing about it indirectly. The interest thus kindled will also prove highly profitable to them in later life. It will, certainly, open the eyes of the student to the innumerable ways in which he can improve his land and thereby add to his own prosperity and that of his country.

The practical lessons I studied from the College may be broadly enumerated as follows :—

1. The use of improved implements such as Gorru (Seed Drill), Guntaka, and Dantulu, the iron plough, Sampson's harrow and the Ridge plough, etc.
2. The importance of ascertaining, by analysis, the proportions of plant foods in the soil in view of the economic application of fertilisers.
3. The advantage and the necessity of giving the best possible tillage "The poor man's manure" to the soil.
4. The advantage of the rotatory system which, I may mention, has hitherto been unknown or at least unrecognised in Malabar with the result that for several months in the year valuable lands remained uncultivated after the ordinary crop had been lifted.
5. The essential importance of seed selection, as also of raising special seed crops.
6. The necessity of substituting healthy and vigorous races to replace those which have degenerated through overcropping and other causes.
7. The value of economic transplantation of paddy.
8. The distinct advantages of the loose-box system and of leguminous green manure crops, and also the comparative value and the uses of various natural and artificial fertilisers.
9. The economy of field and farm labour in various directions, such as, for instance, the construction of cross bands and anicuts and flooding, wherever possible, thereby enabling the raising of a second crop.
10. The benefits derivable from having headmen specially trained for farm and field works.
11. The necessity of raising fodder crops.

I will try to state my experiences with regarding to each of the above points.

I found that my plot worked with the drill and dantulu yielded five times as much as an adjacent plot sown in the time-honoured broad caste system. The weeding in the latter plot was both costlier and more tedious. And in my improved plot the tillerings were much more numerous.

The iron plough is vastly superior to the old country plough as it turns up and opens the ground much more thoroughly, enabling plantfood to be more easily

* Paper read at the 2nd Agricultural Conference held on 13th July 1912.

absorbed and further helping the thorough extermination of deep rooted weeds. Be it noted here that the iron plough costs only Rs. 6 and lasts at least four or five years; while the country plough, though initially cheaper, costs far more in the long run. I am confident that it will ere long be generally recognised that the iron plough is the ideal plough for a district like Malabar.

The Ridge Plough: I found my ridge plough opened up the soil well and helped the dibbling of the seed in the furrows and facilitated weeding. Later on a further advantage revealed itself when it was found that the crop could be dug out easily.

Harrow: my harrow is the wooden triangular harrow with iron teeth set vertically on the sides and having a hook nailed to the nose for a chain ring. My bullocks required some training before they were able to do the work properly and the driver had to take some care in handling the instrument at the end of every turn the bullocks made in the field. I found it more useful in the dry-farming areas; for instance, I could work my rotation plot nice with it. In the wet-land soon after the first showers in April when the land got baked up, I used it for the preparation of my nursery. The soil then was neither wet nor dry.

I submitted typical samples of my soils for analysis to the Government Agricultural Chemist and based on his report, I got out the necessary commercial fertilisers.

Though the agricultural industry in Malabar is properly believed to be pursued with intelligence and enterprise, the fact remains that Rotatory system has not been in vogue here with the result that, almost all over the district, lands are allowed to remain uncultivated for several months in the year. On my farm, I grow as rotation crops not only the cereals above-mentioned, but also ground-nut. This latter crop is eminently suited to my part of the country and can be raised equally well in both the seasons, *i. e.*, after the first as well as the second rice crop season. For the last two years I was rotating this with another paddy, and I obtained good results. I was informed by the Manager, Taliparamba Agricultural station that paddy rotated with ginger and chillies formed a good rotation. To try the same, I have added another plot this year.

The economic transplantation of paddy.

In 1909 on joining the College I was forcibly struck by the single paddy planting system, and immediately arranged for its introduction in my farm. My paddy crops are degenerate, and so I am gradually bringing down the amount of seed sown for seedlings. The seed rate of my farm till the year 1909 ranged from 80 to 100 Madras measures sown in 50 cents of seed bed. That year, I manured the seed bed properly after giving it a thorough ploughing in a due time, *i. e.* just after the mango showers in April, and also reduced the amount of seed for sowing in the bed by one third for the experimental plot and by one fourth for the rest of the bulk crop, at the same time increasing the area of the seed bed. The only precautions I had taken that year were:—

1. To give the experimental plot the best tillage possible beginning the ploughing soon after the completion of the first season, *i. e.* in September, and to thoroughly expose the soil.

2. To apply the usual dressing of cowdung manure mixed with forest leaves before the monsoon and to be in readiness for the transplantation to commence.

3. To plant the seedlings in singles, doubles, and trebles but in rows, as directed 6 inches apart, preserving also some plots to be planted according to the local method of planting in bunches varying from 6 to 8 on an average.

The results of that year can be summed up in a few words:—

The tillerings in the singles and doubles were few and far between from two to four. Each individual plant had well developed stalks, looked healthy, and had better ear heads than those planted in the bunching method which latter had more ungrained ear heads, and also there were seeds of other varieties intermingled throughout.

From the former well ripened, healthy, close grained ear heads I secured a good quality of seeds after thrashing out separately from the rest and carefully drying in the sun. I reserved this for sowing in the following year. In fact, this was the only main advantage I had gained that year. The out-turn was on the whole poor, never better than those of the previous years.

Last year again a further reduction in the seed rate was effected to thirty Madras Measures. The average came to 30 to 35 Madras Measures in 50 cents of the seed bed to transplant 4 acres of the field, with this difference, that for the experimental plot only the seedlings raised from seeds selected the year previous was used for sowing, all the bulk crop being planted with seedlings raised from beds sown at the reduced rate, but not with the seedlings of the selected seeds. There is no denying the fact that the seedlings raised in the former case were superior to those raised from the nursery for the bulk planting. The experimental plot was again planted out in singles, doubles and trebles—this year the tillerings raging from 6 to 8 and even to 10, this time the doubles giving the best tillerings, as I have reason to believe, from the cultivation sheet kept for the purpose. In the bulk crop I adopted the *spacing system* but planting in bunches of 3, 4 and 5 in rows of a span apart. This gave sufficient space for the young seedlings to send forth shoots. The result last year in both the experimental plot and in the bulk plot where the spacing system was adopted was quite encouraging. My mastery was laughed at by neighbouring farmers when he started the spacing system remarking that "Such sorts of improved methods would result in a terrible loss." In July the crops looked luxuriant and the spaces were all covered up. The same men who had scoffed were then really expressing wonder and admiration. In their opinion the spacing system was revolutionary. My out-turn of paddy rose from 13,000 Madras Measures to 18,000 Madras Measures. Considering the scarcity of rain which prevailed last year and the fact that *Tiruvatura Nalluvella* (the best part of the season in June when plants take new shoots by the help of the rain falling at that particular time and lasting for 15 days) was a failure, I can only come to the conclusion that the result was due to the improvement made in the matter of seed selection and to the spacing system adopted. Among the substantial advantages of reducing the seed rate and adopting the spacing system was also a saving in

both coolies for the transplanting work and cattle for ploughing. This saving worked out to 1000 dangalis of paddy for last year's transplantation.

I am also trying some imported varieties of paddy along with the local ones. My object in so doing is to compare the imported varieties with the local ones in point of tillering capacities and yield. *Rascanum* from Palur and *Terrakula* and *Bantu* from Sivagiri estates stood out more than a match for the local varieties such as *Thayyan*, *Keeripala*, *Peralan*, *Vethuri Kuzhams* and *Thadakkunnu*. At present the success of the former can only be attributed in my opinion to the fact of the seeds being selected and I am convinced that, if the improved methods are continued, the local varieties can also be made to thrive better and increase the tillering capacities. *Sambas* from the Central Farm gave poor results.

It was at this time that Mr. Wood, the Principal of this College was good enough to visit my farm and inspect my crops, I was, however, unavoidably absent. I was much pleased to hear from my maistry, on my return, that among the several suggestions for improvements, Mr. Wood had, in special instruction him and actually shown him how to select the best seed and preserve the same—an important thing to which my special attention has been paid for the last three consecutive years. My experience in the Central Farm had led me to the conclusion that seed selection is the fundamental basis and one of the secrets of the success of the economic transplantation system.

The French have a proverb "Like soil, like produce". Even more important and imperative is "Like seed, like progeny". There is also a Malayalam proverb "good seed, ten fold yield": but, the proverb is not practically applied here. In paddy, seed should be selected from single planted plants which have thrown out most tillerings and not from the plants which have better ear heads as the latter may only be due to bountiful manuring and not necessarily to the superior vitality of the parent plant. During last year, profiting by what I saw in the College farm, I had made special arrangements for the selection of the best seeds.

I have not been able to deduce any result from the sowing of leguminous crops last year as these were prematurely washed away by floods. This year, I am at it again and hope to have satisfactory data to report upon. My plan is to give a thorough ploughing to the experimental plot soon after the harvesting in September and keep it fallow for the succeeding two months, thus thoroughly exposing the plot to light and air. In November I sow leguminous and green manure varieties of crops. In March, these pulse crops will be raised and the seeds collected. The stubbles of these would be puddled dry in the soil. The fallen seeds of these will again sprout up and they will be allowed to remain in the field till June when these will be again puddled in as manure for the transplantation to commence then. Such quick growing varieties as sunn-hemp, cow gram etc., will be grown with the mango shower season in March and April, so that by June these will be in full flower—the exact stage at which they can be puddled in.

Sunn-hemp and Daincha have been extensively grown this year, as these will save the trouble and labour of bringing in forest leaves from great distances. A

comparison was made this year between the cost of carrying down these forest leaves to the experimental plot with the cost of green manuring with the above crops with the result that the cost incurred in the former case was nearly double the cost incurred in the latter in nearly equal plots of each. As an additional advantage, I have been able to procure a large quantity of seed in the latter case.

The loose box system.

I introduced the loose box system after seeing it at the Taliparamba farm. The manure collected from the loose box on my farm was utilised in fertilising a plot of a double crop wet land which used to yield very poorly. Year before last this plot gave a much higher yield. Last year again the same was applied with the result that the yield rose still higher, thus clearly proving that the improvement was due to the loose box manure. A separate plot has been laid out this year also to compare the results of applying the loose box manure with the ordinary cowdung manure. Essentials in the loose box are a good clean litter and dressings of straw and forest leaves applied at intervals over the droppings. Mr. Wood recommends hill straw being given to the cattle in box during the hot weather and ordinary straw during the wet season—a load being put from time to time.

In passing, I wish to say something about the process of thrashing prevailing in my farm and elsewhere in my place—a practice, the sooner discontinued the better. As Mr. Wood remarked in his inspection note "It is making the poorest use of the coolies to put them to treading corn like animals and it would be much better to get the corn trodden by cattle while the coolies are cutting. The whole operation can be done in three quarters of an hour by eight or twelve animals (bullocks or calves). I recommend that this be tried." I am taking steps to change "the antiquated method which is in vogue" in my place and follow the practice adopted in the Central Farm. The only thing required is a few days' training of the farm bullocks.

My sugarcane crop.

My sugarcane plot was laid out as closely as possible after the model of the one in the Palur farm. I grow *Red Mauritius*, *B. 208*, *Stripped Mauritius* and a variety of local cane. Of these I find that *B. 208*, has come up best.

Hitherto, I was fertilising my sugarcane plot exclusively with fish manure, but the good condition of my crop is attributable in large measure to the close attention I used to pay to drainage and irrigation and also in some measure to the preliminary preparation of the soil. About this latter point I may mention incidentally that I have it on the authority of Mr. W. H. Harrison, the Madras Agricultural Chemist, that a really good manure for ground-nut and sugarcane is the ash of the *Lantana*. This shrub which is one of the worst enemies of cultivation grows wild in most areas of Malabar. It must be uprooted, burnt and the ashes used as manure (a potassic manure). Not only for my ground-nut but also for my sugarcane I had arranged that this *Lantana* should be cut in sufficient quantities and burnt in the trenches, as this will not only improve the land but also

prevent the attack of white ants. Besides, I have learnt in the Chemistry class at the College how important and essential as plantfood-ingredients the phosphoric acid and potash are for such a soil-exhausting crop as the sugarcane, for the growth of the plant as well as for the return of the highest percentage of sugar. Last year in an analysis of my soil by the Agricultural Chemist I found that my cane plot was deficient in Potash and Lime but rich in Phosphoric acid and Nitrogen. So I should think that, besides the attention paid to drainage and irrigation, the preliminary preparation of the soil which I began last year earlier than usual and the full dressing with the ashes of the Lantana shrub had contributed a little to the success of the crop. My sugarcane plot last year covered an area of $\frac{1}{2}$ of an acre, surrounded on three sides with water and consequently the moisture standing often at higher level and interfering with drainage, 6,000 sets were planted and the plot had to be occasionally irrigated from a whote.

The manure applied in the trenches consisted of a candy of fish manure and ashes of lantana plants. I took the greatest possible care to ensure thorough drainage, as much as the lay of the land allowed. The first banking (an important operation after drainage and irrigation which should never be lost sight of by cultivators) commenced with the breaking of the first showers of rain in April followed by another dressing of fish manure, about a candy per acre. The second banking took place with the breaking of the monsoon early in June, and the former ridges were made into drainage channels and all the cane rows were fully trenched up. The Principal who visited my farm in October remarked, "You have scored a great victory over your sugarcane". Now a word about the outturn. I must first mention that in the latter part of February about one-fifth of my canes was blown up by the wind and about one-third of the blown up crop was an utter loss to me in canes. My jaggery making commenced on the 13th of January with the help of a crushing mill from Messrs. Burn & Co., Madras and an iron pan from the Central farm. The furnace and oven were constructed on the model of those in the Taliparamba farm and according to the suggestions lined out in the new pamphlet on jaggery making by Mr. Bala Krishna Murthi of this College. Though firewood was abundant in my place I used more of the beggass which produced only a low fire and which thoroughly boiled the juice. Consequently I had a great saving in the cost of carrying the firewood etc., I was also very careful in removing the scum. The more the scum is removed the greater the purity of the jaggery. The few canes that were milled between the 10th and the 20th—those broken canes that were blown up by the wind—yielded only very bad jaggery but I had instructed my maistry the proportion of lime to be added to the juice, $\frac{1}{4}$ Madras Measure for each tin measuring 24 bottles. Surely excess of lime spoils the sample of jaggery as was apparent to me when I milled a portion of my Mauritius canes adding half Madras Measure per tin. In the beginning I extracted only from 150 to 225 canes, 4 men and 2 bullocks working at it for 3 hours a day, each charge requiring from 10-12 kerosine tin full of juice and yielding from 2 to 3 Tulams of jaggery; and in the later stages from 300 to 350 canes per day yielding jaggery from $3\frac{1}{2}$ to 4 Tulams, each Tulam weighing 50 lbs. Seeing that my jaggery was bad at first I

availed myself of the services of the Taliparamba farm cooly who was able to turn out a very superior quality of jaggery each day turning out double the quantity I was able to get previously from my Mauritius canes. The men were given sufficient work and we were able to get juice sufficient for two charges until half the Mauritius canes were crushed and the jaggery obtained was of a superior quality. I could get better and harder jaggery from a milling with a mixture of both the Mauritius and B 208, but this was not of a refined sort like the one I got from a crushing of B. 208 alone. The jaggery in the latter was fine, on mere scratching of the surface showing whitish appearance. This is considered to be the best jaggery by the local people. The jaggery obtained from the mixture was more sweetish in character and it was priced more obtaining Rs. 60 per candy, the former fetching from Rs. 40 to Rs 45. There was also a third variety, all the younger canes of all the varieties milled together. These were of a bad sort which were sold at the reduced price of Rs. 20 per candy.

I did not actually weigh my sugarcane, but when I counted the average number of tillerings I found in the Mauritius canes from 6 to 7, in striped canes 4 to 5 and in B. 208 the same as in the Mauritius. Taking 5 as the average I must have got 30,000 canes. Excluding the numbers blown up by the wind and those reserved for sets I actually milled about 10,150 canes. All the tops of these were particularly set apart for seeds. I would parenthetically state here that the cane tops are as good as and even better than cane sets for seedlings. I used more of cane tops this year than sets and they have all come up best. The ashes of my ash chamber were also sufficient for the previous dressing of this year's ratoon crop.

My whole expenditure comes to Rs. 246-13-8. I got on the whole $11\frac{1}{2}$ candies of jaggery, and after reserving $1\frac{1}{2}$ candies for my own use I sold the remaining 10 candies for Rs. 370-14-11. So I find that, even after meeting my own jaggery expense and the price of the mill and pan, I have a clear profit of Rs. 124-1-6.

I have already pointed out that sugarcane is a very paying crop and that it is thriving very well in Malabar. I may also point out in this connection that if some enterprising landlords take active interest in the cultivation of this crop the ideas of starting a sugar factory in Malabar shall ere long be realised.

By a judicious extension of the anicut and channel system many lands now lying uncultivated on the banks of our rivers and streams may very profitably be put under such crops and sugarcane. Though Malabar is a land of rivers and streams, our people do not make good use of the opportunities for extending cultivation and increasing the number of crops raised annually by diverting the water of the streams into the fields and gardens during the hot weather. Sugarcane now has to be laboriously and expensively watered from March to the end of May where with such facilities as are indicated, this could be done very much more inexpensively. It can also be said that, if such natural facilities are taken proper advantage of, a crop like sugarcane for which there is already much scope can be further extended on an immense scale.

It will not suffice for members of the landed class who desire to take personal interest in improved agriculture, to simply train themselves. As in other branches of industry, there must be skilled supervision and a proportionate amount of skilled labour. The benefits of this, I have been perceiving in my own case after training a mistry of my own at this College. Such men easily grasp new ideas and principles, and they are in a better position to popularise such ideas and principles among the labourers than are the landowners.

The necessity of fodder crops.

One of the axioms of cattle management in ancient India was that pasture lands should not be taken up for cultivation. This shows the importance attached to fodder crops, and the necessity of feeding cattle on fresh green fodder. This axiom has been ignored in modern times, while in Malabar we do not at all raise fodder crops. There farmers feed their cattle almost entirely on straw. I have opened a small plot of Guinea grass to provide my cattle with green fodder. I find that the cattle consumed this with greater relish than straw, and it is visibly improving their condition. One of my objects in raising cholam as one of the rotation crops is to use the seed for further raising cholam as my fodder crop during the N. E. Monsoon season when alone it can be best grown in Malabar.

Agricultural Associations.

I have above given the agricultural associations credit for what they have achieved or suggested; but if the truth is to be told these bodies have justified their existence but to a very trivial extent. They are lacking in energy; their work is neither whole-hearted nor continuous, and for the most part we find that the members who show any interest are content with purely academical work. Moreover, these bodies have failed to attract the real cultivators, or to arouse enthusiasm or interest in the modern methods and principles which they are supposed to be intended to popularise. I do not propose that these bodies should be wiped out, but venture to think, that, in standing district or divisional associations there should be *village associations*, so that the work of these bodies might be localised. In such a case the village cultivators will be made directly interested in the work which will be done and the rivalry will be real and healthy. The North Malabar divisional association has its Head quarters at Tellicherry. Such few experiments as the members undertake are scattered so widely over the whole division that the real agriculturists take no interest whatever in them, and do not even know of their existence. Village associations as I have indicated, will focus interest, and this in itself may be an incentive to practical work. In the next place the successful working of village associations is dependant on the establishment of the principle of agricultural credit and the establishment of village Banks without which, the poorer, though enterprising cultivators will not be able to effect improvement or even go in for any experiment.

Co-operative credit societies.

Another factor which would, in my opinion, greatly accelerate the agricultural progress of Malabar is the institution of co-operative credit societies at suitable centres

of agricultural activities. One great cause for the lack of interest evinced by the cultivators towards the introduction of modern methods and appliances is the want of adequate funds at their disposal. The money even for their ordinary agricultural works, the cultivators in those parts have to borrow year after year from avaricious money lenders at an enormously great rate of interest.

The institution of such societies on co-operative credit system, besides helping the poor ryots to pursue their ordinary agricultural works unhampered, will also enable them to gradually introduce improvements. As in almost all other things the initiative in this matter also should be taken by the landed classes who alone are in a position to invest sufficient capital in such philanthropic institutions; but it is to be noted with regret in this connection that their attitude in this direction is anything but encouraging. Although large amounts of money are wasted yearly in costly and useless litigation the land owners of our places view with reluctance the idea of maintaining such institutions which, when once established, would gradually pave the way for the agricultural salvation of Malabar. In this connection I note with satisfaction the efforts put forward by the Government to induce the landed class to start such societies, although I cannot overlook the arduousness and difficulty involved in creating in them a due sense of their responsibility. Co-operation itself is an element wanting in them, and hence naturally the idea of starting co-operative societies must be forcing to them. They have yet to realise how far such systems based on co-operation would ensure the prosperity and happiness of a great many people engaged in the peaceful pursuit of agriculture. In saying all these I must not be understood to mean that the system will not be a success in Malabar but on the other hand, all that I venture to assert is that a great many difficulties and prejudices have to be overcome before the system takes its root in the district.

Another suggestion that I have to bring forward is to impart agricultural education to the village cultivators in some convenient way. I understand that the Government have decided to open a large number of Primary schools out of the Imperial educational grant. If in these schools agricultural classes on a small scale are opened it will serve the purpose of creating in the rising generation a genuine taste for agriculture which will in after life be profitable to them in a variety of ways. For this purpose an agricultural teacher trained in the College of Agriculture must be appointed in each school or at least for two or three neighbouring schools together; and he must give object lessons in agriculture to the students. I have no doubt that this plan has great possibilities in this presidency, and, if adopted, it would certainly, in course of time, prove highly beneficial to the agricultural interests of this Presidency.

Land Tenure.

Above everything, however, if the small tenant cultivator is to be stimulated to join the association and to apply practically the object lessons it has to teach, he must be guaranteed against capricious eviction.

It is our tenure system which is largely responsible for the lack of enterprise; for the cultivator cannot be encouraged to improve his holdings when he knows

that, as soon as it is time for him to reap the fruits of his industry and outlay, he runs the risk of being ejected by the notorious *Melcharth* process.

Village associations, then, and fixity of tenure represent the solution of the agricultural problem in Malabar.

I have frequently been told by tenant cultivators to whom I suggested improvements that they discern the intrinsic value of improvements but have no courage to under take them lest others should reap what they have sown.

Malabar is a district in which, by the investment of sufficient capital and the play of judicious enterprise, agriculture can be made to yield hundred fold more profit than it now does.

I have indicated one of the barriers, the system of tenure. This barrier must be removed by legislation. This alone will bring enterprise into free play and without this, the improvement must continue to be on a scale incompatible with what can really be achieved.

"Trust no future, however pleasant,
Let the dead past bury its dead.
Act, act in the living present
Heart within, and God overhead."

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The Zemindars and Agricultural Progress.

In his presidential address delivered at the last Agricultural Conference held under the auspices of the Madras Agricultural Students' Union, the Hon'ble Dewan Bahadur V. Ramabhadra Naidu, the enlightened and public spirited Zemindar of Doddappa-naickanur and Vadagarai said that the future progress of agriculture in this Presidency depended mainly on the earnest interest evinced by the Zemindars and large landholders in this difficult, but very important, branch of human industry. He was of opinion that the education of the minor Zemindars was incomplete without a sound agricultural education and desired that the best sons of the Zemindars should be deputed for an agricultural training.

At the annual meeting of the Madras Landholders' Association held in October last, he moved a resolution to the effect that Agricultural Farms should be opened in all the Zemindary tracts to popularize improved agricultural methods to the cultivators. Farms have been opened here and there in the Zemindary estates before now and have been closed after an ephemeral existence. Farms have also been started when the estates were under the Court of Wards and, with the exception of a few successful farms, the others have been abandoned sooner or later as soon as the estates were handed over to the Zemindars on reaching their majority. We have has

occasion to notice the causes of success or failure in such farms and purpose to state in broad outline in this article the essentials for success, leaving the details of working to a later issue, for the earnest consideration of such of the Zemindars as may feel a real interest in the matter and not merely treat it as a paper resolution passed for publication in the press.

The land is held, under the Government, by the Zemindars on the *Istimr Sunanud*, the peishkist being permanently settled. The kist is not liable to be increased by periodical settlements on the one hand nor liable to be reduced when the seasons are bad. These lands have been assigned by the Zemindars to smaller or bigger tenants, usually on *varam*, the tenants having the right of *Kudivaram* and the landlords *Melvaram*. After deducting the cultivation expenses, the produce is divided into 2 halves or into $\frac{2}{3}$ rd and $\frac{1}{3}$ rd according to the nature of the produce and the terms of tenure. The tenants cannot always be compelled to cultivate particular crops in particular localities unless otherwise agreed upon in *Muchilikas*. In addition to the *varam* lands, the Zemindars possess *Pannai lands* and *waste lands* over which they have more or less absolute proprietorship. The improvements which they think of carrying out have to be first carried out in the latter two classes of lands, leaving it to the tenants who are in charge of *varam* lands to copy these improved methods enabling them there, by to produce more out of those lands than they are now getting and paying more *melvaram* to the landlords.

Subject to the above limitation, the first and foremost idea which should predominate the proposal to open agricultural farms in Zemindary tracts is that those who formulate it should have an *abiding faith* in the possibilities of improvement. The land contains a certain store of plantfood which it will yield to the plants growing on them only on certain conditions. These conditions are being studied daily in all parts of the civilised world and the land is *made to yield* more to supply the needs of the ever-increasing population. What is possible in other countries should be possible in India, provided these conditions are fulfilled. The study of these conditions has been

undertaken by Government only recently and year after year new truths will be found and better methods of cultivation suitable to Indian conditions evolved for adoption by the ryots. The methods of study, as mentioned above, are slow but, judging from the experiences of other countries comparatively more advanced than ours, are sure. There is no finality to the experiments and as civilisation advances and population increases more and more, new problems will have to be tackled. The nature of the experiments may be altered but experiments of one kind or another will always have to be kept on and we would like to refer our readers to a note which appears elsewhere in this issue on the Rothampstead Farm. Life is but a span. The old man who plants trees does not expect to reap the fruits of his labour but he is sure that his descendants will be profited. Similarly Zemindars who have any projects of agricultural reform in view should work more for the permanent fertility of the land and for the ever increasing prosperity of their sons and grandsons, not to speak of their hosts of tenant cultivators. The first principle to be kept in view, therefore, is the *faith* in the necessity for modifying the present methods of cultivation and in the certainty, at least the possibility, of the modified methods paying sooner or later.

The next thing to be considered is how to begin and what changes are to be introduced. The changes are evolved at Agricultural Stations or Farms and a large number of Farms have to be established all over the country, at least one or two in each representative tract. Farms are of several kinds, experimental farms, college farms, demonstration farms, model farms, etc. For instance, experiments are devised and carried out for a number of years in an Experimental Farm to prove or disprove certain ideas and to evolve new and best methods. The experiments may succeed or may fail. Expense is not a matter of consideration here. It is a question of study. The best scientific skill available is secured for this work and a free and almost unfettered hand is given to the scientific workmen. It collaborates the work of the practical farmer with the researches of the Botanist, Chemist, Bacteriologist, Entomologist, Mycolo-

gist and other scientists. More specialised study is carried on further with the aid of individual researchmen, such as cotton specialist, jute expert, sugarcane expert, indigo expert, etc. The work of the scientists is slow. It involves large sums of money but it is inevitable, if India should advance in scientific knowledge. We do not suppose that the Zemindars intend to start experimental farms of this nature. It is possible that there may be a Zemindar of the type of the late Sir John Bennett Lawes of Rothampstead Farm, who will take up the work as a hobby and richly endow an institution, diverting a major portion of his "Law charges" to scientific research. The Government have undertaken this work and the Zemindars need not, at any rate for the present, embark on this extremely difficult portion of the undertaking. There is time enough for them to think about it when they have achieved the less difficult tasks to be detailed later and have imbibed some faith in science and scientific methods.

A College Farm does not aim usually at anything more than providing some land for practice by students in ploughing and field operations and growing some specimen crops for observations. Experiments may be and are usually tacked on at these farms for students to know how experiments have to be conducted and what may be the limitations of experiment. The College Farm is an aid, as it were, to nature study and serves the same purpose in the teaching of Agriculture, as a laboratory is required for teaching Chemistry and a map for teaching Geography. Zemindars may establish smaller or bigger College Farms, or more properly school gardens, as an adjunct to the colleges and secondary and elementary schools which most of them have largely endowed.

A Demonstration Farm is designed for demonstrating or exhibiting certain truths evolved by the scientific workmen. It is educative in its purpose and cannot be valued in money. The work of this farm can be very well performed by mediocre, but enthusiastic, men who have faith in what they are doing and preaching. The work is more or less missionary in character. Any number of demonstration farms may be started in each estate, only ideas which have passed the test of experiments being put

before the ryots; e.g., seed selection, single seedling transplantation of paddy, drill sowing, green manuring with leguminous plants, etc. There is the risk of these farms being summarily closed by an over zealous manager of an estate who as an eye to the immediate curtailment of expenditure, as these, being missionary and educative in their character, may not always be paying.

Lastly, with regard to the model farms, they will be models to the neighbouring ryots and estates if properly managed and will discourage people and make them more sceptic and even suspicious if carelessly managed. A model farm is a purely *business concern* and should be managed from the very beginning in a businesslike manner. It should not be played with, to be discarded after a few years. No great work was ever done in this world without trouble and expense and a lot of trouble and expenditure will have to be incurred before these farms become *model farms* in every sense of the term. The management of these farms should be guided by well-trained men on one side and financed by enthusiastic business men on the other. The Zemindars, as mentioned above, have mostly leased their lands on varam on different kinds of tenure to the cultivators and they cannot effect much improvement in those lands, at any rate in the beginning. The cultivators may copy the improved and more intensive methods followed in the model farms and produce more out of their lands and thereby, as stated above, indirectly pay the Zemindars a greater amount of dividend. But the field of work for the Zemindar is in his pannai lands (otherwise called homefarm lands) and in the waste lands of his estate. These are but indifferently cultivated at present and the whole of the produce does not always find its way into the palace granary. The pannai and waste lands are not sufficiently large in each Zemindary to pay highly paid scientific staff for management but several of them can afford to engage the services of trained men of the types and salaries of the Farm managers of Government Agricultural Stations. These men would rather enter Government Service on smaller salaries with permanency of employment and surety of promotion than be employed in the Zemindaries on higher initial salaries. Model

farms cannot be managed without trained men, and trained men have to be paid their market value, permanency of service and prospects of advancement being assured at the same time. Above all, the Zemindar must take a personal intelligent interest in the working of these farms, because the aim of these farms is to increase the productivity of his lands on which his welfare and the welfare of his tenants and dependants completely depend.

We propose to show in our next article on the subject the desirability of combining with schemes for agricultural progress, two other movements which the Zemindars have for sometime been contemplating, namely the starting of Co-operative Banks to relieve encumbered estates and the establishment of a Rajkumar College.

Notes on Pepper Cultivation on the West Coast.

1. GENERAL.

Pepper is a perennial climber indigenous to the forests of Malabar and Travancore. It is the dried fruit of the creeper that is called the pepper of commerce. It is one of the earliest spices known and was formerly one of the most important articles of commerce between India and Europe. Pepper being a climber, requires a standard which is usually a living tree, and the prosperity or otherwise of the vine largely depends upon the standard on which it is made to creep on. It often happens that many vines in excellent condition fall away on account of the untimely death or destruction of their respective standards. The vines once fallen very seldom assume their original condition even though proper care is bestowed in properly propping them up. The question therefore of the cultivation of pepper is intimately connected with that of standard. Both being perennials, their study is all the more difficult.

II. CULTIVATION OF PEPPER AS ADOPTED IN NORTH MALABAR.

1. Varieties—There are several varieties of cultivated pepper. They belong to any of the three main types given below :—

i. Kalluvalli. ii. Balamcottah. iii. Cheriakody
Each of these has very distinctive characteristics and they are

indicated by their names. (i) Kalluvalli (kallu-stone ; valli-creeper). It is a hardy variety, the pepper is hard, heavy and more pungent, and the spikes are long and fully packed with seeds. The other parts of the creeper are dark-green in colour. Leaf branches and branchlets show an erect appearance due to the rigidity of the woody portion of the vine. It is rather slow to establish itself after planting. But it lives a longer life giving good yields in alternate years. It is most suited to the exposed places.

(ii) *Balamcottah* or *Valamcottah*.—Has a bushy growth and drooping appearance. Its various parts are light green in colour and its produce is less heavy. It is most suited to low lying shady localities. It establishes itself quicker, but dies comparatively an earlier death. It is more susceptible to diseases, flowers rather regularly all at once and bears fairly well in all the years if season and other conditions remain favourable.

(iii) *Kuruvanthari*, *Aracotta* or *Cheruvalli*.—(Kuru-short ; theri-spike). Is a short spiked pepper. The seeds are closely packed. Leaves smaller, long and narrow ; seeds though small, are heavy and pungent. The plant is bushy and drooping and spikes are often concealed within the leaves.

The flowers of all the three varieties given above are hermaphrodite. There is another variety called Utherancottah which is of the Kalluvalli type. It is very bad bearer and as such should be avoided by the cultivators. The first two are the best.

2. Land and its aspects fitted for the cultivation.—Virgin lands with red laterite soils, heavy and sticky to the mamatty when dug out are best suited for the cultivation. Generally lower portion of hill slopes facing north—where the sun is least powerful—is considered the best in point of aspect, next east and then the west ; southern aspect is the last resource and is seldom resorted to, unless there is a hill just on the other side for sun break. The valleys or rather the hollows where there is plenty of rich washed down soils protected on either side with hill slopes with sufficient access for the sun's rays are often observed with excellent pepper vines. Flat grounds are generally rare in typical pepper areas ; they are also good, but the necessary arrangements must be made for draining the land.

3. Reclamation of land for planting pepper.—Scrub jungle, too big shady and otherwise unsuitable trees should be removed taking care not to destroy trees that are young and useful as standards. All available leaves and twigs are to be left in the ground to decompose and enrich the soil. Almost all jungle trees serve as standards for pepper, but the following are a few of the best :—Nuxvomica, Mango, Karayam, Alum, Venmaruthu. These may be left undisturbed, provided they are deep rooted and as such not likely to come out when the land is dug deeply and thoroughly for the first time. The standards are to be planted ten to twelve feet apart each way and about 2 to 3 ft. deep in rows, wherever necessary, with early showers in May.

4. Preparation of Muruku (*Erithrina indica*) standards. Rich virgin lands with plenty of jungle growth is burned during the hot weather and hill paddy is sown about April. Sometime hence i.e., 2 to 3 weeks, after a few showers have been obtained, Muruku seeds are dibbled about 1 to 1½ ft. apart. Scrub jungle which is likely to check the growth of Muruku should be cut. The side branches of the Murukus should also be cleanly cut very near the main stem once in about August. Paddy is off the ground about September. Afterwards the Murukus are left alone till they are cut in February (Kumbham, preferably in new moon days) i. e., 22 months after sowing. They are cut flush with the ground but slantingly, so that more space may be had for the roots to come out and these roots might not be damaged in the subsequent vertical stacking. The branches, if any, and the tops are also cleanly cut. By this time, if the land selected is rich enough, the standards will be 6 ft. to 9 ft. long with a circumference of about six inches in the middle. The plants below the above sizes are left uncut for another year till the next February. Cuttings older than three years are considered bad. As soon as the standards are cut, they should be removed to the shade and kept flat on the ground for about three days under cover. Subsequently they are stacked topsy turvey for about two weeks and afterwards vertically in the normal position. By this time there will be roots and shoots coming out of the stacked standards. Stacking of standards in the

above way is considered beneficial for their proper rooting and subsequent healthy growth. These are carefully planted in their permanent homes as stated above.

5. Planting of pepper and other treatment of the estate.—Pepper is generally propagated by cuttings. In June-July five to six cuttings with 5 to 7 nodes each are planted near the standards on the northern side of it. They are so planted in the pit that one may not touch the other. Pits are filled and soil is well pressed in, taking care that rain water does not stand and cause rotting of the runners. The portion of the cuttings above ground is protected from the sun with dried leaves or thatch grass. The ground is well dug about one foot or more deep, once in July and the soil left uneven so that rain water might go well into the soil. The runners are carefully tied on to the standards. Another light digging and levelling is given just at the tail end of the north-east monsoon rains to conserve the moisture in the succeeding hot weather, in the beginning of which in December, the bottoms of the vines are protected from the sun by tying Itul twigs (*Xylia dolabris*). These leaves are moved a little away from the vines just after getting a few rains. Otherwise the vines might be damaged by white ants. A good portion of the cuttings thus planted either fail to take root due to excess of rains or want of it just after planting or die away in the hot weather. The vacancies thus produced have to be filled up in the succeeding years. It thus takes 2 to 3 years to fill up an estate completely with vines.

In the early stages, the young vines require a certain amount of shade. The ryots often plant plantains one for every four vines; a few of the shade trees are kept on. After 2 to 3 years, even earlier, if the plots get too shady, plantains are removed, shade lopped off and plenty of light let in. The shade should be carefully and well regulated. Unless the vines are well exposed to the sun, the bearing will be much reduced. The shady and ill-drained plots are the first to get diseased. In the hot weather, preferably in February-March on new moon days when there are dark nights and not many boring beetles about, Muruku branches are chopped off in the 2nd or 3rd year after they have grown

sufficiently, even the very top of it is cut, leaving about 10 to 12 ft. above ground. This is to stop their vertical growth and make them grow stouter. If not, they grow too high and there is the liability of their being blown down by the wind apart from the difficulty of the harvesting of pepper. In the case of standards other than muruku, branches may be cut even in the rainy season; but care must be taken to avoid lopping shade when the vines are in flower. It may be done when the seeds are well set. If the valley is steep and the surface soil is likely to be washed down, the whole area should be terraced suitably in 2 to 3 years after planting the vines, keeping the row of vines in the middle of the terraces. In terracing, care should be taken to keep the surface rich soil at the top only, the rain water that fall in each compartment or terrace should be made to go into the soil. It can be easily managed by making the edge of the terrace slightly higher. It may be noted that the following operations described above should be repeated in time every year :—diggings, tying of vines, lopping of shade and covering with Irul twigs..

Age and yield of vines.—In the 3rd year the pepper gives maiden crop. From the 4th year forward, it begins to give regular yields. It may be considered that the vine is in the best bearing condition from 8 to 15 years. Afterwards the yields begin to decrease. But by careful treatment, regulation of shade and putting in of props, it may be made to give a fair yield up to 30 to 40 years and even more. On the Agricultural Station there are a good many vines over 25 years old which give a net income of Rs. 25 to 50 per acre.

III. THE FOLLOWING ARE THE LINES ON WHICH THE IMPROVEMENTS CAN BE EFFECTED :—

1. The supply of sets and the system of planting.—The Taliparamba Agricultural Station serves as an example to show how careless the farmers are in the matter. The portion of the garden planted up with vines before the acquisition of the farm contains a good many vines called Utherancottah which hardly give any pepper. Generally runners that come from the bottom of vines are rolled and kept for next year's cuttings for planting purposes.

When the cuttings are actually taken *i. e.*, in June-July, there will be no pepper on. Besides it is not easy to distinguish Utherancottah or any other bad varieties from the respective type of good vines such as Kalluvalli and Balamcottah. The former presents a very healthy and vigorous appearance. Naturally the ryots carelessly take cuttings from such vines and when once the vines have been grown and begun to yield pepper, they never destroy the vines, though they know them to be bad bearers. To avoid such mistakes and consequent heavy loss for a number of years to come, it is extremely important that young vines which give a good yield and whose berries fill properly should be selected and marked when the vine is in bearing. The cuttings should be taken from them and them alone. It is indeed a bad practice to purchase cuttings from bad and untrustworthy ryots.

In parts of Ponnani Taluk, there is a system of making coils or rings out of long cuttings and these are planted in big pits and they are covered with earth which is well compressed, only a small portion of the cutting being seen above ground. Naturally good many roots come out from all the nodes and a better root system is developed. The result is a thicker growth of vines from the very outset.

2. Manuring.—Hither to the practice in vogue in pepper areas was to reclaim rich virgin lands of the valleys and plant them up with vines. On account of the fertility of the lands due to the enormous quantity of leaf mould the vines grow well and give excellent yield for 15 to 20 years. Afterwards they give up the garden and take up a new area, but this system cannot be continued much longer. On account of the abundance of the available lands in the past, the ryots had no necessity to think of any manuring for pepper and naturally no ryot ever cared to or did any manuring. Virgin lands are fast becoming a thing of the past and the time has come to seriously think of getting a pepper crop by manuring or otherwise from a limited area. With that view different kinds of manures were tried on the Taliparamba Agricultural Station. The most natural and the cheapest available is leaf mould or (decomposed leaf) and the application has given good

results. A special plot which was in a poor condition was treated with lime and leaf mould *i. e.*, half seer of the former and a big basket full of the latter were dug in round each vine a little away from the main stem. The annual application of the above in the rainy season has given excellent results and all the vines young and old have revived and are giving good and increasing yield every year. Fish manure is another good manure which has given very satisfactory results. About a lb. of it is a fair quantity for each vine every year. But for a day or two after the application of fish, the vines have to be watched lest the vines be damaged by jackals, dogs, etc. Direct application of other manures including green manuring have not yet given conclusive results, but there is no doubt that digging in of a good green manuring crop such as cow gram, groundnut, etc., goes a good way in improving the condition of vines. Mulching the pepper areas completely with leaves in the hot weather and subsequent digging in of the gardens would certainly do good to the vines, but special care has to be taken of such plots to save them from fire.

3. Supply of Standards.—The question of standard for pepper is a very vexed one. The most common and probably the best is a Muruku, *Erithrina indica*. This is a leguminous tree having a rough and thorny bark. It has a serious drawback in that it often dies before the vine. It is an excellent practice to plant mangoes near Murukus to serve as an alternative standard by the time the Murukus fall away. Murukus never do well in shady lands which are shaded by older growth and it is waste of labour to attempt to plant them in old estates. Thekkan Karayan (*Garuga pinnata*), Ambayam (*Spondius mangifera*) which can be both propagated by cuttings are the two best standards which do well in old and shady gardens and live by far a longer life than Murukus. The branches of these can be planted in suitable localities and cuttings can be subsequently taken from them for planting in the estates.

Irul props.—Irul poles make very good props and they should be stored with a view to prop the big vines whose standards have fallen away.

4. Mounding.—Putting a mound of earth round the trees and gradually raising it by putting small quantities of finer earth from the vacant space of the garden itself has been found to be a good practice. The vines thus treated have developed a thick root system at the surface and they are doing very well indeed. In flat spaces where drainage is bad and in places where surface soil is insufficient, the system can well be recommended.

5. Pruning.—Both top and bottom pruning of vines were tried on the Taliparamba Agricultural Station and it has been found that in the case of old and sickly vines, pruning will do very well. The whole of the top portion leaving a foot or two can well be cleanly cut and removed just in the beginning of the rainy season or after a few rains have been obtained. Many vines thus treated are faring well.

Conclusion.—There is no doubt that there is money in pepper. Plenty of lands fitted for the cultivation are available in South Malabar and in Coondapur (Kollur and Golie Holla side), Udipi (Karkal side) and Puthur Taluks of South Canara. The present system of cultivation admits of improvement as pointed out already. After the establishment of the Taliparamba Agricultural Station, the cultivation has been already started in new centres and it is hoped it will spread rapidly.

M. GOVINDA KIDAVU.

The College of Agriculture, Sabour.

This College was opened in November, 1910, with twenty-one students who were selected out of a large number of applicants. A brief description of the institution may interest our readers.

The College building is a long two storied structure constructed by Messrs. Martin and Co., the well-known architects of Calcutta. The long verandah and the portico projected out of it enhance the beauty and style of the building.

The ground floor contains the Chemical section, the prepara-

tion room for Exhibitions, Principal's room and office, the library, the lecture theatre and the agricultural laboratory.

The first floor contains the Botanical, Mycological and Entomological sections, the students' laboratories, a research laboratory and lecture rooms for Botany, Entomology and Physics.

The Chemical block contains a lecture gallery, research laboratory, the Agricultural Chemists' private room and office, a photographic dark room, assistants' rooms and the students' working laboratory. A separate 'balance room' is attached to it. The water is pumped up from a deep well in the compound fed by a perennial spring and stored in four tanks on the roof of the College, and the gas is made from petroleum in a Mansfield Engine. Forty students at a time can very comfortably work in the laboratory.

The Practical Botany Laboratory is a big hall fitted with gas and water taps—and seats are so arranged that a north light is always available for microscopical work.

The Botanic garden covers about 12 acres and contains a green-house containing many varieties of orchids, ferns, a big nursery and a collection of many rare plants. The lawns with flower beds present a very attractive and charming sight.

The farm lying north and south of the college is controlled by the Professor of Agriculture assisted by a Superintendent. It covers about 300 acres, including the farmstead, workshop, cattle sheds etc. The actual land under cultivation is 150 acres. Many improved implements have been installed, but special attention is always paid to the local methods. A dairy with some Montgomery cows has been started, but the milk at present is barely sufficient to meet the demands of the staff and of the students in the Hostel.

The Hostel is a large one storied building built round a court-yard with the dining rooms and kitchens in the rear containing accommodation for 120 students. Separate blocks are available for Hindus and Non-Hindus, with entirely separate kitchens and dining halls. The courtyard in front is divided into two equal

halves by a row of smaller rooms and is large enough to contain two tennis lawns; there are a common room for playing indoor games and a library and reading room which contains a selection of standard scientific text books and English and Vernacular novels. A sun-dial presented by the Hon'ble Mr. J. G. Cumming, Revenue Secretary to the Government of Bengal has been located in front of the Hostel gate and the college gong strikes according to it in the sunny weather. The water for drinking and washing purposes is supplied from a big tank placed upon four arches 15 ft. high on a mound 10 ft. above the level of the ground. The mound which separates the college from the Hostel has recently been carefully laid out and shrubs have been planted on it.

The students work six hours a day including both theoretical and field work. The practical agricultural classes are generally taken in the morning and the students are always kept in touch with the various operations of the farm. Each student has to carry out the ordinary farm operations and is also given a plot which he has to cultivate himself.

A short six months' course has lately been introduced for the training of the sons of Zemindars and cultivators in the Science of Agriculture and about ten students are at present taking advantage of this course.

The present staff consists of the Principal who is also the Economic Botanist to the Government, the Agricultural Chemist, the Professor of Agriculture and a staff of Assistant Professors most of whom have been trained in America.

For the recreation of the students there are Athletic, Dramatic and Debating clubs. Hockey and Football are the compulsory games, tennis and cricket being kept optional. The students have successfully staged two dramas. In the Debating club questions of general and agricultural interest are taken up.

A medical officer looks to the health of the students and he is in charge of the drainage and conservancy systems of the estate. A new building for the hospital will soon be constructed.

D. N. MITTER.

Convocation 1913.

The Convocation for the purpose of presenting Diplomas to the successful students came off at noon on Saturday, 29th March 1913 under the Presidency of Mr. D T. Chadwick, I.C.S., Director of Agriculture. The teaching staff of the College, both European and Indian, were seated on the dais. There were also present, in addition to the other officers of the College and friends of students: Mrs. W. H. Harrison, Dr. E. J. Butler, Dewan Bahadur Suler Lakshminarasimha Aiyar and Messrs. Plyman, Vengail K. Krishnan Nayanar, J. R. Ranga Raju, M. Panchapakesa Aiyar, K. R. Venkataramana Aiyar, S. S. Venkatakrishna Aiyar, T. A. Ramalingam Chettiar and Vellingiri Gounder.

The Principal opened the proceedings by welcoming the Honorary visitors and others who could spare the time to attend the Convocation and said that this was the first time that Mr. Chadwick, the Director of Agriculture, Madras was present at one of these functions and hoped that he might be able to control the Department and attend to its welfare for several years to come. In reviewing briefly the events of the last year, he thought that it might be said, without exaggeration, that progress had been continued with no less energy than before. "This College", he said "is, as you know, comparatively young. In a well established College, it will be only necessary to refer to the progress in studies on the part of the students passed out, but we are still in a condition of change. Some small changes have been made in some directions by the teaching staff during last year and we have not reached the condition of finality. There is still a greater change impending in the college course. Hitherto we had a three-years' course. A proposal has been made for increasing the activity of the College by instituting a two-years' course and a four-years' course. This will entail more work on the teaching staff and I am confident the work will be cheerfully carried out. In the passing of the last three batches of students, a lot of spade work has been turned out. Speaking for myself and for my colleagues, I can testify that we have received considerable help from our Indian assistants and subor-

dinates. Under the proposed reconstituted course we are also sure of getting similar assistance from them in future. I may also take this opportunity of congratulating Mr. K. Rangachari on his acting appointment as Government Botanist. So long as Mr. Rangachari continues in charge of the teaching work in Botany, the teaching in that subject is not likely to deteriorate. To you, students who are completing the course I have been offering advice off and on and you have probably had enough of mine and I will therefore ask the Director to give you fresh advice. I am glad to be able to report that discipline has been very well maintained throughout. In very few instances last year, as in previous years, had disciplinary measures to be exercised. The friendly relations which the staff have cultivated with the students in the field, in the class rooms and in the play grounds have been considerable. We shall shortly hear of the erection of another College, namely, the Forest College, within a short space of time and there is sure to be a competition of friendly rivalry and I hope the Agricultural students will take the first place in that rivalry in behaviour and manners. The Warden, Mr. R. V. Subramania Aiyar, is responsible for the hostel discipline and he has fulfilled his duties of that Honorary post ungrudgingly."

Next coming to the out going students, Mr. Wood said that the class started with the full number twenty but there were only fourteen in the third year class and that out of these, twelve qualified themselves for the Diploma and were eligible for the degree of Licentiate in Agriculture. He further pointed out that Mysore had again taken the first place. (*Cheers*).

He then asked the Director of Agriculture to present the Diplomas to the successful students.

The following students, arranged in order of merit, were presented with the Diplomas of the Degree of Licentiate in Agriculture :—

- | | |
|------------------------|----------------------------|
| 1. C. Ellappa Chetty. | 8. Kunhi Sankaran Nair. |
| 2. K. Raghavachari. | 9. N. V. Visvanatha Aiyar. |
| 3. D. Panakala Rao. | 10. D. B. Sivarama Rao. |
| 4. H. C. Javarayya. | 11. V. Ratnaji Rao. |
| 5. L. Srinivasa Das. | 12. Bhairya Siva Rao. |
| 6. { K. Ramanujachari. | |
| { P. S. Venkuswami. | |

The medals were awarded as under:—*The Robertson Prize* (Gold Medal) for Proficiency in Agriculture (Diploma Examination)—C. Ellappa Chetty. *The Clogstoun Prize* (Gold Medal), for General Proficiency, as determined by class marks—C. Ellappa Chetty. *The Kress Prize* (Gold Medal) for Proficiency in Agricultural Chemistry (Diploma Examination),—K. Raghavachari.

(Cheers)

After the presentation of the Diplomas and medals, the Director delivered the following presidential address:—

Mr. Wood, ladies and gentlemen, I am thankful for the occasion which has come, for me to preside at to-day's Convocation and to present the diplomas. You all know that, at a time when one had lost touch with students' habits, I was deputed for a course in Agriculture in England lately and can therefore sympathise with the difficulties and aspirations of agricultural students like yourselves. The results are on the whole very good and you have the great satisfaction of being able to look back on three years of long and successful effort. The satisfaction which comes from hard but successful effort is one of the most pleasing sensations men can enjoy and I hope that many of you who are present here will realise this again and again in after life. When one's College course was done one felt that one was equipped for the world and knew all there was to be known, but it is a trite saying that one's education is only commencing on taking one's degree. But this is trebly true of agriculture. An agricultural course teaches you the way to think, the way to work and, as far as possible, the reason and the need for certain operations and work. Circumstances are so varied, and lands differ in soil, in climate, and in facilities for water, that in each case it is for the student to apply and develop the knowledge he has obtained here, and this means close and constant study and work. Agriculture to be successful demands forethought, patience, skill and attention to detail. If they become careless in their methods or in their work they will not be able to command success. I am also thankful for the welcome assurance by the Principal regarding the cordiality between the

staff and the students. It is now 5 years since this college was started and most of those who have passed out during these years, if not all, are members of the Students' Union. The Union will be the cause of creating an *esprit de corps* amongst the old students and will keep them in touch with the College and I would ask the old students to give the benefit of their experiences in practical life either at the annual conferences or through the columns of the journal. I should also request you, whenever you hear of myself or any of the Departmental experts touring in the localities where you may be residing, whether employed in the Department or not, to come and see us and tell us the results of your experiences; and it will give the greatest pleasure to me and the experts to see you occasionally in the districts. For instance, two Deputy Directors had personally reported the good work done by an old Saidapet student, Mr. D. Appa Rao of Kasimkota who, on hearing that I was in the district, came quite a long way, about 10 miles, to see me recently and told me of the agricultural practices prevailing in the Vizagapatam District. The soil conditions in the Madras Presidency are so vast and varied that quite a large number of men with an agricultural training are required to develop the resources of the country, and, after all, agricultural education is probably what is most needed in India. In other countries advantages of agricultural education are well known. Look at Canada with its fourteen highest grade Agricultural Colleges with about 1000 students at the largest. But here, as Mr. Wood said, we are still in the initial stages. And it depends upon you—you the boys who go out from this College—as to the opinion that is formed of agricultural education in India. Show that you know your business, that you know what you are doing, at what you are aiming and command the respect of your neighbours.

There is one other thing I wish to say. You have had a better agricultural training than many of your neighbours, but do not think that you are the repositories of all knowledge. You were profiting from the labours and work of men who have since died. You have done nothing. You have merely learnt the result of others' labour and the responsibility lies on you to extend

knowledge by your labours so that the children and generations which come after you may not look upon you as belonging to an unprofitable age and for the present do not despise those who have not had your advantages. Some of you will, I hope, join as Farm managers to help the Department in its work. Whether you join the service or prefer to take to private farming, you will have a certain number of men to control and it is essential for an efficient control that you should ensure their respect for you. They would respect you, first of all, if you show in your work, knowledge and powers of observation superior to theirs. For instance, it will not do if, standing on the bund, you simply make a remark that the work has been shabbily done, but it will really make them respect you if you actually show with your own hands how ploughing or reaping or any similar operation is performed in a better manner. This means that a knowledge working details is necessary for you to ensure respect from the men placed under your control and you must try to master these details. The second manner in which you can command respect, not only from those under your control but from all about you, is by your being a model of good character. The favourable opportunities you have had have given you a superior education and you are bound to give the benefit of that education to the cultivating classes, although you will have to learn a lot from them before beginning to advise them. You have done well whilst at College. Add to the fame of your College by your actions hereafter. I wish you all a good fortune and a prosperous career (*cheers.*)

The Convocation was then dissolved.

A group photograph was then taken of the new Licentiates in Agriculture and the Teaching Staff.

DIPLOMA EXAMINATIONS (1912-13)

The following have been awarded the Diploma of Licentiates in Agriculture, having obtained not less than 50 per cent in the 2nd part of the Diploma Examinations. 14 students appeared and 12 passed.

Maximum=600 marks.

1. C. Ellappa Chetty	420	Robertson Medal, Clogstoun Medal.
2. K. Raghavachari	398	Keess Medal.
3. D. Panakala Rao	380	
4. H. C. Javarayya	374	
5. L. Srinivasa Das	358	
6. { K. Ramanujachari	327	
P. S. Venkuswami	327	
8. Kunhi Sankaran Nair	324	
9. N. V. Visvanatha Aiyar	321	
10. D. B. Sivarama Rao	317	
11. V. Ratnaji Rao	316	
12. Bhairy Siva Rao	300	

Agriculture.

Examiners. { S. Milligan Esq.,
Imperial Agriculturist, Pusa.
R. C. Wood Esq., B.A.,
Principal, Agricultural College, Coimbatore.
Maximum 300 Marks.

*1. C. Ellappa Chetty	224
2. K. Raghavachari	216
3. D. Panakala Rao	208
4. L. Srinivasa Das	197
5. H. C. Javarayya	188
6. { D. B. Sivarama Rao	176
P. S. Venkuswami	176
8. K. Ramanujachari	165
9. Kunhi Sankaran Nair	162
10. Bhairy Siva Rao	160
11. V. Ratnaji Rao	159
12. N. V. Visvanatha Aiyar	154

* C. Ellappa Chetty was awarded the Robertson Prize.

Agricultural Engineering.

Examiners. { K. T. B. Tressler Esq.,
Director of Industries, Madras.
M. R. Ry. R. V. Subramania Aiyar Avergal, B.C.E., L.T.,
Engineering Assistant.
Maximum 150 Marks.

1. C. Ellappa Chetty	107
2. H. C. Javarayya	95
3. K. Raghavachari	91
4. N. V. Visvanatha Aiyar	88
5. K. Ramanujachari	87
6. D. Panakala Rao	86
7. P. S. Venkuswami	82
8. Kunhi Sankaran Nair	81
9. L. Srinivasa Das	79
10. { K. R. Sankaranarayanan	76
D. B. Sivarama Rao	76
12. V. Ratnaji Rao	73
13. A. S. Pandyan	72
14. Bhairy Siva Rao	66

Veterinary Science.

Examiners. { D. Aitchison Esq., M.R.C.V.S.,
Principal Veterinary College Madras.
S L. D' Silva Esq.,
Veterinary Assistant.

Maximum 150 Marks.

1. { H. C. Javarayya	91
2. { K. Raghavachari	91
3. C. Ellappa Chetty	89
4. D. Panakala Rao	86
5. V. Ratnaji Rao	84
6. { L. Srinivasa Das	82
7. { A. S. Pandyan	82
8. Kunhi Sankaran Nair	81
9. N. V. Visvanatha Aiyar	79
10. K. Ramanujachari	75
11. Bhairy Siva Rao	74
12. K. R. Sankaranarayanan	72
13. P. S. Venkuswami	69
14. D. B. Sivarama Rao	65

Agricultural Chemistry.

Examiners. { F. G. Plyman, Esq., Agricultural Chemist, Central Provinces, Nagpur.
W. H. Harrison, Esq., M. Sc., Government Agricultural Chemist,
Madras, Coimbatore.

9 appeared and all passed.

Maximum 100 Marks.

* 1. K. Gopalakrishna Raju.	74	} I class.
2. K. Ramiah.	73½	
3. T. Paramanandam.	63	
4. M. U. Vellodi.	61	} II class.
5. { T. Budhavidheya Rao	59	
6. { P. S. Subramania Aiyar	59	
7. Badami Siva Rao	52	} III Class.
8. M. K. Sitaram	50	
9. Rajagopal, G. Mal.	49	

* K. Gopalakrishna Raju is eligible for the Keess Medal.

Mycology.

Examiners. { Dr. E. J. Butler, M.B., F.L.S., Imperial Mycologist, Pusa.
W. MacRae, Esq., M.A., B. Sc.,
Government Mycologist, Madras, Coimbatore.

9 appeared and all passed.

Maximum 100 Marks.

1. K. Ramiah.	73	} I Class.
2. T. Budhavidheya Rao.	71	
3. K. Gopalakrishna Raju.	60	} II Class.
4. M. U. Vellodi.	55	
5. T. Paramanandam.	52	} III Class.
6. P. S. Subramania Aiyar.	48	
7. Badami Siva Rao.	44	
8. { M. K. Sitaram.	42	
9. { Rajagopal G. Mal.	42	

Entomology.

Examiners. { L. C. Coleman Esq., M.A., Ph. D.
Mycologist & Entomologist, Mysore.
T. B. Fletcher Esq. R.N., F.Z.S., F.E.S.,
Government Entomologist, Madras, Coimbatore.

9 appeared and all passed.

Maximum 100 Marks.

1. K. Ramiah.	92	} I Class.
2. K. Gopalakrishna Raju.	84	
3. M. U. Vellodi.	79	
4. T. Budhavidheya Rao.	75	
5. M. K. Sitaram.	74	
6. T. Paramanandam.	70	} II Class.
7. Badami Siva Rao.	67	
8. P. S. Subramania Aiyar.	63	
9. Rajagopal G. Mal.	54	

The Economic Entomologist and his Work.

An Economic Entomologist is by many people deemed to be at fault if he does not confine his attention solely to such insects as are actually injurious or beneficial to the interests of man. Although this opinion is apparently quite reasonable, it is in reality rather erroneous—due to ignorance of actual conditions. It is, in fact, impossible for the Economic Entomologist to restrict himself solely to insects of economic importance. For, firstly, no sharp line of distinction can be drawn between injurious and non-injurious insects; while a certain insect may be very destructive to crops, its nearest cousins—species of the same genus—may be absolutely harmless. Secondly, some of the most serious pests are normally harmless insects feeding on wild plants and, only under favorable conditions, increase enormously and prove ruinous to crops. As an instance may be cited the rice swarming caterpillar (*Spodoptera mauritia*), which normally breeds on grasses but occasionally appears in such large numbers on paddy that whole areas may be wiped off. Thirdly, the same insect may be harmless in one country but extremely harmful in another, as exemplified by the destructive cotton Bollworm (*Chloridea obsoleta*) of America which—perhaps owing to climatic or other conditions—does not attack cotton in India. And fourthly an insect which, by nature, is harmless may, under stress of starvation or other similar causes, suddenly develop destructive habits, as instanced by the case of the blue Coffee Fly recently noted in South Canara.

The blue-bottle or the green-bottle flies (called *Bandcecha* in Malayalam) are common insects—perhaps quite familiar to the reader. They may generally be found hovering about fresh dung—especially about human ordure. Usually, they breed on decaying animal matter (and possibly on dung as well), large numbers of eggs being laid in masses by the female fly on decaying meat, and the maggots on hatching feed on the juices of the decaying flesh and transform eventually into flies. Under normal conditions these flies are not very numerous—having to depend for their increase on the presence of dead animals and offal of the shambles. In South Canara (and Malabar probably) the normal conditions have been in this respect upset by the enormous development of the fishing industry. From October to January huge hauls of the migratory sardines are obtained along the coast—much of which is dried in the sun to be sent as fish manure to coffee plantations up the Ghats. On account of the hugeness of the hauls, the fishermen find it very difficult to secure a proper and uniform drying of the whole quantity of fish caught; and if the weather happens to be raining or drizzly as is generally the case for some days in October and November in South Canara, the greater part putrefies. The blue-bottles breed plentifully in the abundant material thus provided and multiply. The flies subsist on a liquid diet and make themselves as comfortable on the slime of fresh dung or putrefying meat as on syrup or sweetmeats in the bazaar, or on cooked food in houses or on fresh drawn toddy. On account of the abnormal increase in their numbers, the food-supply along the coastal region is soon exhausted and the flies appear to migrate (helped perhaps by the wind) in search of food to the interior—reaching the very foot of the Ghats (50 miles in places from the sea). Here they seek palmyrah palms tapped for toddy and, gathering together in very large numbers on the spathes, drink away the juice as it slowly oozes out, so that during day-time toddy is not obtained. They also deposit droplets of excreta on the spathes as well as in the pots with the result that even the toddy that may be collected at night, while they are asleep, becomes discoloured and unfit for use. The flies may also follow the toddy pot to the shop and fall in numbers in the toddy if left exposed and plague the customers while drinking. These blue-bottles also seem to enter houses and contaminate food so that they form a regular nuisance at that part of the year. The

people reported that the pest has been appearing regularly during November-December for the past 4 or 5 years. By January the sardines gradually decrease in number and the weather becomes drier; and consequently the flies themselves disappear from the interior by the middle of January.

Here, then, is a case where, under favourable conditions, an insect—generally only an occasional visitant of exposed meat or food,—has evolved into a plague of the first magnitude not only occasioning considerable loss to the toddy-contractors but also endangering public health by contaminating both toddy and food. The Entomologist has thus to view insects not only on their present capacities of damage but also on their latent potentialities. Perhaps the reader will now realise the position of an Economic Entomologist and understand why it is necessary that the life histories and habits of all insects—irrespective of their economic significance—should be studied.

Y. RAMACHANDRA RAO.

The Rothampstead Experiment Station.

The history of the Rothampstead Farm may be shortly summarised as follows :—

Mr. afterwards, Sir John Bennett Lawes, was a squire of the county of Norfolk in England and came into possession of the Rothampstead Estate in 1834. As a result of the scientific training he had had in his early years, he took up, apparently in the beginnings the hobby of conducting experiments on the cultivation and growth of plants, first in pots and later in the field. Systematic experiments were begun, however, in 1843 when he secured the services of the eminent chemist, Dr. afterwards, Sir John Henry Gilbert, as the Director of the Experimental Station. The Station was maintained by Lawes out of his private resources but, in view of the national character of the work he was engaged in, a large voluntary donation was raised in 1855 and a public laboratory was erected and presented to him. This laboratory, the experimental areas and a sum of £100,000 were handed over by him in 1889 by a trust deed to a committee of management consisting of 9 members elected by the learned societies, like the Royal Society and the Chemical Society, etc. Both Lawes and Gilbert tackled several problems of Agricultural

Chemistry in all its branches and published several reports jointly. They worked long and laboriously in closest friendship which was only terminated by the death of Lawes in 1900 and of Gilbert in 1901. The single-mindedness with which the originator of this Experimental Station worked at it for more than three quarters of a century and the enormous amount of private resources which he sacrificed for the cause of applied science should fill the minds of all earnest advocates of agricultural reform in India with esteem and gratitude and, may we also add, emulation.

Dr. Hall was appointed Director of the Experimental Station in 1901 on the death of Sir John Gilbert. The science of Bacteriology as applied to agriculture is of recent growth and, consistent with the advance of scientific ideas, two eminent bacteriologists, Drs. Russell and Hutchinson, are now associated with Dr. Hall in the work of Soil Bacteriology.

Of the several subjects studied at Rothamstead, the question of manuring, both with nitrogenous and mineral fertilisers received great attention and we have, therefore, great pleasure in extracting elsewhere in full the learned discourse delivered by Dr. Hall at the Royal Institution last year on the *Fertility of the soil* under the heading of "Recent Advances in Agricultural Science."

Explosives in Agriculture.

Recently at the annual ploughing match and livestock show of the Rochester and Gravesend Agricultural Association, a series of demonstrations with explosives in clearing uncultivated land was given, which included the breaking up of tree stumps to show how effective apart the explosives play. The charges used for a stump of 7 or 8 feet in diameter, consisted of a central one of 10 lbs. and a fuse of 4 lbs. each, of gelignite, fired by electricity. The result was entirely successful, the great mass of wood being thrown clean out of the ground and broken in a way that made removal easy.

For purposes of tree planting a hole about 3 feet deep was made and a charge of 8 oz. of cheddite inserted, ignition being effected by an ordinary fuse. The explosion loosened the strong soil lying on chalk to a depth of 3 feet 6 inches and to about the same extent in diameter. It is claimed for the system that, besides saving labour and expediting work, it provides a better rooting area for trees. It has

been proved that fruit trees planted in this way have taken root more quickly and made more rapid growth than those planted in the usual manner. The cost of the operation is from 4½d. to 6d. a tree and one man can prepare for sixteen trees in an hour.

In the case of loosening the soil, experiments carried out on these lines proved very effective, 4oz. charges of gelignite were inserted into holes made with the crowbar 3 feet 6 inch deep at intervals of 10 feet. There was practically no impression upon the surface after the explosion; but the momentary effect was to raise the earth for a distance of 5 to 7 feet around the centre of concussion several inches above the ordinary level and, when dug, the subsoil was seen to be cracked and broken. It is believed that the effect will facilitate the spreading of the roots and plants, thereby encouraging growth and reducing the risk of injury from drought. The cost of the operation is estimated at £5-10-0 per acre but it would be required only once in twelve years.

T. B.

Notes.

His Excellency Lord Pentland, Governor of Madras, visited the Agricultural College, Coimbatore on 10th April 1913 and was shown round the College and Farm by the Director, Principal and staff. His Excellency was entertained at tea and left after over 3 hours' stay much pleased with what he saw.

The Commissioner of Agriculture inspected the Manganallur and Taliparamba Agricultural Stations in January and the Central Farm and the new sugarcane station in the beginning of February.

Rao Sahab M. R. Ry. Kannambra Raman Unni Valia Nayar Avergal of Malabar paid a visit to the College and Farm on 20th February 1913, in his official capacity as Honorary Visitor.

Mr. Vengail K. Krishnan Nayanar, another Honorary Visitor paid a visit on 29th March 1913 and also attended the Convocation.

The Director of Agriculture and the Departmental experts met in Conference in the middle of March to discuss the proposed two-years' and four-years' courses at the College, referred to by the Principal in

his Convocation address. The scheme, we understand, will be placed before the Board of Agriculture in India which is to meet at Coimbatore this year in December next, for final adoption.

The Silver Jubilee of His Highness the Rajah of Pudukotta came off on 22nd February last and a number of boons were announced by His Highness at the Durbar. Three of these boons will be of special interest to our readers. A sum of Rs. 10,000 was granted for starting Grain Banks. An Agricultural School will be started at the capital where instruction will be given by experts in up-to-date agricultural methods and scientific appliances. Two scholarships will be granted to commence with, to deserving students of the State to enable them to undergo a higher course of training in the Agricultural College at Coimbatore.

Our readers, especially the first two batches of students of the Coimbatore College, will be glad to hear that Mr. C. J. W. Shepperson, who was the first Principal of the Coimbatore College and who has consented to be an Honorary member of the Union is now farming on his own account in Canada, having purchased 320 acres of "prairie" land. Labour is very dear and as much machinery as possible is used. Mr. Shepperson himself has a power ploughing outfit, consisting of a traction engine and a set of six ploughs which could plough a strip 7 feet wide at a time. A disc harrow is attached behind the ploughs to pulverise the soil and, sometimes on stubble land, a drill is also attached so that the whole operation is done with the engine once going over it. The climate is very cold and the chief crops grown are wheat, barley and oats.

The Sugarcane Station. The work on seedling canes has been successfully continued. Although the arrowing season has been unusually bad this year, a great number of seedlings has been obtained. The suggestion made last year that the difficulty might lie more in dealing with the seedlings than in raising them has been abundantly justified and it is proposed only to grow on some 2,000 out of the 12,000 to 15,000 which have germinated. The new land at Chettypalayam has now been acquired and the field laboratory is rapidly approaching completion. Great water difficulties have been

experienced in the Botanic garden and it is hoped that the work will be rendered much easier at the new farm.

Mr. Vengail Kunhi Krishnan Nayanar writes to us giving particulars of 2 experiments which he conducted last year in his farm at Kuttoor, North Malabar. The first was in respect of economic transplantation with selected and non-selected local paddy, and the second was the drill method of sowing in single crop land as compared with broadcast system. With regard to the former, one-fourth local seed rate sown in nursery, with selected seeds of previous years has given $1\frac{1}{2}$ to $1\frac{3}{4}$ times the yield of the plot wherein full local seed rate and unselected seeds were used. In the latter experiment, Mr. Nayanar says that he has adopted the drill system for the last three years and has obtained not less than $1\frac{1}{2}$ times the ordinary outturn as net profit.

We are occasionally receiving from our readers enquiries regarding agricultural problems. While we have so far been able to comply with some of these requests ourselves, we would like to mention two facts, first that we are not experts in all branches of the work appertaining to agricultural progress and second that, even if we were, we would be unable to attend to these enquiries for want of time, especially when there are officers specially appointed for the purpose and who would only be too glad to answer the enquiries. The Department, exists for the public and the officers are willing to help them and it is the turn of the people to make full use of the opportunities given by the Department and its officers. Advice is given, soils are analysed, localities are inspected and insect pests and fungoid diseases are reported upon, all at no cost to the enquirer, while in other countries, the cultivators have to pay enormous fees for each of these kinds of work. The scientific reports and bulletins of the Madras Agricultural Stations detailing experiments done are sold at such small prices that we would request our readers to purchase these copies, at least those which refer to the localities where they are residing. These publications, along with the English and Vernacular leaflets which are given away gratis, can be obtained from the Departmental officers. In this connection we would invite the attention of our readers to the latest leaflet No. 2 of 1913, issued by the Government Entomologist. We would, however, be glad as usual to receive communications meant for publication regarding individual agricultural experiences.

In sects-pests. All crops are subject to attacks by insects, which, in spite of their small size, often do great damage merely through their large numbers. A drop of rain is a small thing by itself but, if many drops fall, the land may be flooded and great damage done. So it is with insects : one insect may eat only a few leaves in its whole lifetime but if innumerable insects attack a field, by their very numbers they may strip every leaf and spoil the crop. Every cultivator knows that insects often spoil his crops and must often have wished to know what to do to prevent this loss. Government have now appointed a Special officer whose business it is to study insects of all kinds, and especially those which do damage. All cultivators and landholders whose crops are seriously damaged or threatened with insect-pests, should write for advice to this officer. It is not always possible at present to suggest remedies for every kind of insect, but in many cases advice can be given or (in bad cases) a qualified man sent to investigate and help after seeing the local conditions. It is generally impossible to advise without seeing the insects concerned. It is useless for a cultivator to write and say " my paddy is attacked by insects ; please tell me what to do " ; at least a dozen different insects attack paddy, and it is impossible to tell which is meant or to advise what should be done without knowing what the particular insect is. Specimens of the insects doing (or supposed to be doing) the damage should be sent ; it can then be seen what insect is really doing the damage and appropriate measures can usually be suggested. Living specimens of the insects should be sent and they should be put into a tin or wooden box together with a little crumpled paper and sufficient dry leaves or stems of their food plant to serve as food on the journey, and sent by unregistered post. A hollow joint of bamboo plugged with a cork or wooden stopper, makes a suitable receptacle for sending specimens in, if no tin box is available ; but care must be taken that the stopper is secure. All parcels must have the name and address of the *Sender* clearly written on them, in addition to the address and must be accompanied with a letter giving as much information as possible about the insects about which advice is sought, the crop attacked, nature and extent of damage, when first noticed and whether noticed in former years, etc. All parcels and letters about insect-pests should be addressed to :— the Government Entomologist, Agricultural College, Coimbatore.

Soil Survey. Manurial requirements of different tracts of land are so varied, especially in the Madras Presidency, that a fairly detailed knowledge of the chemical analyses of these soils is absolutely necessary both for the conducting of experiments and for the giving of advice to the cultivators. A soil survey is thus a necessary *sine qua non* and a beginning was made last year with the Kistna soils. A more detailed work has been undertaken this year with the soils of the Tanjore delta samples having been collected at short distances and being analysed by an Assistant specially told off for the purpose. We await the results of the Tanjore Soil Survey with great interest.

Pati Manure Experiments. One of the most common practices adopted in the manuring of wet lands in Kistna delta for a long time has been the application of several cartloads of village site earth, called *pati mannu*. This manurial earth having been nearly exhausted, the attention of the Agricultural Department was drawn to this subject 4 years ago and a series of field experiments was conducted in a number of villages in the Kistna District for the last three years with a number of manurial mixtures called *pati mannu* substitutes. The experiments were quite successful and a demand has come up from the ryots for these manures which are now largely supplied from the Presidency Manure Works Ranipet. Similar experiments have been ordered by Government to be conducted on the right bank of the river, that is in the wetland taluqs of the Guntur District and a sum of Rs. 1,000 has been allotted for three years for the purpose. Suitable sites for the experiments are being selected by a Farm Manager who is placed on special duty by the Deputy Director of Agriculture, N. Division and one of the Assistants to the Agricultural Chemist has collected samples of *Pati mannu* in the locality for analysis. The work will be pushed on to the beginning of the Official year.

Results of experiments evolved at the Government Agricultural Stations may require to be slightly modified in details when the same practices are introduced in different classes of soil under different conditions of temperature and rainfall, that it is more or less essential for speedy and correct progress that the individual cultivators who adopt these methods should keep an accurate record of their work

both for their own future benefit and for the use of others who might be sceptic about following these new methods. In most cases, the individual ryots may evolve, for instance, out of these simply devised experiments whether a spacing of 6 inches or 9 inches, or the planting in singles or doubles, gives better yield in their own soils. In other cases, the Departmental officers may throw new suggestions in the light of the results of the ryots' own experiments. It is pleasing to note that Mr. Sampson, Deputy Director, Southern Division has published in Leaflet No. 1 of 1913 the ryots' own opinions as to what they have to say about single seedling planting of paddy. Twelve cultivators from the districts of Tinnevely, Tanjore, South Arcot and Malabar give facts and figures to show that single seedling planting has given a better yield than bunch planting.

Estate Notes.

A Scheme has been sanctioned at an estimate of about Rs. 5,000 and the work has already been commenced, for collecting the rain water which falls on the terrace of the College in 2 large masonry cisterns, one on the eastern side and the other on the western portion of the ground just outside the wings of the main building.

An Insectory for the breeding and study of insects is under construction in Field No. 27 at a cost of about Rs. 4,000 and is nearing completion.

The well in the farmyard has been walled round and a lot of addition has been made to the cattle-sheds for housing the increasing stock on the Farm.

There was a virulent outbreak of *Food and Mouth* disease affecting practically the whole herd of the Central Farm, some of the calves having succumbed to it. Of these was the Ayrshire heifer purchased last year. The disease has now died out.

Department.

Mr. R. C. Wood, Principal, goes home on combined leave for 6 months from about the end of April 1913 and Mr. H. C. Sampson, Deputy Director of Agriculture, Southern Division, has been appointed

to act as Principal and Mr. K. R. Ramasastrulu Naidu, Assistant Director, Southern Division, will act for Mr. Sampson.

Mr. W. McRae, Government Mycologist, goes home on 6 months' leave from the beginning of May 1913 and Mr. F. J. F. Shaw, B. Sc., A. R. C. S., F. L. S., Supernumerary Mycologist, Pusa will act for him.

Mr. G. R. Hilson, Deputy Director of Agriculture, Northern Division, has been granted privilege leave for one month and Mr. D. Ananda Rao, Assistant Director, has been appointed to act for him.

Mr. C. Tadulingam, Acting Chief Assistant to the Government Botanist has been granted furlough for 3 months from the beginning of April.

Mr. S. Raghunatha Rao, First Grade Farm Manager, on special duty, Nandyal, has availed himself of combined privilege leave and furlough for 2 years from March 1913, apparently with a view to retirement. He is one of the two Agricultural Inspectors who worked under Mr. Benson, still in service, the other being Mr. R. Ramaswami Aiyar, now at the College.

Messrs. K. T. Alwa, L. Ag. and K. P. Sundram Aiyar, L. Ag. who were appointed Assistant Farm Managers on probation, have been confirmed.

A number of ex-students, both of Saidapet and Coimbatore, have been appointed Assistant Farm Managers during the last quarter and posted to the following places :—

Mr. G. R. Venkatachellapathi, (Saidapet, D. A. 1906) who was Home Farm Superintendent, South Valluru is posted to Hagari, Mr. S. Anantarama Sastri (Saidapet, D. A. 1908) to Samalkota, Messrs. T. A. Krishna Aiyar, (Coimbatore, L. Ag. 1911) and A. Chinnathambi Pillai, (Coimbatore, L. Ag. 1911) to Koilpatti, and Mr. S. Narayaniah, Coimbatore L. Ag. 1912) to Palur.

Mr. V. S. Subramania Sastri, D. A. Assistant Farm Manager, on return from leave, is posted in the first instance to Coimbatore *vice* Mr. W. Raghavachari, D. A. on leave, and, on the latter's joining duty, is to proceed to Samalkota *vice* Mr. S. Anantarama Sastri granted leave without pay for 3 months.

The Students' Club.

Tennis Tournament :—

Mr. B. Dwaraknath, L. Ag. having won the Tennis Tournament Cup instituted by Mr. C. Wood, Principal, in three successive years, it became his private property. Mr. Dwaraknath, however, in his turn, presented a cup for competition between the Tennis Teams representative of the Colleges and High Schools of Coimbatore. As there were no entries from the other institutions, the cup was not presented to this year.

There was, however, a Tennis Competition—singles—amongst the students themselves of this College. There were 8 entries and A. Yesudan and H. C. Javarayya met in the finals with the result that the former won by 6-1 ; 6-2. The Students' Club awarded silver medals to the winner and the runner-up and the medals were presented by Mrs. W. H. Harrison on 24th March 1913.

Entertainments :—

The students had organised a number of social gatherings during the term, the residents of each hostel block being hosts in turn. The outgoing students were entertained in the last week by the Officers' Club. The Students' Club had an excellent entertainment again on the evening of the Convocation Day which was also signalled by a large bonfire lit on the maidan.

We wish the outgoing students every success in life and hope that they will continue to take an increased interest in the working of the Union.

Meetings :—

In response to the call made by the Principal and President of the Club advising students to read papers based on direct observation by them of special crops or of special methods of cultivation peculiar to isolated tracts, a number of students of the outgoing class III came forward with well written papers in the last month of the last term. Mr. N. V. Visvanatha Aiyar read a paper on some of the *peculiarities of paddy cultivation* in the Cochin State. Mr. Bhairy Siva Rao read a paper on the *cultivation of mango ginger*. Mr. H. C. Javarayya's paper on the recent agricultural tour of class III had to be given up for want of time and he had to give precedence to Mr. G. R. Hilson, Deputy Director of Agriculture, Northern Division who

delivered a lecture on *cotton work in Kurnool and Bellary*. The following are the salient points in the papers.

Mr. N. V. Visvanatha Aiyar divided the Cochin State, for the purposes of his paper, into 3 main divisions, the first resembling Coimbatore District, in the existence of tanks and channels, the rainfall here being the least, the second and middle one forming an undulating tract traversed by hills and dales and the third being seaboard tract having a net work of channels leading from the lagoon which joins the Arabian Sea at the Cochin harbour. The system of cultivation adopted in the first two tracts is similar to that followed in other places, except it may be the raising of *modan* paddy on the hill tops and slopes once in 2 or 3 years with little labour. The cultivation on the coast side presents two distinct features, well-known to the Cochin ryots but practically unknown in other parts. The *Kol* cultivation consists in raising paddy in the dry months in the lagoons from which water is pumped out from artificially bunded areas by the *chukrams* or Persian wheels, nowadays being replaced by power engines, the harvesting being finished before the S. W. monsoon brings the floods from the Ghats, small boats being used for gathering the corn from the submerging earheads. It is a question of fight against nature, the baling out of water being most vigorously pushed on at the harvest time. The other peculiar feature is the *Kaipad* cultivation which consists in raising a single crop paddy in the swamps between sandy ridges and in the shallow portions of the backwaters adjacent to the coconut plantations. The soil is saline and subject to influx of salt water, so that the cultivation is carried on during the S. W. monsoon. The land is enclosed by a bund to keep off salt water, and the earth dug up with thumba and arranged in heaps, a foot high and 5 ft. in circumference and the seed dibbled before the monsoon, the long duration variety of a coarse paddy, *Pokkali*, being sown. In the above two classes, no ploughing is given and no manures are applied, the smaller trampled fish left in the puddle after baling probably supplying the manurial ingredients.

Mr. Bhairy Siva Rao gave a detailed description of the cultivation of the *mango-ginger*, which, as its name implies, is a variety of ginger with the smell and fragrance of the mango. The methods of cultivation are almost similar to those of the cultivation of turmeric or ordinary ginger. The mango ginger was

once brought to the plains from the Parlakimedi hills and are now grown for pickles, in isolated places chiefly in arecanut topes in the Ganjam District. Mr. Bhairy Siva Rao will be glad to send rhizomes, with detailed instructions, for cultivation to any of our readers who may desire to introduce the crop, on sending him actual cost of the rhizomes and Railway fare. His address is :—Mr. Bhairy Siva Rao, L. Ag., Bhairy Village, Bhairisingapuram B. O., Calingapatnam Post, Ganjam District.

Mr. G. R. Hilson gave a brief resume of the work of the Agricultural Department in growing an improved strain of cotton, now called the Sirkar cotton, in the Bellary and Kurnool Districts with the help of the ryots in Cotton Seed Farms and in the distribution of the improved seed cotton to the ryots. The extent of this work will be gauged by the fact that in the 1st year 3,000 lb. of seed were distributed, in the 2nd year 18,000 lb., in the 3rd year 34,000 lb. and during the last and fourth year 70,000 lb. in Kurnool District alone.

Mr. Mangesha Rao who had experience of cotton work in both the Northern and Southern Divisions and Mr. J. Chelvaranga Raju who was one of those who initiated cotton seed farms in the Tinnevely District gave their experiences.

The Principal presided at all the above meetings and gave eloquent and valuable addresses each time. He drew the attention of the students at the last meeting to the fact that the greater the percentage of lint in the cotton the higher was its market value and the Farms have now succeeded in producing cottons with higher percentage of lint and, if any student succeeded in producing an average 30 per cent. of cotton where only 24 per cent. is now obtained, he will be considered a true friend of India.

Agricultural Tour :—

The Principal, accompanied by Mr. J. Chelvaranga Raju, Chief Assistant, took class III students on a tour in January last. Tenkasi, Koilpatti Farm, Periyar irrigated lands near Madura, Palur Farm, Nellikuppam factory and sugarcane plantations and Mr. Rangaraju's Farm at Guindy and Dairy at the Mount Road were amongst the important places visited.

Election of Office Bearers for 1913-14. A departure was made this year in electing the principal officers of the Students' Club for the

ensuing Session on the last day of this term, so that the various sections of the Club may be in working order as soon as the College reopens in June.

Mr. U. Vittal Rao was elected Captain.

„ M. U. Vellodi „ Games Secretary.

„ T. Paramanandam „ Literary Secretary.

Badami Siva Rao Class III representative.

N. R. Srinivasachari „ II

Co-operative and Agricultural Associations.

The Madura-Ramnad District Co-operative Conference was held at Madura on 20th March 1913 under the Presidency of the Hon'ble Mr. P. S. Sivaswami Aiyar, Member of Council. Agricultural Co-operation occupied the foremost place in the deliberations of the Conference, both in the President's address and in the Resolutions passed and discussions held. On this aspect of co-operation, Mr. Sivaswami Aiyar spoke as follows :—

“After co-operative credit, Co-operation in the matter of agriculture must undoubtedly be the next and I find, on going through the programme of work to be placed before this Conference, that a prominent place is given to the extension of co-operation in the field of agriculture, and I cannot conceive of any more useful form of co-operation or one more likely to be attended with permanent benefit to the people. Co-operation in agriculture has been found necessary even in European countries. On the continent of Europe the number of Co-operative Agricultural Societies is counted by thousands. In Ireland there are immense numbers of such societies. There is an awakening on the part of England to the needs of co-operation in the domain of agriculture. If it has been found necessary even in the countries of the west where holdings are fairly large in size and where the farmer comparatively commands more capital, how much more necessary is it in our country, where the system that obtains is the ryotwari system with its innumerable small holdings and peasant proprietors? The extent of our individual ryotwari holdings will, I imagine, be found to be very much less than the extent of peasant holdings in the countries of Europe, and with such small holdings, there is no surer remedy than co-operation and the only way by which ryots can improve their economic position and attain prosperity is by learning the use of combination among themselves. It must have an enormous effect morally as well as economically. The moral and intellectual effect of co-operation has been

abundantly made manifest even in the sphere of co-operative credit. But it is bound to be much greater in the field of co-operative agriculture or co-operative production. It is found to quicken the intelligence of the ryot to enable him to find out the conditions of the market where he has to obtain his necessities or dispose of his supply. It must enable him to find out the difference in the quality of things which he has obtained for carrying on his operations. It must stimulate him to produce a better quality of articles than he has hitherto produced, and it must in various other ways have a profound influence upon his character. Instead of looking upon his neighbours in the village with any feelings of jealousy or hatred, he will learn to look upon them as friends and partners. I have no doubt that the progress of co-operation will tend to put down the spirit of faction and quarrel and of all kinds of feuds in the village. I feel sure that, if co-operation be applied in a larger sphere and for a variety of purposes, the ryot will become a much more refined and useful being than he is. He will cease to find pleasure in litigation, will be able to devote all his time and all his energies in the improvement of his lands and to the promotion of the material prosperity of the country.

There is a very large scope for co-operation in the field of agriculture. To speak of one very profitable application of co-operation, an application which has already been carried out, I understand in this district, the ryot may be able to purchase manure for his lands at much cheaper rates; he may be able to purchase seed and cattle; he may be able to dispose of his produce at a time when the prices are high instead of being obliged to dispose of them when the prices are low for the purpose of meeting the revenue demand of the Government. The ryot may obtain an advance from the village agricultural association upon his grain for the purpose of meeting various pressing demands and await the rise of prices for the disposal of his produce. Then again, he may take advantage of co-operation for other purposes than mere agriculture. If a number of ryots can combine together and purchase sugar mills they may make sugar or jaggery, reduce the profits of the middlemen who intervene between the ryot and the consumer and transfer the difference to their own pockets. Again, take the case of dry lands in this district. I believe what the dry parts of Madura suffer from is want of water. It is not that the soil is by itself poor, but it is the lack of water facilities that prevent many a part of these districts from being properly irrigated or cultivated. If the ryots were to combine together for the purpose of buying Oil Engines and irrigating their lands by means of water drawn from wells by oil engines there is no practical limit to the extension of cultivation and to the growth of more valuable products. Then again, take the case of a ryot who owns a plantation of cocoanut trees. At present he simply sells the cocoanuts. But if he can add coir making as a

cottage industry, he can make a sensible addition to his earnings. A number of industries may be added to the occupation of the ryots and he may earn a much larger amount of money than he has hitherto been able to earn by his customary occupation. As to the exact form which the societies for these various purposes should take, whether they should be started with unlimited liability or with limited liability and share capital, all those are matters into which I do not desire to enter. They are matters which I have no doubt you will be able to solve with the help and the advice of the Registrar and of those gentlemen who have taken an interest in this movement and have studied the question closely. But at the same time I tell you that these are the various directions in which co-operation may profitably be extended and it is not a day too soon that the organisers of this Conference have thought of starting Co-operative Societies for the purpose of encouraging agriculture."

The following *resolutions* were also passed.

That this Conference is of opinion that the need for advice and assistance in the matter of developing agricultural co-operation is generally felt in the districts of Madura and Ramnad and recommends that a District Co-operative Agricultural Association in which the subjects shall be the following be started, with its headquarters at Madura :—(1) to establish Agricultural Co-operative Societies throughout the districts of Madura and Ramnad, (2) to purchase for the use of members and share holding societies all agricultural requisites, (3) to secure the best market for the sale of produce, (4) to buy or hire pedigree bulls for the use of the members and societies, (5) to arrange for all kinds of Agricultural instance, (6) to arrange for the holding of Agricultural Conferences, Exhibitions and Shows at various centres in the two districts, (7) to disseminate a knowledge of the latest improvements in Agriculture by means of leaflets, touring, lectures etc., (8) to act as a medium of communication between members and the Department of Agriculture in all matters relating to agriculture and applied industries, (9) and such other objects as may be conducive to agricultural development and prosperity.

Resolution No. 2. That a committee consisting of 20 persons be formed for carrying out the objects of the 1st Resolution.

Resolution No. 3. That, in the opinion of this Conference, the Co-operative Societies in the districts of Madura and Ramnad do interest themselves in the spread of Elementary education and for this purpose request the authorities to open primary schools wherever necessary with *instruction in elementary agriculture as an integral part of the curriculum* and render all assistance in the matter of inducing children to attend schools and offer such other help as may be possible and that Elementary school teachers should be made to undergo a course of training in experimental farms for such a period as, in the opinion of

the Director of Agriculture, may be necessary for their acquiring a practical knowledge of agriculture and use of agricultural implements.

The first Resolution is so far-reaching and difficult to carry out, at any rate, for some time to come, that it was so pointed out at the meeting by Mr. H. C. Sampson who was present. The Resolution was carried, however, and we only hope that the public men of Madura will be as enthusiastic in taking practical steps to bring about the objects covered by the Resolution as they have been in passing it.

Agricultural Association, Tiruvallur. The Annual meeting of the Vibert Agricultural Association was held at Tiruvallur, Chingleput District on 22nd February with the Hon'ble Mr. A. Butterworth, I. C. S., Commissioner of Agriculture, as chairman. Messrs. D. T. Chadwick, I. C. S., Director of Agriculture, J. R. Ranga Raju, Editor of the Agriculturist and J. M. Venkataperumal Raju, Vice President of the Association delivered addresses, prominent mention being given to the experiments conducted successfully on single seedling transplantation of paddy. Mr. Chadwick spoke on the desirability of raising ragi in ridges and furrows instead of in beds and promised the help of the Department in the matter of sugarcane mills and furnaces and advised the ryots and Revenue officers to send diseased specimens to the Government Entomologist and the Mycologist. The Hon'ble Mr. Butterworth complimented the Association on its work and said that he was until then of opinion that District and Taluk Agricultural Association were not doing any useful work but was agreeably surprised to see one working on correct lines.

The Kumbakonam Agricultural Association held its annual meeting, under the presidency of Mr. F. G. Moscardi, I. C. S. in the month of March 1918. Mr. H. C. Sampson, Deputy Director of Agriculture, Southern Division, referred to the good work done in the District by Mr. C. Narayana Aiyar who has since been transferred to the Entomologist's section and stated that Mr. K. Sankara Aiyar who had considerable experience in the Tinnevely District and who is now the Farm Manager at Manganallur will be able to continue the work equally well. Reference was made by the President at the meeting to the closing of the Farm attached to the Kumbakonam Agricultural Association for some years but, as a set off against this, the enthusias-

tic secretary, Mr. C. R. Lakshmivaraha Aiyangar had induced a number of Mirasdars to undertake simple experiments in small areas on their own estates.

Another *Co-operative Agricultural Society* has been registered in Tinnevely, the objects being (1) the co-operative purchase of seed, manure and implements for sale or distribution to members and other Co-operative Societies; (2) to borrow money for being utilised as loans to members for agricultural purposes contemplated in these by-laws; (3) to disseminate information on agricultural matters; and (4) to maintain a Farm or to employ one trained in agriculture to give advice to members of the Society and other agriculturists on such conditions as the Committee may decide.

Reviews.

Departmental Reports.

Madras. The Madras Agricultural Department was under the control of Mr. M. E. Couchman, I.C.S., now Collector of South Canara, from the time of its reorganisation in 1907 until he went on leave in August 1911. The work done during this period was summarised by Government in the Annual Report of 1911 in the following terms:—"In many directions, and notably in the introduction of improved cotton staples, in the establishment of disease-resisting species in sugarcane, in the demonstration of the single-planting method of paddy cultivation and in the operations to check and eradicate the palmyra tree disease, the reorganised Agricultural Department has already achieved results which more than fulfil the hopes with which the reorganisation was undertaken. During most of this period, the Department has been under the direction of Mr. M. E. Couchman, I. C. S. who has just severed his connection with it and the Government have pleasure in recognising the considerable share which Mr. Couchman's intelligent and sympathetic administration has had in eliciting the valuable results produced by the experts under his control." The policy of the working of the several sections under his control had to be evolved by him and he had done it in a sympathetic and thorough manner which he was able to do so well, on account of the knowledge of Agriculture which he possessed on one side and his intimate acquaintance with

the ryot classes in his previous capacity as a Settlement Officer on the other. From the very inception, the Madras Agricultural Students' Union received considerable encouragement and help from him. Another Settlement Officer, Mr. G. A. D. Stuart, I. C. S., acted as Director for about a year when, after about three months' interval during which time Mr. H. C. Sampson acted as Director, a third Settlement Officer, Mr. D. T. Chadwick, I. C. S. has been permanently appointed to control the destinies of the rising Department. Settlement Officers come into contact with all sorts and conditions of the ryot classes during their Settlement work and the special training they have had in Agriculture enables them to direct and popularise the operations of the Department and to collaborate the work of the various experts without hitch. Both the regimes of Messrs. Couchman and Stuart were marked with real interest in the welfare of the ryots and, with the limited trained staff at their disposal, they had largely succeeded in their efforts to popularise the work of the Department. In one respect especially they were both perfectly agreed, namely in the constitution of the Agricultural Associations and in the possibilities of the work they were capable of doing—a view which was also unanimously arrived at by the Special Committee appointed by the Board of Agriculture in India to enquire into the working of these Associations.

During last year two bulletins and 24 leaflets were published and distributed on a variety of subjects. In the work done on cotton improvements effected largely by an increased establishment of seed farms, the distribution of seeds for green manuring and the expansion of areas under single seed-planting of paddy, the Department may congratulate itself on having done some really useful work. It is worthy of note that improvements have been effected more largely in places where the work was concentrated, *e. g.*, cotton work in Tinnevely and Kurnool. Future success depends on such concentration extended over somewhat wider areas which will only be possible when more students pass out from Coimbatore. The work which these men have to do is difficult and more or less missionary in character and we are confident and hopeful that our young friends will realise how much the enrichment of the resources of the country depends on their hands and rise equal to the arduous duties they will be called upon to perform.

Bengal. The administrative changes consequent on the annulment of the Partition of Bengal resulted in the transference of the Agricultural College, Sabour with its staff to the Government of Bihar and Orissa while the Jute expert, the Agricultural Chemist and the Government Botanist formerly working in East Bengal and Assam have now been taken into the province of Bengal proper. Sabour College will be open to Bengal students and a staff of Divisional Agricultural Officers will form the medium of Communication between the people of East Bengal and Assam and the Bengal Agricultural Department. Jute—being the foremost industrial crop of the province, prominence is given to the experiments of the Jute Expert who has shown that jute is normally self fertilised and that improved varieties can be produced which are taller in stature and yield a superior quality of fibre. Another important industry of Bengal and Assam, practically unknown in the south, is sericulture and a new French expert has already succeeded in producing hybridised seed for supplying to the silkworm rearsers.

Bombay. One of the interesting experiments tried and found successful in the Bombay Presidency is the training given to young boys of the cultivating classes in the Vernacular Agricultural School at Poona. Another school is proposed to be opened this year. We, in Madras, should be glad to hear of a number of Vernacular Agricultural Schools being established in different parts of the country. Probably one may be attached to each of the Agricultural Stations. As a beginning it would be at least desirable to have one school each in the Tamil Districts, West Coast Districts, Northern Circars and the Ceded Districts. With regard to the remarks made by the Director of Agriculture, Bombay, that the men trained by Mr. Mollison, late Inspector General of Agriculture in India, are administrators and not scientific observers and that Indian graduates are incapable of doing any scientific work, all we can say is that such remarks are better left unwritten especially in a public report, as we do not consider any useful purpose is served by such remarks, however true they may be. No one knows more than the Indian staff of the Agricultural Department generally that, for want of facilities in early training, they lack in what may be broadly termed scientific observation and they look up to their experts for guidance and help and, as far as Madras is concerned, we can say that the help is cordially given and

the subordinates are anxious to learn. We do not write this in any criticising attitude but we wish to show, if possible, how the same object could be achieved—namely the infusing of a scientific spirit into Indian students—by an encouraging word, occasionally spoken.

REVIEWS.

We have received a copy of "The Cultivators Guide," published by Mr. R. L. Bannerji of the Bengal Agricultural Department. It is really a list of the common agricultural crops classified and tabulated with short notes regarding soil suitable, seed rate, times of sowing and harvesting and outturn, all these having reference to the conditions obtaining in Bengal.

We have received a copy of a lecture delivered at the last Mysore Dasara Exhibition by Mr. P. S. Govinda Rao, District Forest Officer, Tumkur and one of the old Saidapet students, on "Cycle relationship of animals, plants and soils as bearing on Agriculture." It is an ingeniously conceived paper showing, what every elementary student of Agricultural Chemistry knows, how animals, herbivorous or carnivorous, depend for their subsistence directly or indirectly upon plants which, in their turn, depend upon the constituents of the soil for their support and how these constituents removed by successive croppings are recouped by the decay of animal and vegetable matter.

EXTRACTS:—

*Recent Advances in Agricultural Science

The Fertility of the soil.

From an ordinary common sense point of view the fertility of the soil is best defined as that property for which a man pays rent—the property which causes some land to let for £ 2 or £ 3 an acre, whereas the adjoining land may be dear enough at 10s. With the causes of this fertility I do not propose to deal at any great length this evening more than to indicate that it is the outcome of a very complex series of factors, among which we can enumerate the actual plantfood in the soil, its mechanical texture as conditioning the movements of water, and the particular micro-fauna and flora inhabiting the soil, for upon these lower organisms depend the facility with which the material contained in the soil will become available for the nutrition of the plant. For the purpose of the

* A discourse delivered before the Royal Institution, May 24, 1912, by Dr. A. D. Hall, M. A., F. R. S., Director of Rothamstead Experiment Station.

present argument it will be sufficient to fix our attention upon the amount of *nitrogen* in the soil as the main factor determining fertility, because, in the first place, nitrogen is one of the necessary and most expensive elements in the nutrition of the plant, and, secondly, because its amount in the soil is subject to both gains and losses from causes which are more or less under the control of the farmer. The other essential elements which the plant has to draw from the soil—for example, phosphoric acid and potash—are only subject to slight losses by solution in the drainage water, and cannot be added to except deliberately by the action of the farmer; but in the case of nitrogen we have in addition to the small stock of combined nitrogen in the soil the vast store of free gaseous nitrogen with which both soil and plant are in contact. We may take it as settled nowadays that the plant itself can make no use of nitrogen gas, but must draw combined nitrogen in one of its simpler forms, such as nitrates or ammonia from the soil. Among the bacteria of the soil, however, there are two great groups, one of which is capable of breaking up compounds of nitrogen and setting free the element as gas, whereas the other can take free gaseous nitrogen from the atmosphere and bring it into a combined form. Which of these two groups will be more active depends upon the conditions prevailing in the soil, and goes far to determine both its current fertility and the length of time during which it will be capable of bearing crops.

The question of the duration of the fertility of the land under continual cropping has excited much attention of late, chiefly because the United States has begun to take alarm about the reduced production of some of its most fertile lands as, for instance, the old prairie lands of the middle west—a reduced production which, amongst other causes, has helped to set in motion a stream of emigrants from the United States to the newer lands of the Canadian North West. In the development of agriculture three distinct stages may be observed. In the first place, we may have a process of pure exploitation of the initial resources of the soil, when the farmer is to all intents and purposes mining in its fertility. This is the process which, in the main, has been going on in America, and, indeed, in all the newer countries which have been opened up to agriculture during the last two centuries. Not all virgin soils are rich, and the system of cropping alternately with wheat or maize which prevails over so much of North America has reduced great areas of the land in the eastern States to such a poverty stricken condition that it has been allowed to go derelict. In the great plains, however, where the first settler found four or five feet of black soil, containing nearly half per cent. of nitrogen, the land has kept up its productivity almost unimpaired for nearly a century. If we suppose the black soil only extended to a depth of three feet, and contained three-tenths per cent. of nitrogen, both limited estimates, there

would still be 30,000 lbs. of nitrogen per acre—that is to say, nitrogen enough for 500 crops larger than the American farmer has been accustomed to win from that land—and yet in less than a century such soils are beginning to show signs of exhaustion. The farming of the kind just described is destructive; but in the older lands of the West of Europe, which have been under cultivation for something like a century, a conservative system has been devised which is capable of keeping up the productive power of the soil, though not, perhaps to a very high pitch. Perhaps the best example of this may be seen in the Norfolk four-course rotation prior to the introduction of artificial fertilisers. In this system a turnip crop, which was either consumed on the ground or converted into manure and so returned to the soil was followed by barley in which clover was sown, and the clover, which also got back to the soil, was followed by wheat. The farming covenants prevented the sale of anything more than barley and wheat grain, and the meat that was produced by the consumption of the turnips and hay. Thus but a small proportion of the nitrogen taken out of the soil by the crop left the farm; the rest was returned and used over again, although considerable losses of gaseous nitrogen occurred during the making of the dung. Both losses however were more than replaced by the nitrogen which the clover crop gathered from the atmosphere during its growth. At any rate, we find that under such a conservative system of farming the productivity of the land remained pretty constant at about a level of twenty bushels to the acre from the time of Queen Elizabeth down to the beginning of the nineteenth-century. This conservative farming about 1840 began to give place to the third stage in the development—intensive farming, rendered possible by the discovery of artificial fertilisers and the cheap freights which brought foreign fertility in the shape of cheap feeding stuffs to the soil of this country. By these means the average production of the land of the British Isles has been raised from the twenty-bushel level to something over thirty bushels, and the most intensive farmers reach an average level at least 25 per cent higher. In their case the soil has become practically a manufacturing medium transforming the nitrogen and the other fertilising materials added to it into crops, giving nothing to those crops from its original stock, and, indeed, up to a certain point gaining rather than losing fertility with each year's cultivation. The inner history of these three stages in agriculture may be followed by a consideration of certain experimental plots at Rothampstead (Table I). We may begin with the experimental wheatfield which is now carrying its 69th successive crop of wheat. One of the plots has been fell steadily for the first ten years, has since that time remained so constant that the slow falling off which we still believe to be taking place is disguised

by the fluctuations due to season. The average yield is about 12 bushels to the acre, almost exactly the average yield of the wheat lands of the whole world. Unfortunately, samples of soil were not taken at the very outset, but if we begin with the earliest analyses that were available in 1865 and draw up a balance sheet for the nitrogen, we shall find that the removal in the crop is almost exactly balanced by the small amount that comes down in the rain and the decrease that has taken place in the amount of nitrogen in the soil. There are, however, other losses of nitrogen not brought into account; some is washed away by drainage water every year, and a further small unestimated amount gets removed as weeds. As these losses do not appear in the balance-sheet we must conclude that some recuperative action is at work keeping up the stock though the process is not sufficient wholly to make up for the removals in the crop. The results of this plot show two principles at work—the tendency of the land under an unchanging system of farming to reach a position of equilibrium when the only variations in the crop are those brought about by seasons; and, secondly, that regeneration of the nitrogen stock in the soil is possible by natural causes alone.

Table I.—*Experiments on wheat Broadbalk Field, Rothampstead.*

Average produce of grain, first 8 years (1844-51) and the successive 10-year periods (1852-1911).

Averages over.				Plot 2. Farmyard manure.	Plot 3. Unmanured.
				Bushels.	Bushels.
8 years, 1844—1851 ...	...	...	...	28.0 ...	17.2
10 years, 1852—1861 ...	...	...	...	34.2 ...	15.9
Do 1862—1871 ...	...	...	...	37.5 ...	14.5
Do 1872—1881 ...	...	...	...	28.7 ...	10.4
Do 1882—1891 ...	...	...	...	38.2 ...	12.6
Do 1892—1901 ...	...	...	...	39.2 ...	12.3
Do 1902—1911 ...	...	...	...	35.1 ...	10.9
60 years, 1852—1911 ...	...	...	...	35.5 ...	12.8

We may now turn to one of the other plots which receives an excess of farmyard manure each year, the manure supplying about 200 lbs. of nitrogen per acre, whereas the crop only takes away about 50 lbs (See Table II). Naturally the land in this case increased in fertility, but after twenty or thirty years, another position of equilibrium was attained at a level of about 36 bushels per acre, after which, despite the continued additions of manure, the crop again did not vary except as the result of exceptional favourable seasons.

If we now consider a similar balance sheet for this plot, we find that the additions of nitrogen are balanced neither by the removals in the crop nor by accumulation of nitrogen in the soil; indeed half of the nitrogen applied is unaccounted for. The soil has been getting no richer for the last twenty or thirty years, and the greater part of the nitrogen is wasted, doubtless because bacterial action sets the nitrogen free as gas. Here, then, we see another principle illustrated, that in very rich land the wasteful agencies are so speeded up as to prevent any continued accumulation of fertility out of the unused residues of the manures put on. Higher fertility means a higher level of waste, and this explains the rapidity with which the very rich virgin soils lose their fertility when they are put under arable cultivation. In the Rothamstead plot, the soil of which still contains less nitrogen than the less rich virgin soils of the prairies, three times as much nitrogen are wasted every year as is converted into crop, and the same on an even greater rate of wastage must attend the conversion of the rich virgin soils into land growing a succession of cereal crops.

Table II.—Broadbalk Wheatfield.

| Nitrogen in soil, lb. per acre.

In soil 1865	In soil 1904	Gain or Loss in 39 years	Added in manure	Added in rain	Removed in crop	Un- accounted for
<i>Plot 3—Unmanured.</i>						
2,850	2,290	— 560	—	150	600	— 110
<i>Plot 2—Farmyard manure.</i>						
4,470	4,970	+ 500	7,800	150	1,990	— 5,460

We may now turn to another plot on the same field to illustrate the recuperative actions of which I have spoken (see Table III). This is a part of the field that has been running wild since 1881, when the wheat it carried was not harvested but allowed to seed itself. A very few years sufficed to eliminate the wheat, which was unable to maintain itself against the competition of the weeds, and the land now carries a miscellaneous vegetable consisting mostly of grass. A soil sample was taken at starting, and when compared with another sample taken twenty-three years later showed that in the interval the land had gained nitrogen at the enormous rate of 92 lbs. per acre per annum. Making every allowance for possible errors in sampling and analysis, the accumulation of nitrogen is in

marked contrast to its steady depletion in the equally unmanured arable land alongside. Now the difference between the two plots lies in the fact that on the land running wild the vegetation is never removed, but allowed to die down naturally. Hence not only is the nitrogen taken out by the crop returned to the soil, but also a large stock of carbonaceous matter assimilated from the atmosphere, and carbonaceous matter furnishes a bacterium present in the soil, *Azotobacter Chroococcum*, with the source of energy which will enable it to fix the atmospheric nitrogen. *Azotobacter* is equally present in the soil of the unmanured wheat plot; but as there the crop is removed, and only a little root and stubble left behind, there is but little carbonaceous matter for the *azotobacter* to work upon, and a correspondingly small fixation of nitrogen, sufficient only, as we have seen, to repair the casual losses by drainage and weeding. This plot gives us a clue to the source of the vast accumulations of nitrogen in the old prairie soils. Vegetation alone, however long continued, cannot increase the stock of nitrogen in the soil; there is only a circulation of the initial stock removed by the plants, and then put back when the plant dies *in situ*. But if the conditions are also favourable to the development of the *azotobacter*, this organism derives from the carbonaceous part of the plant-residues the energy it requires for the fixation of nitrogen, and a steady addition to the original stock goes on. We have found *Azotobacter* present in all these rich black soils, from both South and North America, the Russian steppes, and similar virgin land in all parts of the world, and again we also find an abundance of lime, one of the other necessary factors for the growth of *Azotobacter*. Virgin soils are not necessarily rich; there are miserably poor ones, though they have equally carried some sort of vegetation for hundreds, indeed thousands, of years. They have remained poor because some of the other factors upon which depend the development of the *Azotobacter* are lacking. With this far-reaching conclusion in sight, we have naturally tried at Rothamstead whether we could not bring about a similar heaping up of nitrogen in the soil by simply adding to it a carbohydrate containing no nitrogen, such as starch or sugar. In pots, the experiment is perfectly successful, and accordingly we selected one of the plots in the barley field which was in a very nitrogen-starved condition, because it had been manured for fifty years only with mineral fertilisers containing no nitrogen, and treated half the plot with sugar at the rate of a ton to the acre, the other treatment of the two halves of the plot being alike. (See Table IV.) To our surprise, the half receiving sugar gave a miserable crop, much below the non-sugar half, for four years in succession, and bacteriological examination of the soil showed that *Azotobacter* had not increased in response to the sugar, but that the number of merely putrefactive organisms had gone up greatly. These facts led Dr. Hutchinson to surmise that we had been putting on the sugar at the wrong

time of year, in early spring or winter, some time before the barley was sown, when the soil is cold. Now *Azotobacter* is comparatively inactive at low temperatures, and the sugar was probably being wholly taken up by the *Streptothrix* etc., which are less affected by cold. As these organisms must also contain nitrogen, they were robbing the barley of the small stock available in the soil, and so bringing about the observed reduction of crop. A change was accordingly made in the time of application of the sugar, which was put on as soon as the barley had been harvested when the soil still retained its summer heat, and the change was immediately followed by an increase in the succeeding barley crops, as compared with the non-sugar plots, that was as marked as the deficiency had been previously. This illustrates the many pitfalls which attend investigations in agricultural science. Under laboratory conditions one can define the issue sharply, but as soon as the experiments are extended to the open ground and living plant, so many extraneous and unsuspected factors come into play, that what is popularly called a conflict between theory and practice often becomes apparent.

Table III.—*Broadbalk Field, Rothamstead.*

Land allowed to run wild. Nitrogen in soil, lbs. per acre,

Broadbalk.	In soil 27 inches		Added by rain	Gain in soil per annum
	1881	1901		
	5910	6110	90	92

Table IV.—*Hoosfield Barley.*
Effects of Sugar or Starch on the amount of Produce.
Plot 4 O Complete Minerals.

Year.	Sugar (or Starch) applied.	Total Produce of Barley lbs.	
		Without Sugar	With Sugar.
1906	Spring	2485	(a)
1907 (b)	Spring	3578	3249
1908	Spring	1820	1401
1909	Spring	2563	2261
1910	Autumn	2082	2502
1911	Autumn	1244	1915

(a) very small crop, not weighed.

(b) starch applied instead of Sugar in 1907.

We may now take a more complex example from the Rothamstead plots to illustrate what I have called the conservative system of farming (see Table V.) One of the fields is farmed on a four-course rotation of turnips, barley, clover, wheat, but over half the field the clover is replaced by a year's bare fallow. Further, if we confine our attention to the one plot which never gets any nitrogen, but only mineral fertilisers, it is again divided at right angles into plots from which the turnip crop is wholly removed, and others on which it is returned, as so often occurs in practice when the turnips are eaten off *in situ* by sheep.

Table V.—*Nitrogen per cent. in soil of Agdell Field, Rothamstead.*

The plots receive other Mineral Manures, but no Nitrogen.

Year	Fallow		Clover	
	Roots carted off, 13/14	Roots returned, 9/10.	Roots carted off, 15/16	Roots returned, 11/12
1867	0.1224	0.1240	0.1327	0.1380
1874	0.1147	0.1238	0.1241	0.1321
1883	0.1161	0.1228	0.1329	0.1383
1909	0.1159	0.1195	0.1347	0.1498

Average, 1852-1903

Crop				
Wheat	31.2 bush.	32.2 bush.	32.2 bush.	35.1 bush.
Clover			41.0 cwt.	47.7 cwt.
Swedes	151 cwt.	268 cwt.	160 cwt.	187 cwt.
Barley	22.1 bush.	28.7 bush.	24.5 bush.	34.5 bush.

Table V shows the average yield on these plots and also the changes in the nitrogen content of the soil at different dates. There are two possible recuperative actions to make up for the crops removed—the *Azotobacter* working upon the carbonaceous matter returned in the turnip crop, and the growth of the clover, for that crop, as we know, gathers nitrogen from the atmosphere by means of the organisms living in the nodules upon its roots. When neither clover is grown nor are the roots put back, the soil is slowly losing nitrogen; when

either occurs singly, a fair production is maintained without loss of soil nitrogen; when both take place during the rotation, the average removals from the soil become as high as thirty five bushels per acre of wheat, thirty-four of barley, and more than 2 tons of clover hay, yet the soil is, if anything, gaining rather than losing in fertility, though no extraneous nitrogen is being introduced.

Thus we see that we can maintain indefinitely a production of over four quarters per acre of wheat, and their equivalent in other crops, by natural agencies alone without recourse to external supplies of nitrogen, provided we repair the small annual losses of phosphoric acid and potash, which of course cannot be regenerated from the atmosphere. But such level of production, though equal to the average of the British Isles, is below that which a modern intensive farmer must attain, and the lesson that we have to bear in mind is that at a higher level, say, that of five quarters of wheat, the wasteful actions of which we have spoken are increased out of all proportion. Hence we have to add as manurial nitrogen not merely the difference between that contained in the extra quarter of wheat, but four to five times that amount to repair the waste, and so on to an even greater extent if we still further raise the fertility and the production.

The essential wastefulness of highly intensive agriculture such as must be forced upon the race as the new countries will fill up is a serious question, but the prospect of reducing the waste is not entirely hopeless. The losses, as we have seen, are due to bacteria, which attack the nitrogen compounds with liberation of nitrogen gas, the particular bacteria doing this being most active in soils rich in organic matter, until at Rothampstead we only recover in the wheat crop about one quarter of the nitrogen applied in the heavy dressing of farmyard manure. The problem before us is to bring the soil bacteria under control, and we already begin to see in various ways that such control is not impossible. For example, the researches of Drs. Russel and Hutchinson at Rothampstead have already proved that in one simple way we can so re-arrange the micro fauna and flora of the soil as to obtain a much higher duty from the reserves of nitrogen therein contained.

It is too long a story to enter upon now. I can only briefly say that, by putting the soil through various processes of partial sterilisation, such as heating or treatment with antiseptics, like chloroform or toluene, we can eliminate certain organisms which keep in check the useful bacteria in the soil, i.e., the bacteria which break down the nitrogen compounds to the state of ammonia, a form assimilable by plants. Heating the soil to the temperature of boiling water for two hours will double its productivity, and such a process has been found to be commercially profitable in the case of greenhouse soils. The market growers of cucumbers and tomatoes make up an exceptionally rich soil of virgin

loam and stable manure, but in a few years such soil, while still enormously rich on analysis, becomes incapable of growing a profitable crop. The partial sterilisation processes of which I have been speaking restore and even enhance its fertility by eliminating the injurious organisms, and we learn from the detailed results that after such treatment a much larger percentage of the soil nitrogen, is recoverable in the crop than normally prevails in treated soil. At present the processes have not been extended to the open field, and progress is being made in that direction, and give some promise of a method by which ultimately the unseen fauna and flora of the soil will be domesticated, the useful races encouraged, and the noxious repressed, just as the larger flora and fauna have been reduced to our service since the days when primitive man first turned from hunting to agriculture.

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* AGRICULTURAL CO-OPERATION

BY H. C. SAMPSON, ESQ.

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Agricultural co-operation has been advocated by the Agricultural Department for sometime past as one of the main lines on which agricultural association should work, but beyond this it is quite new to the Madras Presidency, if not to India in general. It is therefore to other countries that we must look to see in what directions this has developed. Such development naturally varies with the natural resources of the country, but in the main there are three classes of co-operative societies: viz, (1) for purchase: (2) for sale and (3) for production. It is proposed to discuss the subject under these heads and to try and indicate on what lines agricultural co-operation might commence in Madras.

There is every evidence that there is need for agricultural co-operation in this country. With the expansion both of intensive and extensive cultivation local resources are often taxed to the uttermost to supply the needs of the farmer. Even now he is often dependent on outside resources:—i. e. outside his own neighbourhood, and as time goes on he will become more and more dependent on outside. This naturally leads to keener competition and a consequent rise in the price of the commodity required, and thus the farmer will have to protect himself by means of co-operation when effecting the sale of his produce, and in some cases he may even have to alter the style in which a particular commodity is placed on the market. There thus seems to be a scope for all these three classes of co-operation.

* Paper read at the Provincial Co-operative Conference at Madras on 21st December 1912.

Co-operative Societies for Purchase.

The most important items which the farmer has to purchase are:

1. Manures
2. Seed
3. Feeding stuffs for his cattle
4. Implements
5. Draught animals and livestock

Manure :—The question of the manure supply of this Presidency has become much more acute within recent years. High prices have not only encouraged farmers to spend money on manures in order to obtain increased yields, but it has also put much capital into the farmer's hands and large amounts of money have been spent in land improvement, such as in sinking wells, reclaiming lands for wet cultivation, all of which improvements mean a much greater demand for manure. High prices have again led to an expansion of dry cultivation which has in many places curtailed grazing areas, and has, as a natural consequence, curtailed the supply of cattle manure as well as of green leaf manure. As a result, much greater reliance is now placed on other sources: municipal manure, slaughter house manure, tannery refuse, poudrette &c., have now a considerable market value very much more so than a few years ago. In the Kistna Delta, one hears of how farmers even excavate the floors of their houses for old house site soil or patti-maunu. In South Arcot it is now a general practice to apply oil cake for ordinary wet land paddy; while in Tinnevely the use of neem-cake for the same purpose is now becoming common. Many ryots also, on the advice of the Agricultural Department, are now growing green-manure crops on their wet lands. Thus, it is evident on all sides there is a much keener demand for manure and surely even this alone seems to call for co-operation. Manure can be purchased in quantity at cheaper rates than it can in retail, and co-operation would mean a reduced expenditure to all concerned in their manure bill. For example, municipal manure is as a rule sold by auction, and since the quantity is much more than one man requires, it is usually purchased as a speculation by some contractor who often retails it out at a very handsome profit to himself. Surely a body of ryots, if they joined together, could effect such a purchase and would thus save all the middleman's charges. One case where certain members of a co-operative credit society joined together for this very purpose has already come to my notice, and this is the first case of any attempt at agricultural co-operation which I have come across.

In the purchase of oil-cakes, co-operation is very necessary. At present the ordinary merchant stocks cake, but has many risks to run; he has no means of

gauging the demand and it is natural, if the supply falls short of this, that his price will suddenly rise, while, in any case, his prices must be such as will cover the risk of short sales. With co-operation, not only would the middleman be done away with, but the association would know how much each member is prepared to buy and could then call for tenders. They could guarantee a pure article, since the agreement would stipulate that the bulk must be up to sample, and to ensure this, both could be analysed by the Agricultural Department free of charge. Oil-cake is an easy thing to adulterate, and I have had samples analysed which have contained more than 33% sand or mineral matter. Thus, at present, the farmer not only has to pay the local retail rate, but is very liable to be swindled with an adulterated article, and by co-operation he can protect himself from both of these. If this kind of purchase developed, it might be possible for several societies to be supplied by a central society who might very possibly arrange to have the cake powdered in a machine cake crusher. Breaking oil-cake entails a considerable amount of labour, and very often that labour is urgently wanted elsewhere.

In the same way, in the purchase of green-manure seeds, much might be done by co-operation. At present the work of purchasing and selling green manure seeds is mainly done by the Agricultural Department, but the work is considerably hampered by the Department not being able to forecast what the demand is likely to be. The work of collecting reliable seed in large quantities would require a large inferior staff and at present the Agricultural Department is very short-handed. It is thus considerably hampered and its scope in this direction is restricted. Co-operation would be a great advantage here not only to the society but also to the Agricultural Department. Joint orders, booked with the Department in ample time to arrange for the supply, would not only save money in freight, but would enable that to be purchased at a cheaper rate. In time, moreover, there is no reason why a society should not be able to arrange for their own supply, which they could probably do at a much cheaper rate than a Government Department.

The purchase of seed :—Although many farmers do carefully preserve their own seed supply from one year to another, there is a large proportion of the farmers of the country who have to buy each year, and for this purchase they are solely dependent on what the merchant in the bazaar gives them. Now, the seed question is nearly as important as the manure supply; for it is only with good seed that one can expect a good crop. That this is realised by many is shown by the numerous applications for seed of ordinary crops, which are received by the Agricultural Department. There is no reason why, by means of co-operation, a society should not be able to grow their own seed. The original improved stock might be yearly obtained from the Agricultural Department

and grown by the society on a field scale to supply their own requirements, and the balance could be sold at a profit as seed. The following extract from the annual administration report of the United Provinces shows that this method of co-operation is being successfully introduced into that Province.

Speaking of Co-operative Societies, it states :— ' These societies, as in other countries, are beginning to find the retailing of the good seed, while highly advantageous to its members, a profitable business to the society...In time, they should become self-supporting and maintain their own supplies of seed.'

Feeding Stuffs :—In the future there seems to be no doubt that the farmer will have to expend money on feeding stuffs for his cattle. The rapid rise in the price of cattle has already been followed by more careful feeding, and it is to the interest of the farmer to keep his animals in good condition in order that he can get the greatest return for the capital invested in them. Moreover, the price of agricultural labour is now rising, and it renders this all the more important, as the work which a man does when working with cattle is solely dependent on what these animals are capable of doing. This is not all: the manure of well-fed cattle is much more valuable than that of cattle fed on straw alone or dependent on grazing, and as the supply becomes less able to meet the demand in quantity, one of the ways of increasing it is by improving its quality.

Now, concentrated cattle foods often have to be imported from other tracts such as cotton seed, groundnut cake, bran, &c. and any one who has studied the local prices and seen the samples for sale will agree with me that very much could be saved both as regards quality and price by co-operative purchase.

Implements :—Up to the present time, the demand for improved implements is limited, but the farmer is beginning to find out that more efficiency is required in his implements to compensate for the higher rates which he has to pay for manure, draught cattle, feeding stuffs and agricultural labour. Unless one has seen the agriculture of other countries, one does not realise how extravagant the farmer in India is of his labour and motive power. When I first came to Madras, this is one of the points which struck me most, though I am afraid that I have now got so accustomed to this waste that I do not realise it to the same extent as formerly.

Take as an example the cotton soil plough. Here one man is required to guide the plough and one man for each pair of animals to urge them on. In South Africa labour is much more scarce and therefore more efficient use is made of it. A team of 16 bullocks requires two men and a boy to look after them, one man guiding the plough, one man armed with a long whip and a small boy to lead the front pair. Not only is labour saved but the bullocks work much better. The man with the whip has simply to call out

the name of any bullock which is lagging and occasionally has to use his whip, but the real stimulus is that the bullocks know that if they shirk their work the whip will come down on them; thus all pull together and the whip is very seldom used. Here in Madras, each man urges on his own pair of animals with the result that the animals seldom pull together and all feel the strain of work much more.

The country plough, although it can do good work if used often enough, entails a great waste of bullock power and labour. Anything from two to five ploughings are considered necessary to get dry land into a sufficient tilth for sowing a crop, while as good results could at any time be obtained by a single ploughing and cross ploughing with a mould-board plough suited to local conditions. Look at the saving in cattle power and labour. That this is not done in Madras is chiefly because the farmer has not yet conceived the idea that his implements should be any other than can be made locally at a trifling cost. He will often pay Rs. 150 to Rs. 250 for a pair of bullocks but grudges paying more than Rs. 1-8-0 or Rs. 2 for a plough. It is not only in ploughs, but in many other things that the farmer requires more efficient implements, such as implements for inter-cultivation, harvesting, winnowing &c. This demand is therefore bound sometime to come, and when it does, then Co-operative Societies could be most useful in stocking or becoming sub-agents for implements and spare parts, issued, if necessary, on security loan.

Supply of Cattle and Live Stock :—As cultivation extends and as it becomes more intensive, the individual farmer will, in the future, have to look to breeding his own cattle much more than he does at present. How many thousands of farmers are there at present who have to make the best they can out of old and worn out cattle, when they know full well that the food given to them could be much better utilised by younger animals. Young animals, however, cost a lot to buy, but one finds all over the Presidency that it is the petty ryot who can afford to and does rear the best cattle. Thus it comes to this that in the future there will be much more home-breeding of cattle than there is at present, mainly for the supply made by the breeding herd. Now the question of breeding is one which requires co-operation. One of the first principles of breeding is to see that the female stock are served by a good sire, and I expect that in the future it will be to Co-operative Societies that one will have to look for the maintenance of good breeding bulls. At the present time this may seem Utopian, but looking at the development of such a form of co-operation in other countries, it is by no means an improbability especially when in other ways farmers have already been taught the value of co-operation. Taking cattle as they are at present, a good yearling bull-calf can be purchased for Rs. 100; the feeding charges for such an animal for the next 18 months would prob-

bly be Rs. 90, by which time he would be ready to serve cows. He would probably be useful for this purpose for the next three years and would cost, say Rs. 60 a year to keep, after which he would, when sold, sell at say Rs. 200. Thus the cost of the animal with its keep, less the selling price, when sold would be Rs. 170; and during the three years of service; he would serve, say, 340 cows. Thus the cost of each service would come to only 8 annas which is not too much to pay for the prospect of getting a good calf and of gradually improving the breeding stock of a locality. Such Co-operative Societies for the purchase and maintenance of breeding bulls, stallions, &c. are very popular in many countries in Europe.

Co-operative Societies for Sale.

There is an English proverb which says that 'honesty is the best policy' and looking at the trade in commodities, especially the export trade, one sees time and again how India has lost one market after another owing to the adulteration of the commodity as it reaches the consumer. Now, although there are dishonest farmers, I think you will agree with me that, in the main, the farmer in this case is the innocent sufferer, and it is the middleman who is the culprit. I have been told on good authority that at one time there was a considerable export from Madras of silk cotton, but as this fetched a better price than ordinary country cotton, the latter was used for adulteration, with the result that foreign buyers were shy of buying Madras silk cotton and transferred their patronage to Java where they were more certain of getting what they paid for.

Take the case of groundnuts again. How is it that the bulk of the export trade is in nuts and not in the form of oil and oil cakes, and that thus a valuable industry has been lost to Madras? This was due mainly to the wholesale adulteration of the cake with sand and earth, which, since it was used as cattle food in the country of consumption, was naturally most unpopular. Importers therefore preferred to buy the nut and mill it themselves.

Take the case of Cambodia cotton at the present time in the extreme south. In the Tinnevely District, one sees excellent crops of pure Cambodia cotton; yet this very seldom reaches the consumer in this condition. The middleman, in order to make a greater profit, mixes this with country cotton or as happened last season, owing to the shortage of Tinnevely cotton, this was mixed with country cotton in order to fulfil forward contracts for the latter commodity. What has been the result? The mills are at the present time hardly able to buy either pure Tinnevely or pure Cambodia cotton, with the result that the mixture which will not take the dye evenly, was last year selling at a lower price than the ordinary country cotton, although the previous year, Cambodia cotton was selling at considerably above the price of Tinnevely's

Here again it is the farmer who suffers: he grows his crops pure, but suffers from the fall in price, due to the mixing done by the middlemen.

Take again the case of ghee. I need not mention to any of you that this is largely adulterated. Yet, from enquiries which I have been able to make, this is seldom done by the ryot. It is true that, since any quality of ghee sells nowadays, he is not so particular in its preparation, often leaving moisture in it which gives the ghee a bad smell; but if the demand for good ghee were to reach him and an adequate remuneration were given to him for a genuinely pure article, it is probable that the demand would be supplied.

Take again the question of the supply of fruits and vegetables to our large urban centres. If these could be sent direct from the grower to the sales agent in the town, there is no doubt that the farmer would obtain better prices, while the produce would be much fresher and cleaner than it is now when it has to go through the hot, dirty and dusty country shandy.

Surely these are cases which show the necessity of co-operation for sale. Why should not the farmer benefit by the higher prices paid for a pure commodity rather than suffer loss owing to the fall in the market rate due to subsequent adulteration and deterioration after he has sold? There seems to be no reason why such rural societies should not work in conjunction with urban supply co-operative associations.

Co-operative Societies for Production.

In other countries, one of the main lines of co-operative production is in the preparation of dairy produce and in Madras there are, as far as ghee is concerned, possibilities of working co-operative village dairies. This, however, largely depends on whether the purchasing public are prepared to pay for the genuine article or whether they are content to continue using the adulterated article about which so much complaint is heard. Recently I came across a village in the Chittoor District which mainly depends on the extraction of gingelly oil. The seed was purchased from several districts and was often brought from considerable distances, but the oil-mongers always realised the best market prices for their oil since this was known to be unadulterated; thus it is clear that there is a demand for a genuine article and that a higher price is paid for it.

In the matter of selling oil seeds, there seems to be considerable scope for co-operation. At the present time, the farmer sells his seed and has to buy back again oil cake for cattle and manure; i. e. he pays out from one pocket what he takes into the other. If, instead of selling the seed, only the oil was sold there would be a considerable saving. Co-operatively, purchased power oil mills seem to have some prospects in the future. Similarly rice mills, cane mills and possibly in the future, bone crushing mills.

Looking to the future, it seems possible that it will be from such agricultural co-operation that agricultural associations will arise.

The suggestions made above, if put into practice, require little expert agricultural knowledge. Most of it consists of purely business and commercial transactions; but it will, I believe, lead up to agricultural experiment for which the advice and assistance of the Agricultural Department will be sought, and it will be the means of bringing the Agricultural Department into direct touch with those who are anxious to effect agricultural improvement.

Notes.

Mr. Parnell, Botanist to the Bihar Indigo Planters' Association has been appointed Government Botanist in the place of Dr. C. A. Barber on other duty. Mr. and Mrs. Parnell are expected to arrive shortly.

Messrs. T. R. Venkusaami Rao, D. A., N. S. Kulandaisamy Pillai, D. A. and N. Sitaramaswamy Naidu, Assistant Farm Managers have been promoted to the grade of second grade Farm Managers.

Mr. K. T. Bhandari, Assistant Farm Manager on probation has been confirmed.

Mr. Mohammad Azzizzuddin Sahib, D. A. who was Fieldman in the Government Botanists' section and was in charge of the College Botanical Garden has been appointed Curator of the Gass Forest Museum, Coimbatore, on a salary of Rs. 60 rising to Rs. 90.

Messrs. S. L. D'Silva, J. Chelvaranga Raju, R. V. Subramania Aiyer, T. V. Narayana Rao, and M. R. Ramasami Sivan, Teaching Assistants of the College have all been granted privilege leave and will join duty just before the re-opening of the College.

APOLOGY.

This issue should have been published by the end of July 1918. An explanation is due to the subscribers for the delay of three months which has occurred.

In the first place, on the suggestion of several members, it was considered desirable to publish the whole of the Proceedings of the College Day and the Agricultural Conference in one issue, instead of in 2 or 3 issues as in last year. The College Day and Conference were held in the middle of July and it was not found possible to send in the whole of the matter, including the papers read, to the Press before the end of the month.

Secondly the Guardian Press where the Journal is printed is located at Madras. Messrs. G. C. Loganadham Brothers, the Proprietors of the Press, have been very considerate to us and have executed the work satisfactorily so far. They had agreed to deliver the Journals at Coimbatore within 15 days from the time the matter for printing was put into their hands. They should have done the work by the 15th of August. In the present case, however, they did not execute the printing within the stipulated time, explaining that, on account of an enormous quantity of work which they had already in hand, the work of the Agricultural Journal was delayed. The result was that a large amount of vexatious correspondence took place between us and the printers on one side, and between the subscribers and ourselves on the other. We are extremely sorry that, owing to the above cause which was beyond the control of ourselves and the other members of the Working Committee at Coimbatore, we have caused much annoyance to our subscribers.

Thirdly, as some of the matter was put in print in August, it was not possible to change the Press which was not, after all, easy in a mofussil station like Coimbatore.

The Committee of the Union wish to assure our subscribers that the usual causes for the delay—shortness of finance or of material—do not apply in the case of the Journal, as happily we have plenty of resources on one hand and contributions on the other.

The larger size of the present issue will, we venture to hope, go a little way in making amends for the delay.

Beginning with the 2nd volume, the Journal will be regularly published in future on the 1st day of January, April, July and October. The next issue will be sent to all the subscribers by V. P. P., unless they choose to send the amount of subscription (Rs. 1 0-0) by money order.

The Munagala Prize Essay

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

Paddy cultivation in the Madras Presidency—and the lines on which it could be improved with special reference to the locality from which the competitor is coming.

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

3. The competition is open to all the members of the Union.

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

5. The essays should be sent in so as to reach the General Secretary, not later than 31st March 1914, with a covering letter showing the full name and address. The essay itself should be subscribed *nom de plume*.

6. The essays will be valued by a committee of five judges composed as follows:

- i. The Director of Agriculture, Madras (*Chairman*.)
- ii. The Director of Agriculture, Travancore
- iii. The Principal of the Agricultural College, Coimbatore
- iv. The Deputy Director of Agriculture, Southern Division
- v. The Editor of the Journal of the Madras Agri. Students' Union.

7. The results of the judging will be announced in the July issue of the journal and the prize will be awarded at the Agricultural Conference in July 1914.

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

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

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

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



Madras Agricultural Students' Union Conference Group (1913).

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OF
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No. 4.

Third Agricultural Conference.

The Agricultural Conference organised by the Madras Agricultural Students' Union for the third time must be considered to have been a great success. The success was due to several causes, the presidents who conducted the proceedings, the papers read and the audience. The Hon'ble Sir Harold Stuart, Member of H. E. the Governor's Council and Mr. M. E. Couchman, I.C.S., who presided at the 1st and 2nd sessions respectively, brought to bear upon the deliberations of the Conference, their intimate knowledge of the working of the Department on one side and of the aspirations and possibilities of the agricultural students of the Madras Presidency on the other. Both the gentlemen were imbued with a sense of duty, occasioned by the high appointments they have held and are now holding, to do all they could to improve the agricultural practices of the country.

The papers read may be classified under three or four separate classes. Those by Messrs. G. Jogi Raju, K. T. Alwa and Vengail K. Krishnan Nayanar referred to the actual experiences they gained in farming after they left the College. The paper by Dr. Kunjan Pillai is a scientific one and is based upon knowledge possessed and experiments made by a distinguished scientist, a research scholar of Madras, England and Germany and at the

The Udder of the Cow and the diseases incident to it. Milk and its disorders.

Mammals, popularly known as suckling animals, are the highest of the vertebrate animals. They are so called because they are provided with mammary glands. (Latin, *mamma*—breast or udder) with the secretion of which, milk, the young animal is nourished for a longer or shorter time after birth. With the exception of a single order, the monotremata, which includes the Duck-bill and the spiny ant-eater of Australia, the mammals are all viviparous, that is, they bring their young ones alive. The foetus is nourished before birth from the blood system of the mother through a special development of the foetal membranes and the lining membrane of the womb, termed the placenta. In the order monotremata above referred to, the female lays large yolked eggs, which are hatched and the young ones are suckled.

Mammary glands belong to the class of skin glands like the sweat and sebaceous glands and have a certain similarity in structure to them. Theoretically speaking, mammary glands may be developed on any part of the skin, but as a matter of fact, they are limited to the ventral side of the body, a position best adapted for suckling the young.

As a rule, each mammary gland is provided with a teat, whose form and structure is not the same in all mammals. The glands are often situated in two nearly parallel rows along the ventral side of the thorax and abdomen, as in the carnivorous animals and pigs. In others they are restricted to the inguinal region or groin. This is the case in hoofed quadrupeds, whales &c. In others again the glands are confined to the thoracic region, as in sloths, elephants, bats, monkeys and man. In a few they are placed in the arm-pit, for example, the hyrax and the dendrohyrax, in which animals there are six teats, four in the groin and two in the arm-pit. The number of teats varies greatly. There may be only one pair or as many as eleven pairs. Generally, their

number has a certain correspondence to the number of young ones produced at one birth. Often supernumerary or accessory mammary glands and teats are seen. There are again indications in the foetus of a greater number of teats than that which occurs in the adult. Cases of this sort have been noticed even in the human foetus. Mammary glands are found both in the female and male. In the male, however, the mammary apparatus becomes absorbed, though frequently at birth and at puberty, milk is seen in the human male. Male goats and castrated sheep have been known to give milk.

The mammary gland has an elastic envelope. The substance of the gland is made up of small cells or vesicles clustered in groups around the lactiferous ducts. The lactiferous ducts run into each other to form a certain number of principal canals. These open into a reservoir or reservoirs (galactophorous sinuses) placed at the base of the teat. From each reservoir there springs a duct. The orifices of the ducts are very small and are seen beside each other at the free extremity of the teat. The extremity of the teat is provided with a ring of muscular fibres which prevents the passive flow of milk. The gland is supplied with blood by certain arteries. The blood, after the milk-producing materials have been removed from it, is removed by veins, some of which are deep seated while others are superficial. These last are popularly known as milk veins. The more prominent and bigger they are, the better milker the animal is considered to be.

Mammary glands secrete milk, which is intended for the nourishment of the young animal during the earlier months of its life. They are rudimentary in youth and become developed at puberty and assume their greatest development towards the end of gestation. They are most active after parturition and cease their function as well as diminish in volume when the period of lactation has been terminated. The secretion of the mammary glands is a complete food containing an albuminous matter called casein, milk sugar, various salts and a fatty matter in globules—the butter. The milk yielded for a short time—three to five days—after calving, is called colostrum and differs somewhat from the ordinary milk

It is of a rich yellow colour, thicker and of a higher specific gravity than the ordinary milk, slightly acid and contains large oil globules. It is on account of the presence of a large quantity of albumen that colostrum coagulates when boiled. Colostrum contains certain purgative principles, which serve the purpose of cleansing the intestines of the newly born young of its contents, the meconium.

The udder of the cow.—In the cow, the mammary glands are placed in the groin as in the mare. These are four glands, two on each side. The two lateral masses are placed close to, but are quite separate from, each other. Each is enclosed in a single fibrous capsule, and is composed of two distinct glands, each having its own teat. There are also not infrequently found, behind the four teats, one or two rudimentary ones. These are, as a rule, imperforate but sometimes they are not only perforate but even yield milk. In the centre of each gland and at the base of the teat there is a single large galactophorous sinus into which all the lactiferous ducts flow. The sinus opens externally through the teat by a single excretory canal. The two anterior teats are generally longer and larger than the two posterior and furnish more milk. As has been said above, at the extremity of the teat there is a sphincter which prevents the passive escape of the milk from the teat. If a small canula be inserted slightly beyond the orifice of the teat, the secretion immediately flows. When the end of a teat has been wounded, there is no longer any obstacle to the emission of the milk.

The diseases of the mammary glands in the cow.—In animals which are used as milk-producing machines, namely the cows and milch-goats, the diseases of the mammary glands are, as might be expected, of very frequent occurrence. The chief of these are briefly referred to below :—

(1) *Imperforate teats; blind teats* :—It sometimes happens that although the udder is otherwise well formed, one or more teats are found to be imperforate. This condition is discovered only when the animal first calves and begins to be milked. No milk flows from the teat, although the udder is swollen with milk. Examination

will show a little membrane closing the extremity of the teat. The membrane should be perforated with the end of a probe or a milk catheter.

(2) *Contraction of the sphincter* :—Sometimes the teat presents a distinct perforation but the milking is extremely difficult and even impossible. This is often due to the construction of the sphincter of the teat. Treatment is rather difficult. An operation may be necessary, which can be performed only by an experienced hand and which is not always attended with permanent good results. Forcible dilatation is far preferable. This may be effected by frequent passage of probes or siphons of gradually increasing size.

(3) *Structure of the teat* :—Inflammation of the lining membrane of the teat occurring as a complication of mammitis, sometimes results in stricture, that is, narrowing of the canal of the teat. Treat as in “contraction of sphincter.”

(4) *Sore teats* :—This occurs chiefly in the newly calved animals specially in those whose skin is very delicate. The cause is often rough manipulation of the organ by the calf. Ulcers form and assume a very sluggish character. In very bad cases the calf should be removed and fed by hand and the milk drawn off after lubricating the teats with oil. After each milking, dress the ulcers with glycerine of carbolic acid (carbolic acid 1 part, glycerine 12 parts).

(5) *Relaxation of the teat* :—This often results from the practice of allowing over-accumulation of milk whereby the sphincter becomes weakened. It gives rise to spontaneous flow of milk (Lactorrhoea). The sphincter in bad cases requires to be replaced by an elastic band, which compresses the teat enough to close the passage but not to strangle it.

(6) *Tumours on the teats* :—Little tumours or warty growths are sometimes seen on the teats. They interfere with milking and are liable to injury. They can be easily removed with the knife or by means of ligatures.

(7) *Obstructions in the teat* :—These are not rare. They are felt as nodules along the course of the duct during milking and

the flow of milk is more or less interfered with. They are either masses of curdled milk, or small tumours attached by narrow bases to the mucous membrane or lacteal calculi. These not only impede the free flow of milk but may tend to produce inflammation of the udder and must therefore be removed, if possible. When they cannot be removed, an attempt must be made to return them to the galactophorous sinus where they will often remain without causing inconvenience.

(8) *Fistula of the teat; milk fistula*:—Any disease or injury to the udder, specially during the period of lactation, may establish an opening between the milk sinus and the side of the teat. The milk, instead of passing through the teat, escapes in a jet at the side. This is a source of loss and is altogether an unpleasant condition. There is further danger of the udder becoming infected and inflamed. It is difficult to cure the fistula during the lactation period as the milk escapes constantly through the injured spot and prevents cicatrization. A teat syphon may be inserted into the teat and kept for some time and the fistula treated according to surgical principles. If this does not succeed, it is necessary to wait until the cow goes dry when, with little attention, the fistula may be readily cured.

(9) *Mammitis; inflammation of the udder*:—This is due to most diverse causes. Lactation itself is a predisposing cause, as the mammary glands are most active during this period and are therefore most liable to disease, the disease appearing immediately before or soon after calving. Foot-and-mouth disease and cowpox may cause mammitis. Death of the calf and the difficulty of milking the cow in consequence is also one of the causes. Mechanical injuries may produce inflammation, such as contusions, wounds, injuries in milking and suckling, &c. Among the most frequent causes must be included the imperfect removal of the milk and allowing the animal to remain too long without milking so as to ensure a full and tempting bag at the time of sale. Influence of cold and wet has also been ascribed as a cause of mammitis. There is reason to believe that there is a form of mammitis due to putrid or septic infection.

Mammitis is of the highest importance, not so much as affecting the life of the animal, but as affecting the yield of milk. The disease may be partial or complete. The quarters of the glands are separated from each other by dense fibrous septa so that there are four glands and one or more may be affected without the rest being involved. The affected gland is swollen, red, hot, painful and hard to the touch. There is generally high fever. The yield of milk is markedly decreased and the milk is curdled and often mixed with blood and pus. Sometimes, when efforts are made to milk the animal, a thin serous fluid is removed. The most favourable termination is what is known as resolution, where the acute symptoms gradually subside and the udder is restored to its original condition. Suppuration is of frequent occurrence and is denoted by stiffness of some part of the gland which pits on pressure. Abscesses form which may involve a very large part of the gland giving rise to sinuses and fistulae. In severe and acute cases, gangrene sets in and the affected parts of the glands slough away, the constitution being at the same time greatly disturbed. When the inflammation is less acute, what is called induration sets in, that is, the affected gland becomes hard, the milk secreting cells being blocked up with products of inflammation. In either of these cases, suppuration, gangrene or induration, the quarter is lost. Treatment must include both constitutional and local measures. A purgative dose should be administered and nitre given in drinking water. Milk must be removed at regular intervals, either by milking or by use of the teat syphon or by allowing the calf to suck freely and frequently. The udder must be fomented freely and a poultice applied to it containing belladonna or opium. The udder with the poultice must be supported by a wide bandage passed over the loins. If any abscesses form, they must be opened with a lancet immediately, otherwise the pus will burrow extensively and cause sinuses and fistulae. In cases of gangrene, the mortified parts should be excised, the strength of the patient being supported by proper food and stimulant tonics. In cases of induration, alkaline injection must be made through the teats and the udder constantly

milked. Stimulating applications such as iodine must be resorted to, so as to induce the absorption of the products of inflammation. Iodide of potassium may be administered internally.

(10) *Milk and its disorders* :—Agalaxia ; non-production of milk :—The principal causes of these are previous diseases of the glands such as atrophy or induration. It is sometimes due to the injection of certain plants which check the secretion of milk. Temporary suspension in the secretion may also result as a consequence of the removal of the calf from its mother. In cases of accidents and temporary suspension of milk, change of food is the first thing to be done. Caraway, cumin, ani-seed, coriander and sulphur may be mixed in equal parts and an ounce of the mixture given daily.

(11) *Lactorrhœa* :—This means constant flow of milk through the teat. See "relaxation of the teat" above.

(12) *Hypergalaxia* :—By this is meant prolonged lactation. Of course it is by no means a frequent condition but it is sometimes seen in very good milkers. It is hardly a diseased state but it may constitute a great strain on the system. When a cow is within a couple of months of calving and is still in milk, it is advisable to get her to go dry, so that the mammary glands may have rest and the new secretion of milk after calving may not be interfered with.

(13) *Changes in the quality of milk* :—Some of these are due to excess or deficiency of natural components while others are due to admixture of foreign matters such as blood, pus, specific discharges, bacteria etc. Some milk gives scarcely any cream, while in other cases the secretion of milk is scanty but very rich in butter.

Bluish watery milk is sometimes given by debilitated animals.

Some milk is known to clot immediately after being drawn from the udder. This is probably due to the action of some fermentation organisms.

Putrid milk is characterized by its smell and is probably the work of some other organisms.

Some milk, sometime after it is drawn, is known to become thick and viscous, and to give bad cream. This change is attributed to the action of various micro-organisms.

The milk is sometimes tinted red in consequence of hæmorrhage within the udder itself. If such milk is allowed to remain undisturbed, the blood corpuscles sink and deposit themselves at the bottom of the vessel.

Milk sometimes becomes red some hours after withdrawal. This is probably due to the growth of certain organisms.

The ordinary milk and cream is generally of a yellow colour but sometimes an intense yellow colour has been noticed in milk which is attributed to certain organisms.

Milk is known to turn sometimes bitter, sometime after it has been drawn. Certain organisms are supposed to produce this change.

The udder acts very much like the kidney as a natural channel for the elimination of certain principles such as the active principles contained in food and fodder, vegetable alkaloids, drugs of various kinds and poisons like nicotine. This peculiarity explains the influence of changes of diet on the composition of the milk, and the effect of the milk on the consumers. Certain diseases of the cattle are transmissible to man through the medium of milk, particularly tuberculosis, and foot-and-mouth disease.

S. L. D'Silva.

This Year's Celebrations.

In response to the invitation issued by the President of the Union and the members of the Working Committee, old students and visitors began to arrive on Friday, 11th July, and were received at the Railway Station by Mr. K. Krishnamurti Rao and a number of volunteers. A number of houses on the estate and several rooms in the hostel were placed at their disposal. Special arrangements were made for such of the guests as preferred to mess in the Hostel. Mr. T. Lakshmana Rao, as Captain, had organised a band of over 30 volunteers and was ably assisted by Mr. C. S. Madiah, as Lieutenant and Messrs. K. T. Bhandary, K. Jacob Cherian and Badami Siva Rao, as Serjeants, in looking after the comforts of guests, decorating the hall and making arrangements on the maidan. College Day Rosettes were worn by all old and present students and some of the visitors and the proceeds of the sale of these rosettes went a great way towards meeting the expenses of the ground arrangements.

The celebrations were spread this year over 4 days, from 11th to 14th July, and all were fully and usefully occupied. The Union Jack was floating on the college tower all the four days. The maidan was fenced round with iron wire and tastefully laid out and decorated with flags and tents were pitched therein for the comforts of European and Indian guests, for Indian ladies and for competitors.

Sports.

The sports may be said to have commenced on the afternoon of Wednesday, 9th instant, when a steeple chase was run, consisting of a cross country race of about 4 miles, running across ploughed black soils, water courses, tank beds, paddy lands and fields grown with crops. This was quite an exciting race appropriate to agricultural students. Preliminary heats were held in some of the events on Friday evening, 11th instant, Dr. C. A. Barber kindly acting as Judge.

Sports were resumed on Saturday afternoon in the presence of a large and distinguished gathering of European and Indian ladies and gentlemen of Coimbatore. A portion of the sports ground was marked off to accommodate students of other institutions and a half mile race was thrown open to them. The Police helped to keep out of the race course the large crowd of villagers from the surrounding villages to whom the college sports have now become an annual tamasha. Mr. and Mrs. Sampson were *at home* to the European guests and Rai Bahadur K. Rangachariar to the Indian guests. Messrs. F.R. Hemingway and E. H. Gadsden, Dr. C. A. Barber and Rev. E. E. Berry were kind enough to act as Judges, Messrs. F.L. Cowley Brown and M. Kannan as Timekeepers and Messrs. N.S. Ramaswami Aiyangar, K.R. Ramasastrulu Naidu and K. Krishnamurti Rao as Starters. The events were well contested and finished with a Tug of War for which there were 5 entries.

At the conclusion of the sports, Mrs. D. T. Chadwick presented the prizes to the prize winners. Mr. H. C. Sampson, Acting Principal, thanked Mrs. Chadwick for kindly distributing the prizes and all the guests for their kind attendance and a very pleasant evening was closed with three cheers for Mrs. Chadwick, called for by Mr. Ramaswami Sivan and vociferously responded to.

The following is the list of Prize Winners:—

A

Prize Winners.

(1) Hundred yards Race	...	{ 1 Rajagopal G. Mal. 2 N. R. Srinivasachari. 3 U. Vittal Rao
(2) Coolies' Race, Adults, Castemen [¼ mile].		{ 1 Perumal 2 Kumaran.
(3) Putting the Shot	...	{ 1 Rajagopal G. Mal. 2 K. Manga Raju.
(4) Coolies' Race, Adults, Pallars [¼ mile].		{ 1 Ulagan. 2 Maruthan.
(5) Long Jump	...	{ 1 N. R. Srinivasachari. 2 Rajagopal G. Mal. 3 U. Vittal Rao.

(6) Coolies' Race, Boys [220 yards]	...	1 Palani. 2 Rangaswami.
(7) Quarter Mile Race	...	1 Rajagopal G. Mal. 2 L. Narasimhachari. 3 C. Narasinga Raju.
(8) Greasy Pole [for Coolies]	...	1 Angan. 2 Marudan.
(9) Peons' Race [$\frac{1}{4}$ mile]	...	1 Kasturi. 2 Lingan. 3 Nanjappan
(10) Throwing the Cricket Ball	...	1 K. Adinarayana Rao. 2 B. Shinappa Tolar.
(11) School Children's Race, Boys, over 8 [100 yards].	...	1 Amir Jan. 2 R. Krishnamurti.
(12) High Jump	...	1 U. Vittal Rao. 2 M. Muthayya. 3 N. R. Srinivasachari.
(13) School Children's Race, Boys 6 to 8 [100 yards].	...	1 Tiruvengkataswami. 2 M. R. Venkataraman.
(14) " Boys below 6, [50 yards]...	...	1 P. S. Narayanaswami. 2 M. R. Krishnaswami.
(15) Hurdle Race	...	1 N. R. Srinivasachari. 2 Rajagopal G. Mal.
(16) School Children's Race, [100 yards] Girls above 8.	...	1 Venkalakshmi. 2 Seethammah.
(17) " Slow Bicycle Race, [open to staff, students and ex-students].	...	1 Kalle Sanjiva Rao. 2 K. R. Govindarajan.
(18) " School Children's Race, [100 yards], Girls 6 to 8.	...	1 S. Meenakshi. 2 P. S. Lakshmi.
(19) " " Girls below 6 [50 yards]...	...	1 Godavary. 2 Papammal.
(20) " Sack Race [75 yards]	...	1 N. R. Srinivasachari. 2 C. Narasinga Raju.
(21) " Half Mile Race [open only for students of other institutions]	...	1 Joshua David (L.M.H. School). 2 M. Anantan (Coimbatore College). 3 Hugh Wright (Stanes' School).
(22) " One Mile Race	...	1 K. Adinarayana Rao. 2 C. R. Srinivasan 3 L. Narasimhachari.
(23) " Obstacle Race	...	1 U. Vittal Rao. 2 C. Narasinga Raju. 3 V. Ramanathan.
(24) " Tug of War [open to staff, students and ex-students]	...	Old students and staff consisting of :— 1 S. L. D'Silva. 2 M. R. Ramaswami Sivan. 3 A. Ramanadha Aiyar 4 D. Appa Rao. 5 K. R. Ramasastrulu Naidu. 6 K. Sankara Aiyar. 7 C. S. Madiah. 8 T. N. V. Tirumalpad.
(25) " Steeple Chase	...	1 K. R. Govindarajan. 2 C. R. Srinivasan. 3 K. Adinarayana Rao.
(26) " Best Batsman in cricket during 1912-13.	...	M. Veeraragha Rao.
(27) " Championship Cup	...	Rajagopal G. Mal.

The prize for the best batsman in cricket during the last season was a silver medal presented by Mr. Isidore Saldanha, one of the old students of Coimbatore and a keen cricketeer. The championship cup is the rolling cup presented last year by Mr. Vengail K. Krishnan Nayanar, another old Coimbatore student. The cup was won a second time by Rajagopal G. Mal and a small silver cup was also presented to him, instead of the championship medal. The medals were made once again by Messrs. Barton and Sons, Bangalore and the prize articles were supplied by Messrs. Wrenn Bennett and Co., Madras and we are indebted to both these firms for the large discounts they allowed us in their bills.

The committee's thanks are gratefully rendered to all those who contributed towards the expenditure (acknowledged in detail in Appendix); to the gentlemen who kindly acted as Judges, Time-keepers and Starters; to the Principals and Head Masters of other educational institutions of Coimbatore for allowing their students to attend and take part in the sports; to the Principal, Forest College and the Superintending Engineer for the loan of their tents; to the Superintendent of Police for Police arrangements; to the Committee of the Students' Club, Farm Manager and Messrs. R. V. Subramania Aiyar and C. S. Madiah for ground arrangements; to Mrs. Ramaswami Sivan for making the rosettes; to Mr. and Mrs. H. C. Sampson and Raj Bahadur K. Rangachariar for having been *at home* to the guests; and lastly to all the guests for their kind presence.

Agricultural Conference.

The third Agricultural Conference was held in 2 sessions, the first being presided over by the Hon'ble Sir Harold Stuart on Saturday, 12th July 1913 and the second by Mr. M. E. Couchman on Monday, 14th July. A group photograph was taken of the members of the Union together with the Presidents of the Conference on Saturday morning. The big lecture hall upstairs had been specially arranged and decorated for the sittings of the Conference.

First Session.

President :—The Hon'ble Sir Harold Stuart, I. C. S., C. S. I., K. C. V. O., Member of H. E. the Governor's Council.

There were also present Messrs. M. E. Couchman and F. R. Hemingway, Mr. and Mrs. D. T. Chadwick, Mr. H. C. Sampson, the Hon'ble Dewan Bahadur L. D. Swamikannu Pillai, Rajah Vasudeva Rajah of Kollengode, Dewan Bahadur M. Adinarayanayya, Mr. N. Pattabhirama Rao, Rao Bahadur T. S. Balakrishna Aiyar, Rao Bahadur A. T. Tiruvengataswami Mudaliar, Rao Bahadur C. Hanumanta Gowd, Dr. C. A. Barber, Rai Bahadur K. Rangachariar, Messrs. K. Srinivasa Rao, M. Sambandam Mudaliar, K. R. Ramasastrulu Naidu, T. A. Ramalingam Chettiar, P. Subbaraya Aiyar, T. B. Fletcher, F. J. F. Shaw, F. R. Parnell, W. H. Harrison, C. Venkatachariar, V. S. Gurunatha Pillai, M. Panchapakesa Aiyar, K. R. Venkataramana Aiyar, K. A. Venkatakrishna Aiyar, T. R. Srinivasaraghava Aiyangar, M. G. Arokiaswami Pillai and C. N. Krishnaswami Aiyar, Rao Bahadur J. Dharmaranga Raju, the Zemindar of Wuyyur, Messrs. S. L. D'Silva, G. Rajagopal Naidu, M. S. Mascaranhes, Vengail K. Krishnan Nayanar, T. N. V. Tirumalpad, J. Chelvaranga Raju and Vellingiri Gownder and other distinguished visitors, several old students and all the resident staff and students.

The President, on taking his seat, declared the Conference open and called upon the General Secretary to read the Annual Report.

The following is the Annual Report read by Mr. M. R. Ramaswami Sivan, General Secretary :—

Report of the working of the Madras Agricultural Students' Union during the year 1912-13.

The Committee begs to submit the following report of the working of the Union during the year 1913.

This is the 3rd year in the life of the Union and the purposes for which it was brought into existence and the lines on which it is working were summarised in the last annual report. The Union is an association of the past students of the late Saidapet

Agricultural College and of the past and present students of the Coimbatore Agricultural College, fostered and guided by the officers of the Department on one side and by the landed aristocracy on the other. The main object of the Union is to keep old students in touch with the *alma mater* and the following lines will show how far we have succeeded within the short space of three years.

Membership :—

Patrons.—Gentlemen interested in agricultural improvements and contribute a sum of not less than Rs. 100 towards the Permanent Fund of the Union are styled Patrons. No one has yet joined the Union in this class but we have promises from some gentlemen which, we hope, will be an accomplished fact by next year.

Honorary Members.—In the beginning of last year there were 36 Honorary Members. During the current year the following gentlemen have been good enough to associate themselves in the work of the Union by joining as Honorary Members *viz.*, Sir Frederick Nicholson, Mr. D. T. Chadwick, the Zemindar of Kasimkota, Mr. John Kenny, Honourable Diwan Bahadur L. D. Swamikannu Pillai, Mr. C. J. W. Shepperson, and Diwan Bahadur Kalle Narayana Rao. Honorary Members are not required to pay any subscriptions, as we consider it a sufficient honour if they join us. The Committee, therefore, has great pleasure in acknowledging receipt of Rs. 50 from Sir Frederick Nicholson, Rs. 30 each from Mr. Chadwick and Rao Sahib Kannambra Ramanunni Valia Nayar, Rs. 25 from the Zemindar of Kasimkota and Rs. 15 from Dewan Bahadur Kalle Narayana Rao.

Benefactors.—There were four Benefactors amongst the old students who had paid a life subscription of Rs. 50 each. None has joined during the current year.

First Class Members.—We started with 31 Members. The names of seven were removed for non-payment of subscription in full. 8 joined during the year leaving 32 at the end of June 1913.

Ordinary Members.—There were 67 Members at the beginning of the year. The names of three were removed for non-payment of subscription in full. 45 joined during the current year and we now have 109 Members.

On the whole, the strength of the Union consists of 43 Honorary Members, 4 Benefactors, 32 First Class Members and 109 Ordinary Members—total 188. Of these last, 6 are First Class Student Members and 34 are Ordinary Student Members.

The Committee is gratified to report the steady increase in the membership of the Union.

College Day and Agricultural Conference.—The Third College Day and the Second Agricultural Conference were held on 12th and 13th July 1912 and both were presided over by the Hon'ble Sir J. N. Atkinson. A full account of last year's celebrations was published in the first and second numbers of the Journal and the Committee once more begs to tender its heartfelt thanks to the Hon'ble Sir J. N. Atkinson for presiding, Dr. C. A. Barber, Rao Bahadur J. Dharmaranga Raju, and Messrs V. P. Subramania Mudaliar and Vengail Krishnan Nayanar for reading papers at the Conference and to all ladies and gentlemen who contributed to the success of last year's celebrations.

Journal.—The most important work which engaged the attention of the Committee during last year was the starting of a Quarterly English Journal as the organ of the Union in the place of the Year Book which was published in 1911. The following extract from the editorial of the first number explains its scope.

“The Journal is primarily meant to draw the old and the new students into closer bonds of fellowship with a view to turn out some useful work. Prominence will therefore, be given in the Journal to the publication of what may be called “College News”. Old students will be made acquainted with information that may interest them with reference to what is taking place in the College. Notes summarising the work of the experimental stations will be an important feature of the Journal. It is proposed that the subjects treated of should, as far as possible, have a practical aspect and, with this object, old students and other correspondents will be requested to send contributions stating practical experiences and personal difficulties, omitting all subjects which may have the least political tinge in them. Those who have been entrusted with the conducting of the

Journal are Government servants who have very little leisure beyond their official duties and, as much cannot be expected from them as from a full-timed staff of editors and managers. It is chiefly for this reason that the publication is to be a small quarterly one. It is, however, hoped that the journal will supply a real need not only for the old students of the college, but as well for others who may be interested in the progress of the agricultural condition of the country, as for instance, the enlightened Zemindars, landlords and members of the agricultural associations of the Presidency and who, therefore, wish to be in touch with what is being done by the new department for the welfare of India.”

The Committee is glad to be able to report that 386 paying subscribers have so far patronised the journal during the last eight months and there is a growing demand for the same. The journal is not yet self-supporting, but the Committee can hopefully forecast that, by next year, it will not only be able to pay its own way but also enable the Committee to refund the sum of Rs. 200 which has been borrowed from the Permanent Fund.

Employment of old students :—

Three vacancies were referred to the Committee during the year and none of them has been taken up, ex-students preferring to accept Government service on small salaries to getting employed under private parties as, in addition to the small salaries offered, there was no guarantee of a permanency of service or of prospects of promotion in the latter case. The Committee has reasons to think that, unless better prospects are held out, passed Agricultural students will not care to take up private employment.

Maintenance of the corrected list of old students :—

This work is still incomplete and the Committee hopes to get through this work before the next year.

Finance :—

The accounts of the club were audited up to the beginning of December 1912 and published in the second number of the journal. The following are the statements of accounts classified under Permanent Fund, Journal, and College Day accounts up to the end of June 1913.

PERMANENT FUND ACCOUNT.

Receipts.		Expenditure.	
Up to date of last audit.	December 1912 to June 1913.	Up to date of last audit.	December 1912 to June 1913.
Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
By donations from Honorary Members 210 0 0	105 0 0	To amount advanced to Journal account. 153 9 6	46 6 6
By subscriptions from Benefactors ... 200 0 0	0 0 0	To amount advanced to College Day account ... 23 0 10	10 15 2
By subscriptions from 1st class members. 216 0 0	52 0 0	Invested in the District Urban Bank, Coimbatore at 6% fixed deposit ... 618 0 0	360 8 0
By subscriptions from Ordinary members. 280 0 0	121 0 0		
By interest on amount invested in the Coimbatore District Urban Bank. 18 0 0	10 8 0		
Total ... 924 0 0	288 8 0	Total ... 794 10 4	417 18 8

Audited and found correct.
(Signed) K. KRISHNAMOORTHY RAO.
T. R. RANGANATH.

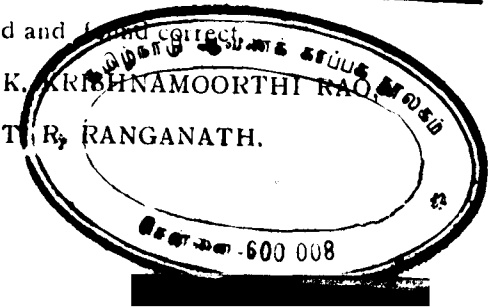
JOURNAL ACCOUNT.

Receipts.		Expenditure.	
Rs. A. P.		Rs. A. P.	
By subscriptions for the Journal paid by V.P.P. 307 0 0		To charges incurred for the printing of the Year book and forms, as published in the 2nd number of the Journal ... 113 15 10	
—M. O. or cash... 78 0 0		To—Postage—do. 35 8 6	
By sale of old Journals. 7 0 0		—Miscellaneous do. 9 1 2	
By recoveries on account of V. P. Charges ... 18 15 0		Total ... 158 9 6	
Advertisement charges. 48 0 0		To charges for printing. 217 3 9	
Registration of fees for the employment register ... 1 8 0		To Stationery and binding charges ... 13 12 11	
Total ... 460 7 0		To Postage ... 97 0 3	
By advance from the Permanent Fund 200 0 0		To Travelling charges paid to the printer for declaration ... 22 0 0	
		To Establishment ... 15 0 0	
		To Miscellaneous ... 7 8 7	
		Total ... 372 9 6	
		Grand Total ... 581 3 0	
		Balance on hand ... 129 4 0	
Grand Total ... 660 7 0		Total ... 660 7 0	

Audited and found correct.

(Sd.) K. KRISHNAMOORTHY RAO.

T. R. RANGANATH.



COLLEGE DAY ACCOUNT.

Receipts.				Expenditure.			
	Rs.	A.	P.		Rs.	A.	P.
By collection of arrears of subscription for College Day 1912 ...	3	8	0	To Stationery ...	4	0	0
By subscription from members for College Day 1913 ...	8	0	0	Deficit in College Day account 1912 ...	28	0	10
By subscription from D. T. Chadwick, Esq.	50	0	0	Balance on hand ...	68	7	2
Advance from Permanent Fund ...	61	8	0				
	34	0	0				
Total ...	95	8	0	Total ...	95	8	0

Audited and found correct.

(Ed.) K. KRISHNAMOORTHY RAO,

T. R. RANGANATH.

The Committee takes this opportunity of tendering its heartfelt thanks to Mr. D. T. Chadwick, I.C. S., Director of Agriculture, for all the help he has rendered to the Union. He has given large donations to the Permanent Fund and College day. He has placed all the publications of the department on the free distribution list. He is communicating all changes and promotions in the staff and referring vacancies in the department. He has made it possible for a large number of the mofussil farm staff to attend the celebration. He has, in a word, completely identified himself with the work of the Union.

The Committee cannot close this report without acknowledging the help it has received, from time to time, from Mr. R. C. Wood, Principal, now on leave, and of Mr. Sampson, the Acting Principal, ever since he took charge.

In conclusion, the Committee begs to state that the Union has not been organised for running a tamasha once a year or for the purpose of merely publishing a Journal. These are only means to an end, and that end is to do some useful work towards the great goal of the Agricultural improvement of the country; and such a work can be done only by the concerted action of as many old students on one side and of the landed aristocracy on the other. (Cheers.)

Mr. H. C. Sampson, the Ag. Principal, in his capacity as President of the Union then delivered the following address:—

Principal's Address of Welcome.

MR. PRESIDENT, LADIES AND GENTLEMEN,—I rise, as President of the Madras Agricultural Students' Union, to accord a hearty welcome to all old students of the Saidapet and of this College, as well as the present students of the Coimbatore Agricultural College, at this annual gathering or Conference. I know that many of you have come long distances to be present here to-day, and I trust you do not gauge our welcome by the accommodation which is available on the estate and which, I know, is limited. You have just heard from the Secretary what progress your Union has made during the year. Since last we met, your Year Book has blossomed out into a Quarterly Journal, which, I trust, will be the means of bringing you all in closer touch, not only with old friends, but with the Agricultural Department, and the desire to improve the agriculture of your country. This Annual Meeting also, I hope, you will enjoy as much as I do. Here you have an opportunity of renewing acquaintances and of finding out what others are doing in the way of improving the agriculture of the country. Some of you, I know, are farming for yourselves and I hope that you are making money at it for, if you are, others will be bound to copy you, and in this way your example not only benefits yourself, but will improve the agriculture of the country. Others of you, are, like myself, servants of the country, trying to improve the agriculture, as we find it, and in all cases we have had an agricultural training, both practical and theoretical, and should, therefore, be able to give others who have not had this privilege,—and I think you will agree with me that it is a privilege, as well as an advantage,—some of the

benefits of this training. Now, I expect all of you have realised that there is very much to learn about agriculture, which you have not learned at College, and I hope you will all take the opportunity of this Meeting to take in what others have learned, and to give out what you have learnt yourselves. (*Cheers.*)

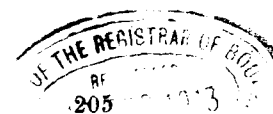
The Principal's welcome address over, the Hon'ble Sir Harold Stuart delivered the following interesting and instructive address which was listened to with rapt attention :-

Presidential Address.

Mr. Sampson, Ladies and Gentlemen,

We have met here to-day under the auspices of the Madras Agricultural Students' Union and I desire in the first place to offer my very hearty congratulations to that body upon its rapid and vigorous growth, evidence of which we have abundantly had in the report which has been read to us. I think I shall have the sense of the meeting with me when I suggest that a large part of that success may be ascribed to the devoted labours of the Hony. Secretary, Mr. Sivan (*Cheers*). The success of the Union augurs for the cause of agricultural progress in the Madras Presidency, for that success would have been impossible without the hearty support of the members of the Union, a support which indicates the existence of a spirit and purpose which are most promising for agricultural development. We have heard with great interest about the institution and the undoubted success of the Quarterly Journal. That Journal will do much to keep alive that *esprit decorps* the cultivation of which is one of the objects of this Union and it will also keep old students in touch with their classmates, scattered over the different parts of the Presidency. It will thereby stimulate some amid flagging energies to further efforts and encourage others whose work appears to be rather disappointing to continue their labours in the cause of agricultural improvement.

I believe that the object of the gathering here to-day is two fold. In the first place it is to celebrate "College Day", the anniversary of the opening of the College by Sir Arthur Lawley; and in the second place, to hold a Conference at which we shall hear papers on agricultural research and demonstration and experiment, followed by discussion. To all those who are interested in the cause of agricultural education,



the success of the College, the undoubted success of the College, is a source of great satisfaction and I should like to congratulate the staff upon what has been done in the comparatively short time that the College has been open. There is possibly scope for wider development of the usefulness of the College, and I understand that proposals with that object are now under consideration. One of the great features of the College is that it is attracting the right stamp of students, men who intend to devote their lives to agriculture either on their own lands or in the service of the State or of large landowners. That is a most encouraging sign and will give us a class of men which is much wanted in this Presidency. I can imagine no nobler object for a young man's life than to endeavour to improve the methods of cultivation in his native country. There are many careers open to young men. There is the ordinary Government service which usually offers dignity and a certain security of income. There is the Bar which attracts by its independence with a prospect of large fortune. There is medicine which affords a career that is perhaps second to none, with its opportunities for sacrifice for the public good. There is general education where leisure is joined with usefulness. But I do not think that anywhere you will find a finer career than is open to what I may call "missionaries of agriculture." Let me read to you the opinion which Swift two centuries ago put in the mouth of the King of Brabdingnag. That sovereign "gave it for his opinion that 'whoever could make two ears of corn, or two blades of grass, to grow upon a spot of ground, where only one grew before, would deserve better of mankind and do more essential service to his country than the whole race of politicians put together' ". (*Cheers*). I should like to see these words inscribed on the walls of every High school in the Province. Before I leave the subject of the College I must just say a few words upon the facilities which it offers to young men who seek an agricultural education. It is extremely well-equipped—both in men and in scientific apparatus. It charges no fees, it provides free quarters, the student requires few books, and practically the only expenditure of the student who attends this College is the cost of his food—an expenditure which would have to be incurred whatever he is doing and wherever he is (*Laughter*). It is therefore a very cheap institution and I do not think that any further measures of attractiveness are required, at least for the present.

I come now to the other object of this meeting—the Conference side of it. We hear a good deal of industrial development in the present day, but I should like to remind those impatient economic reformers that agriculture is not only by far the oldest industry but also by far the most important industry. It is an industry already established, an industry on which 68% of the population of Madras depend for their livelihood directly, while if we include those who depend on agriculture indirectly, the proportion is probably as high as 90%. It is abundantly clear, therefore, that the industry of agriculture is the most important industry in the country and one which has a strong claim on our attention and our efforts. It is also an industry the processes of which are undoubtedly susceptible of improvement. It is not necessary for me to give you details, but I may mention one or two which have occurred to me when reading the reports of the department. The first is the single seedling system of planting paddy—a change of practice which, the last report says, would save the ryots of the Madras Presidency a crore of rupees a year. Surely that alone is a result upon which the department might pride itself for a good many years to come. But that is by no means the end of the improvements in agricultural practice which may be expected. The general question of manures and especially of green manuring, seed selection, which, I believe, has a great future, and the cultivation of new crops like Cambodia cotton are all directions in which we may look for improvements and advance. In fact, I should say that we shall never reach the end of possible improvement in agricultural practice, for fresh problems will constantly arise and offer themselves for solution, and so you will go on from hill to hill always climbing upwards, gaining ground but never reaching the end. It has often been said that the great obstacle in India to the advance of agricultural progress is the incurable conservatism of the ryot. Now all agriculturists have a not unnatural distrust of “book-farmers”, but if you demonstrate to them that a process which you recommend or a practice you advocate is likely to prove remunerative, a ryot is, I think, quite quick enough and sufficiently alive to his own advantage to adopt it. I should like to give you a little story of my own experience which confirms that opinion. In the early years of my service, with the encouragement of my Collector, I started an Agricultural Society at the headquarters of

the district. We had two farms. They did little good and after I left the district and the Society was dissolved, the farms were abandoned, and I discovered later that the village munsif had quietly acquired the better of the two (*Laughter*). Then we held an Agricultural show, which perhaps did some good. Our third line of activity was to introduce improved agricultural implements. I travelled about the district with a number of improved ploughs and with a Behea sugar mill. I had ploughing exhibitions for the ryots, but they said their bullocks were not strong enough to draw them, and that, even if they were, the ploughs would do very little good. Probably they were right. But, in the case of the Behea sugar mill, I had quite a different reception. I used to set this mill up beside the country wooden mill, crushing equal quantities of cane, and it was found that my mill, crushed more quickly and more thoroughly than the wooden mill. The result was that quite a number of them were purchased and set up in the district in a very short time. I have then been of opinion, as I mentioned just now, that the ryot is by no means slow to adopt anything which, you can show, will be to his profit; and if you should by any chance come across farmers who are not quite so alive to the advantages of the improvement, I would recommend you to read the accounts of agricultural progress in England, where it was certainly quite as slow as it is ever likely to be in this country. I remember one instance. In the county of Gloucester it had been the immemorial practice to plough with two men and a boy and 6 horses to each plough. Coke of Holkham with a Norfolk plough, one man and a pair of horses demonstrated and showed that the work could be done by them as well as by two men and a boy and 6 horses, with the result that there was a saving of £ 120 a year. Yet it took 20 years before any of his neighbours took to that method. I could give you other instances of the same kind and I would ask you, when met by undue conservatism, to bear in mind the experience of other countries and to remember that conservatism has given way before persistent demonstration and missionary enterprise. I contend then that there is a very promising field before the Agricultural expert and I can assure you all of the very hearty support of the Government for your efforts in that direction. His Excellency the Governor has commissioned me to say that he earnestly desires to see the work of the department developed. To that message of encouragement I will add

that the Government are ready to increase the Budget grants of the Department, whenever reasonable cause for that course is shown to us (*Cheers*). Already this year we have made special grants to the department of Rs. 67,000, of which the College has obtained a substantial share, I repeat that we are quite ready not only to give special grants of a non-recurring nature, but to make a substantial increase to the recurring grant (*Cheers*). The field, however, is so vast that it is impossible that it can be fully occupied by the Government. Nor do I think it is desirable that it should be, for, to secure success, we must have initiation and enterprise among the people themselves. Fortunately in this Presidency we have a class which is peculiarly well situated to give that assistance to Government. I mean the great zemindars of the Presidency (*Cheers*). The permanent settlement has often been attacked on the ground that it has diverted revenue which could have been more profitably spent by the State than by those to whom it has been assigned. The true answer to that objection is the recognition by the zemindars that their position has responsibilities as well as privileges. I am glad to say that most of them have acted on that principle in many fields, but they have strangely neglected the field of agriculture. We have, however, at least two instances of zemindars who have done, and are doing, something for agricultural progress, I refer to the Raja of Pithapuram and the Zemindar of Sivagiri. But there is very much more which might be done by their brother zemindars and I hope that we shall have their cordial assistance in developing this great industry of the Presidency—an industry with which they are so closely connected and upon which they depend for their incomes. I read the other day an interesting article on this subject in your Quarterly Journal. I am hopeful that it will attract the notice of zemindars and that we may look to their assistance, at least in demonstration of the practices the good of which has been established. They have as examples the great land owners of England. I believe Sir Robert Walpole, the great Prime Minister, always opened the reports of his farm steward before he opened the Despatches. He was much more interested in agricultural developments than in the problems of State. Bolingbroke was another great landowner who maintained a keen interest in his farms even among the distractions of affairs of State. King George III was known as the 'farmer King' and the model forms which he established have con-



W. KEESS, Esq., M.A., M.R.A.C., Late Principal, College of Agriculture, Saidapet,
from 1887 to 1906.

tinued down to the present day, supported and developed by his successors on the throne. There are many other instances, such as the Earl of Leicester, the various Dukes of Bedford, Lord Rockingham and Lord Althorp and it is my earnest hope that their example will be followed by the great landowners of the Madras Presidency. We shall then, I think, have all the elements that are required to ensure success. You will have a Government ready to assist the development of the department both by encouragement and funds. You will have great Zemindars associating themselves with the Government in demonstrating to the ryots the usefulness of the processes which are advocated by the Department. You will have in this Union a very useful agency for keeping alive that spirit of progress upon which perhaps, more than anything else, success depends. And finally in your Director, Mr. Chadwick, you have an enthusiastic chief of wide experience and deep sympathies (*Cheers*). Under his leadership, encouraged by his cheerful optimism, stimulated by his energetic industry, and sometimes, perhaps, restrained by his sound judgment, you will go onward with the work of agricultural development, confident of attaining solid success, to your own worthy satisfaction, to the profit of the agricultural classes and to the lasting benefit of the people of the Presidency (*Loud and continued cheers*).

At the conclusion of the Presidential address, Rao Bahadur J. Dharmaranga Raju, in requesting the Hon'ble Sir Harold Stuart to unveil the portrait of Mr. W. Keess, a former Principal of the Saidapet College, presented by an old student, Mr. M. Parameswara Aiyar, spoke as follows :—

Unveiling of the Keess' Portrait.

Mr. Walter Keess is the son of the late Surgeon Major Keess of the Indian Medical Service who retired as Principal of the Madras Medical College and Senior Medical Officer in the General Hospital. He graduated from King's College, London, and took the Mathematical Tripos at Cambridge. He also won the Gold medal of the Royal Agricultural College at Cirencester. While at Cambridge he was the captain of the Boat Club there. When the Saidapet Agricultural College was transferred from the control of the Revenue to the Educational Department, Mr. Grigg, the then Director of Public Instruction selected Mr. Keess

as Vice-Principal of the Agricultural College. It was at that time that the Madras Technical Education scheme came into force and Mr. Keess gave a number of lectures and demonstrations in the Victoria and Pachiappa Halls on applied chemistry. When the late Mr. Robertson went on furlough in 1887, Mr. Keess was appointed to act as Principal and continued as such until 1906. Great changes took place in the curriculum of studies during the period. During Mr. Robertson's time, students were given first and second class certificates on the result of the Examinations conducted by the College Staff. When Mr. Keess took charge he had to suit to the several syllabuses of the Government Technical Examination Scheme. There was a diploma course of 3 years and a group certificate course of one year. The Examiners were mostly men who were not conversant with the needs of an Agricultural College. As a result of the deliberations of the Madras Agricultural Committee, the junior course was abolished and the number of subjects of instruction reduced. The students selected were not always of the Agricultural classes, as the selection was in the hands of the Collectors of districts who sometimes chose junior clerks in the Département. Changes were introduced in the curriculum now and then as a result of the opinions of outside Examiners, and Mr. Keess was greatly handicapped in several ways. He was under the dual control of the Educational Department and of the Board of Revenue. Although he had the assistance of a good Indian staff, it was not until 1899 that an European Vice-Principal—Mr. Thorne was appointed. He too was sent away after two or three years. Mr. Keess took up the teaching of chemistry almost from the time of his joining service, and had not the opportunities which an officer of the Agricultural Department should have of seeing the country. As a teacher, he was very impressive. He was extremely kind to his subordinates and his students, almost to a fault. He very nearly made India his home, and would probably not have left India for good were it not for the fact that his wife's illness compelled him to seek retirement from India after 20 year's service. His purse was always open. His charities, so far as known, amounted to not less than Rs. 100 a month. He was saintly in his life and the attachment his students had for him was real and great. Whenever there was the harvest of any grain on the Farm—paddy, ragi, cholam or kambu—he would be the first to purchase a quantity and distribute it free to the

Farm coolies. In seasons of scarcity he would purchase hundreds of rupees worth of rice or ragi for free distribution. A number of poor students used to be assisted by him. His contributions to the Athletic Club and the College Day Celebrations were quite lavish. In spite of all this, his life was very simple. He was straightforward and unostentatious. It will interest many of his old students to know that he has settled himself now as a gentleman farmer in Jersey, Channel Islands.

Mr. Parameswara Iyer wished to make it known that he was indebted to Mr. Keess largely and was benefitted by his instruction and, with the permission of the Principal of this College, he made a request that the portrait of Mr. Keess may be hung up by the side of the oil painting of Mr. Robertson, in order to recall to the mind of the younger generation of the students of this College the memory of one who kept on the administration under enormous difficulties. It was a pleasure to the old students of Mr. Keess that his name had been perpetuated at this College by the Keess Prize and the Keess Road; and the Keess Portrait will help to recall the face of the person whom they all honoured so much.

In response to this request, the President addressed the audience as follows:—

Mr. Dharmaranga Raju, Ladies and Gentlemen,

It gives me great pleasure to unveil this portrait to-day as I have known Mr. Keess from a comparatively early period in the lives of both of us. We were at Cambridge together and I well remember what a pretty oar he was. Subsequently I met him again when he was at the Agricultural College at Saidapet. Of his work there I am afraid I cannot speak, but I am sure it will be a source of great gratification to him to know that his labours in that capacity were highly appreciated by the students under his charge and that expression has been given to that sentiment by placing his portrait in this hall. (*Applause*).

The Portrait was made by a young artist, Mr. Athirsham Pillai of Pursewalkam, and is a true likeness of Mr. Keess and, immediately the unveiling was done, an enthusiastic applause was given.

The President then called upon Mr. **G. Jogi Raju, D.A., Superintendent of Pittapuram Farm** to read his paper on "**The Working of the**

Pittapuram Farm". The Paper is printed as **Appendix I**. In the discussion which ensued, Mr. J. Chelvaranga Raju asked for details regarding the cultivation of plantains as adopted at Pittapuram and they were furnished by Mr. Jogi Raju.

The next paper read was on "**The Impressions and Experiences of a Recruit**" by **Mr. K. Thimmappa Alwa, L. Ag., of the Taliparamba Farm**. This is printed as **Appendix II**. Mr. M. E. Couchman who was formerly Director of Agriculture, Madras and is now Collector of South Canara, substantiated the statement made by Mr. Alwa regarding the introduction of Mauritius canes and of improved furnaces in the South Canara District and complimented the farm staff at Taliparamba on the work so far achieved. He also said that, so long as old students were enthusiastic on one side and had a detailed knowledge of local conditions on the other, the introduction of agricultural improvements amongst ryot classes was not a difficult matter.

The President closed the Proceedings complimenting the two old students who had read papers, based on practical experience and wishing success and prosperity to the Union. Mr. Chadwick, Director of Agriculture proposed a hearty vote of thanks to the Hon'ble Sir Harold Stuart for his kindness in coming to Coimbatore and presiding at the Conference. He said he knew how greatly interested he was in what was being done by this College and by this Union. He further said that he would thank Sir Harold Stuart for the assurance of Government to give increased financial help to the Department and to His Excellency, the Governor for his welcome and kind message.

Mr. Ramaswami Sivan, in proposing a hearty vote of thanks to Messrs Jogi Raju and Thimmappa Alwa for the excellent papers they read said that both of them were amongst the best students of the College, having won the highest award at the College *viz*, Robertson Prize for proficiency in agriculture. It was his opinion and he believed, the audience would agree with him in that opinion, that he was fortunate in getting them to read papers at this Conference although they said that, being juniors, they would rather not take up the responsible task. So long as the papers were based upon actual experiences and practical difficulties, they were sure to be appreciated by the members of the Union, whether they were contributed by younger or older men. He

said he was proud that both of them were his students and they amply justified the request made of them by him. The General Secretary next proposed a hearty vote of thanks to all the ladies and gentlemen who, attended the first Session of the Conference and the Conference was adjourned to 14th July.

The General Secretary also announced that messages had been received from the following Honorary Members and old Students regretting their inability to be present and wishing all success to the College Day and Conference.

Mr. C. J. W. Shepperson, Mr. A. E. Castle Stuart, Sir F. A. Nicholson, Mr. W. Keess, Mr. John Kenny, Uttukkuli Zamindar, Zamindar of Singampatti, Hon. Dewan Bahadur V. Ramabhadra Naidu, Zemindar of Doddappanayakanur, Guardian Press (Natarajan), Rao Bahadur T. Subrahmanya Iyer, Mr. G. P. Venkatesa Aiyer, Mr. G. H. Krumbiegel, Hon. Rao Bahadur V. K. Ramanujachariar, Mr. R. D. Austead, Rao Sahib J. Seenan Bhat, Zemindar of Kasimkota, Raja of Kurupam, Hon. Mr. K. Chidambaranatha Mudaliar, Hon. Mr. A. Butterworth, Mr. A. C. Parthasarathi Naidu, Rao Bahadur N. Subba Rao, Dr. N. Kunjan Pillai, and the following old Students —Messrs. K. C. Deviah, M. S. Sankaran, N. Kesavapillai, S. Daniell, S. Narayaniah, S. Subrahmanya Aiyer, K. M. Guru Raja Rao, K. Ramanuja Chari, P. K. Atehan, B. Dwarakanath, P. G. Krishnan, H. C. Javarayya V. Vijayaraghavachari, G. M. Eapen, M. Parameswara Aiyer, D. Ananda Rao, J. Saldanha, K. A. Rashid, C. Jagatheeswara Rao, A. Seturama Aiyer, and Rao Bahadur C. V. Muniswami Aiyar, J. R. Ranga Raju, W. J. John, P. O. Abraham, N. Sadagopa Chari, Venkata Rao Badami, P. A. Chengappa, D. Panakal Rao, and D. K. Venkataramaiyer.

AGRICULTURAL CONFERENCE, 2nd Session.

The Second Session of the Conference was held on 14th July under the Presidency of Mr. M. E. Couchman, I. C. S., Collector of South Canara. In addition to most of the gentlemen who were present at the 1st Session, there were also present the Zemindar of Uthukuli and Messrs. Adinarayana Reddi of Nellore, P. T. Rangasami Aiyangar of Kulitalai, K. Ramaswami Aiyar of Madura and M. R. Narayanasawmi Aiyar of Coimbatore.

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The President called upon **Mr. K. Ramaswami Aiyar, Secretary, District Agricultural and Co-operative Bank of Madura and Ramnad** to read his paper on **Co-operation in Agriculture**. This paper is printed as Appendix IV.

This done, the **Hon'ble Dewan Bahadur L. D. Swamikannu Pillai** delivered an instructive address on "**How co-operation can be used to help the relation of landlord and tenant**." This is printed as Appendix V.

The reading of these two papers was followed by a lively discussion in which Messrs. P. T. Rangaswami Aiyangar, K. Unni Krishna Menon, and M. R. Ramaswami Sivan took part. Mr. Rangaswami Aiyangar was of opinion that landlords should give a greater share of profits to the cultivators and that emigration of coolies to other countries would diminish and disappear if this were done. Mr. Unni Krishna Menon gave an account of village co-operative associations which were formed in an informal manner for the purpose of carrying out certain suggested improvements in Malabar and said that the ryots took up these suggestions when they were satisfied they were useful and when there was some one to help them occasionally to carry them out.

Mr. Ramaswami Sivan said that he recalled his studentship under Mr. Swamikannu Pillai 25 years ago and was greatly benefitted by being told that co-operative concerns were purely business concerns. He was of opinion that sympathy of the richer towards the poor classes was one of the essential points of co-operation but was now convinced that the landlord and the tenant were both equally benefitted in a businesslike manner by co-operation. There must be honest service rendered on both sides if co-operation between landlord and tenant should prove of lasting benefit.

Mr. Couchman said that they would all agree with him in feeling that the address delivered by Mr. Swamikannu Pillai contained many weighty matters. His general impression was that the co-operative movement was essentially a democratic one, but now they heard from the Registrar that that condition was not necessary, and the reasons adduced by him formed a useful contribution to the literature on the subject. The co-operative movement was started by the Government and was not of spontaneous growth. But one of the hopeful signs

of the day was that the rich landlords were taking the lead. If one man in the locality who had position, wealth and character took the lead, smaller people would follow him. Even absentee landlords had opportunities of usefulness by lending out money to their tenants.

Mr. Couchman thanked Mr. Ramasawmy Iyer and Mr. Swamikannu Pillai for their able addresses.

In the unavoidable absence of the **Hon'ble Mr. K. Chidambaranatha Mudaiar of Shiyali**, the paper on "**The Improvement of South Indian Cattle**" (printed in Appendix VI) was read at his request by Mr. T.R. Srinivasaraghava Aiyangar, High Court Vakil, Coimbatore. This was followed by a lively discussion in which Messrs. Rangaswami Aiyangar, J. Chelvaranga Raju, M. R. Ramaswami Sivan, G. Jogi Raju, A. Ramanatha Aiyar and Adinarayana Reddy took part. Mr. Rangaswami Aiyangar said that, at a District Board meeting at Trichinopoly, it was decided to abolish prizes for cattle exhibited in cattle shows as the prizes went to the landlords who owned them and not to the actual breeders of animals. He further said that free grazing should be more liberally allowed in reserved forest, and began a long discourse on forest administration and the hardships caused to the cultivators as a result of the working of the forest Policy.

Mr. J. Chelvaranga Raju interrupted the last speaker and said that questions which are more or less of a political character and criticisms of Government Policy were not allowed in the deliberations of the Conference. Mr. Ramaswami Sivan in his capacity as General Secretary of the Union said that the object of the Conference was to afford opportunities to old students, honorary members and enlightened landlords to exchange actual experiences on subjects pertaining to practical agriculture. What the Government can do or should do in such matters is left out of consideration but what the members have done and can do are more appropriate points for discussion. That the Government are really anxious to improve the breeds of South Indian Cattle is seen from the fact that an officer of Mr. Sampson's attainments, qualifications and experience was deputed for nearly a year to make a Cattle Survey of the Presidency and his report is still not published. While he refrained from making a remark on the criticisms made by Mr. Rangaswami Aiyangar, he said that those criticisms might be more usefully made in other assemblies than a Students' Conference.

Mr. G. Jogi Raju said that the Rajah of Pittapuram had stationed three breeding bulls at the Pittapuram Estate Farm which were largely availed of by the owners of cows in the neighbourhood. No fees were charged so far and there is a remarkable improvement in the young stock in the vicinity. Mr. Adinarayana Reddi of Nellore said that he was watching the work of the Forest Committee closely and was of opinion, as a large landholder owning between 200 and 300 head of cattle, that a relaxation of the stringent rules of the Forest Department for grazing purposes would certainly improve the stock of the country. He said that every ryot in his part of the country had his own breeding bulls.

Mr. Chelvaranga Raju pointed out that large areas of inferior dry land could be hedged in and put down to permanent pasture by well-to-do cattle owners as was done by the Pattagar of Palayakotta.

Mr. A. Ramanadha Aiyar of Bellary said that young calves, especially in large towns were actually starved of their mother's milk and no substitute of an artificial nature was given either.

Mr. Rangaswamy Aiyangar said he never knew he was exceeding his limit and assured the members of the Union that he meant no infringement of the rules.

Mr. H. C. Sampson said that mention was made by one of the speakers that he (speaker) was on special duty doing cattle survey in South India and, while on that, he had opportunities of studying the conditions. And one thing he noticed was that at present high prices for cattle prevailed and that seemed to be the means of improving the breeds, as breeders fetched better prices. Food grains also had increased in value and a very large sum of money, especially in the Southern Districts, had been invested on lands. Sinking of more wells for irrigation purposes made a heavy demand for bulls and the rise in prices also paved the way for salvation. In his opinion people were taking more care and trouble in breeding and rearing bulls now than ever before. Mr. M. E. Couchman, in winding up the debate, said that there was a general impression that Government could do much more in cattle improvement. That was a mistaken idea. The rise of prices in cattle increased with the price of food stuffs. If the area of grazing ground increased it would not alter. The very same people who owned cattle

would not be satisfied with the prices obtaining 30 years ago. The part their Union and College could do was to teach cattle breeders to meet the increasing demand.

There were two other papers on the agenda one on "**the Biological activities of soils**" by **Dr. N. Kunjan Pillai, Director of Agriculture, Travancore** and the other on "**A Peep into Malabar Agriculture**" by **Mr. Vengail K. Krishnan Nayanar of Malabar** an Honorary visitor to the College and a Benefactor and Vice-President, of the Union. As it was already late, Mr. Sampson proposed that these two papers be taken as read and published in the journal.

Mr. Ramaswami Sivan, in seconding the above, said that he had the honour and privilege of having read the two papers beforehand and regretted very much on behalf of the Union, that the papers were not to be read at the Conference, especially when one of them, Mr. Krishnan Nayanar had come all the way to read his paper, and assured the audience that they would agree with him as to the excellent nature of the papers, when they read the same in the journal.

These two papers were then taken as read.

Mr. Couchman, in winding up the proceedings, said that, during the three days he was with them, he had opportunities of seeing things and talking to the experts. He was glad to observe that things were going on in a satisfactory way. Government was convinced that what was done in the college was genuine and not eye wash. The department was rapidly extending and new and increased scales of pay would soon be introduced. In conclusion he wished prosperity to the Students' Union and dissolved the Conference.

After a hearty vote of thanks to the Chairman the Conference was dissolved.

On the afternoon of Monday the 14th July a Business Meeting of the members of the Union was held followed by a Social Gathering.

**Proceedings of the General Business Meeting
of the Madras Agricultural Students' Union
held on Monday, 14th July 1913.**

Present :—

Mr. H. C. Sampson, President in the Chair, Rao Bahadur J. Dharmaranga Raju and Messrs. S. L. D'Silva, and G. Rajagopal Naidu, Vice-Presidents, about forty members of the Union from the staff and ex-students and over forty student members.

The General Secretary announced that all the members, with the exception of student members, met on the previous day to discuss the proposed changes in the rules: and these were brought up for consideration at the meeting.

For the present rule No. 9, substitute the following :—

9. " *The Council.* The affairs of the Union shall be managed by a council consisting of a President, who shall be the Principal, *ex-officio* and four Vice-Presidents and twelve members, of whom one Vice-President and five members shall be resident members. Of these last one shall be the General Secretary, one the Treasurer, and a third the Joint Secretary. Two resident members may be elected from amongst officers who are not old students but the Vice-Presidents, the General Secretary and all other members shall be old students."

Proposed by Mr. S. L. D'Silva, seconded by Rao Bahadur J. Dharmaranga Raju and carried unanimously.

The question of admitting as members of the Union gentlemen who are not invited by the Committee as Patrons or Honorary Members and who are at the same time neither employed in the Department nor are old students was next considered.

Proposed by Mr. S. Babu Rao, seconded by Mr. J. Chelvaranga Raju and carried unanimously that the question be dropped as not being consistent with the objects of the Students' Union.

In Rule No. 11 for 'Joint Secretary' read 'Assistant Secretary.— Proposed by Mr. T. R. Ranganath, seconded by Mr. S. Babu Rao and carried unanimously.

That the Resolution passed at the previous Conference that the General Secretary be the Editor of the Journal be cancelled in favour of the following :—

'Any old student resident member of the Council shall be elected as Editor at the General Meeting'—Proposed by Mr. S. L. D'Silva and seconded by Rao Bahadur J. Dharmaranga Raju.

Mr. M. R. Ramaswami Sivan proposed and Mr. K. Unni Krishna Menon seconded an amendment that the Editor be appointed by the Working Committee under the direction of the Council.

The amendment was lost and the original proposition was carried by a large majority.

With regard to the next year's election and the manner in which the mofussil votes have to be obtained, it was considered expedient that those members assembled at this Conference should nominate a number of persons for holding offices for the next year, and that these nominations should be sent to the mofussil members for selection and approval. Proposed by Mr. J. Chelvaranga Raju, seconded by Mr. Babu Rao and carried unanimously.

That all proposals of amendments to the rules be communicated to the General Secretary before the 31st of March every year for being published in that issue of the Journal previous to the annual General Meeting.

Proposed by Mr. M. R. Ramaswami Sivan, seconded by Mr. Krishnamurti Rao and carried unanimously.

The election of office bearers was next proceeded with :—

Proposed by Rao Bahadur J. Dharmaranga Raju, and seconded by Mr. G. Rajagopal Naidu that Mr. S. L. D'Silva be the resident Vice-President—carried unanimously.

Mr. D'Silva regretted his inability to serve as a Vice-President for another term.

Proposed by Mr. S. L. D'Silva, seconded by Mr. A. Ramanadha Aiyer that Mr. J. Chelvaranga Raju be the resident Vice-President—carried unanimously.

Proposed by Mr. T. R. Ranganath and seconded by Mr. Krishnamurti Rao that Mr. M. R. Ramaswami Sivan be the General Secretary—carried unanimously.

Mr. M. R. Ramaswami Sivan requested to be relieved of the General Secretaryship.

Mr. M. R. Ramaswami Sivan proposed and Mr. G. Jogi Raju seconded that Mr. K. Krishnamurthi Rao be the General Secretary—carried unanimously.

Proposed by Mr. D. Appa Rao and seconded by Mr. S. Babu Rao that Mr. M. R. Ramaswami Sivan be the Editor of the Journal—carried unanimously.

Votes were taken for the election of the other resident members and Messrs. T. R. Ranganath, T. Lakshmana Rao and C. Narayana Aiyar were elected. Of these Mr. T. R. Ranganath was elected Joint Secretary and Mr. T. Lakshmana Rao, Treasurer.

At this stage Mr. Sampson left the meeting and Rao Bahadur J. Dharmaranga Raju occupied the chair.

The election of the mofussil members was then taken up with the following result :—

Messrs.	V. P. Subramania Mudaliar Vengail K. Krishnan Nayanar and T. N. V. Tirumalpad	}	Vice-Presidents.
and Messrs.	D. Appa Rao T. V. Rajagopalachari M. Parameswara Aiyar K. Unni Krishna Menon K. Sankara Aiyar K. Venkata Rao Badami and K. Narayana Aiyangar.		
		}	Members of Council.

The resident members of the Union elected Messrs. R. Ramaswami Aiyar and A. V. Tirumuruganatham Pillai to the Working Committee.

The summary of the election is as follows :—

President.

H. C. Sampson, Esq., B. Sc., Ag. Principal (ex-officio)

Vice-Presidents.

J. Chelvaranga Raju, Ag. Asst. Director of Agriculture (Coimbatore).

V. P. Subrahmanya Mudaliar., G. B. V. C., Deputy Superintendent
Civil Veterinary Dept., Madras.

Vengail K. Krishnan Nayanar, Kuttur, N. Malabar.

T. N. V. Tirumalpad, Fourth Raja of Nilambur.

Members of Council.

D. Appa Rao, Kasimkota.

K. Krishnamurthi Rao, D. A., Chemistry Assistant, Govt. Sugar-cane Expert.

T. Lakshman Rao, B.A., Asst. to Government Agricultural Chemist.

C. Narayana Aiyar, D. A., Asst. to Govt. Entomologist.

K. Narayana Aiyangar, D. A., Farm Manager, Hagari.

M. Parameswara Aiyar, D. A., Chemistry Assistant, King Institute, Guindy.

T. V. Rajagopalachari, D. A., Farm Manager, on special duty, Elore.

M. R. Ramaswami Sivan, B.A., D.A., Chief Assistant to Govt. Agricultural Chemist.

T. R. Ranganath, L. Ag., Assistant to Govt. Mycologist.

K. Sankara Aiyar, D.A., Farm Manager, Manganallur.

K. Unni Krishna Menon, D.A., Farm Manager, Taliparamba.

K. Venkata Rao Badami, L. Ag., Mysore.

Working Committee.

J. Chelvaranga Raju, Vice-President
M. R. Ramaswami Sivan, Editor
K. Krishnamurthi Rao, General Secretary
T. R. Ranganath, Joint Secretary
T. Lakshman Rao, Treasurer

Members
of
Council.

C. Narayana Aiyar

R. Ramaswami Aiyar

A. V. Tirumuruganatham Pillai

K. Ramiah, Student, Class III

K. Manga Razu, „ „ II Assistant Secretary.

A. Gopalakrishnayya „ I

The Committee was requested to get the help of the mofussil members of Council in the matter of enlisting new members of the Union, getting new subscribers and sending contributions to the Journal.

The Committee was also empowered to meet all demands during the year and was requested to submit a budget estimate at the General Business Meeting in future years.

A vote of thanks was recorded for the retiring Committee and was acknowledged by Messrs. S. L. D'Silva and M. R. Ramaswami Sivan.

With a hearty vote of thanks to the chair the meeting was dissolved.

Students' Entertainment.

The present students of the College organised an entertainment for the amusement of old students and visitors by enacting the drama of Harischandra in English, before a full and crowded house on the night of 13th July. Mr. M. U. Vellodi was Harischandra, K. Ramiah acted the part of Chandramathi, K. Gopalakrishna Raju was Nakshathraya, T. Paramanadam played the part of Viswamitra and Kalakanda, N. R. Srinivasachari took the part of Virabahu, Manikka Mudaliar took the part of Indra, Yesudasan of Vasishta, Kunnappa Nambiyar of Devadasa, Sankarakumar was the buffoon, C. R. Srinivasan played the part of the wife of Kalakanda and minor parts were taken by A. Krishnan Nayar, K. Manga Razu, K. Adinarayana Rao, G. Duraiswami Aiyangar and others. The acting was quite excellent, the music being played at intervals by Messrs. Rajagopala Aiyar, Post master, Sundara Rao, Artist and N. V. Viswanatha Aiyar. Messrs. C. Narayana Aiyar and K. Krishnamurthi Rao as secretaries to the entertainment committee did a great amount of work in fitting up the stage. By far the greatest credit should by common consent be attributed to Mr. B. V. Nath, Assistant to the Government Agricultural Chemist, who took indefatigable pains in coaching up the actors, conducting the rehearsals and acting as stage manager.

At the conclusion of the drama Rao Bahadur C. Hanumantha Gowd, one of the Honorary Visitors to the College, said that as President of one of the foremost dramatic companies of the Presidency namely the Sarasavinodini Sabha of Bellary he was glad to testify to the excellent character of the acting and the clearness of exposition and drew the attention of the audience to the subject of the Drama viz., the virtue of truth speaking. Men in other professions the profession of Agriculture can always follow the paths of Virtue and of Truth. (Cheers.)

The General Secretary on behalf of the audience thanked the



students and the other gentlemen who were responsible for the entertainment, for the trouble they had taken in getting it up at such short notice and in successfully carrying it through in the midst of other engagements. He was glad to announce that on the verdict of Rao Bahadur N. Hanumantha Gowd, medals would be presented to the students who played the parts of Harischandra, Chandramathi, Nakshathraya and that these prizes would be given by Dewan Bahadur M. Adhinarayana Aiyar, Mr. M. Pattabhirama Rao, Rao Bahadur J. Dharmaranga Raju. With cheers to the Entertainment Committee the entertainment closed.

Another important function enjoyed by all the old students, present students and visitors was a dinner in the College Hostel at noon on Sunday the 13th July. The thanks of the Committee are due to the Hostel Warden and the Hostel Manager for the excellent arrangements.

Ntoes.

The success of the annual gathering must be measured largely by the number of old students of the College and Honorary members of the Union who attended it. It is a pleasure to the Working Committee that there were at least 19 Honorary members of the Union and Honorary Visitors to the College and over 45 old students who attended the celebrations. The following is the list of those who came from outside.

Honorary members and visitors.

1. Mr. D. T. Chadwick, Director of Agriculture, Madras.
2. Mr. M. E. Couchman, Collector of South Canara.
3. Raja Vasudeva Rajah of Kollengode.
4. Dewan Bahadur M. Adhinarayanaiah
5. Mr. N. Pattabhirama Rao, Retired Dewan of Cochin.
6. Hon'ble L. D. Swamikannu Pillai, Registrar of Co-operative Societies, Madras.
7. Mr. P. Subbaraya Aiyar, Pleader, Madura.
8. Mr. K. Ramaswami Aiyar, High Court Vakil, Madura.
9. The Zamindar of Uttukuli, Coimbatore.
10. Mr. K. R. Ramasastrulu Nayudu, Ag. Dy. Director of Agriculture, Trichinopoly.
11. Mr. C. Venkatachariar, Mutadar of Salem, Kadathur.
12. Rao Bahadur C. Hanumantha Gowd, Hospet, Bellary.
13. Mr. P. T. Rangasami Aiyangar, Kulitali.
14. Mr. Vengail K. Krishnan Nayanar, Malabar.
15. Mr. Adinarayana Reddi, Nellore.

Of the old Saidapet students who came from outside were the following :—

1. Rao Bahadur J. Dharmaranga Raju, Diwan Peishkar, Pudukotta, Vice-President.
2. Mr. G. Rajagopal Nayudu, Retired Agricultural Inspector, Vice-President.
3. Mr. V. S. Gurunatha Pillai, Retired District Forest Officer, Punganoor, N. Arcot Dt.
4. Mr. M. Panchapakesa Aiyar, Dt. Forest Officer, C. C. Coimbatore.
5. Mr. S. Babu Rao, Sanitary Inspector, Madras.
6. Mr. A. Ramanadha Aiyar, Assistant Inspector, Distillery, Bellary.
7. Mr. G. Jogi Razu, Farm Superintendent, Pittapuram.
8. Mr. D. Appa Rao, Kasimkotta.
9. Mr. S. Raghava Aiyangar, Agricultural Teacher, Training College, Rajamundry.
10. Mr. K. Sankara Aiyar, Farm Manager, Manganullur, Tanjore Dt.
11. Mr. T. R. Venkaswami Rao, Farm Manager, Palur, S. Arcot Dt.
12. Mr. Mahamad Azizuddeen Sahib, Curator, Forest Museum, Coimbatore.
13. Mr. K. Unnikrishna Menon, Farm Manager, Taliparamba, Malabar.

Of the old Coimbatore students the following attended the College Day :—

1. Mr. Vengail K. Krishnan Nayanar, Malabar.
2. Mr. T. N. Veerarayan, Tirumalpad, 4th Raja of Nilambur.
3. Mr. K. Thimmappa Alwa, Assistant Farm Manager, Taliparamba.
4. Mr. T. V. Srinivasa Charlu, Farm Manager, Pudukotta.
5. Mr. K. Bhima Rao, Agricultural Teacher, Central High School, Mercara.
6. Mr. C. S. Madiab, Agricultural Teacher, Court of Wards, Madras.
7. Mr. K. Sankara Nayar, Malabar.
8. Mr. V. Ratnaji Rao, Nellore.
9. Mr. K. N. Sankaranarayanan, Madura.
10. Mr. D. B. Sivarama Rao, Salem.

The above list shows that the purpose for which the Union was brought into existence, viz., to create an *esprit de corps* amongst the members and to foster an attachment to the College has already been secured and that the Union was a long-felt want. We hope that there will be even a larger attendance of Honorary Members and old students in future gatherings.

Of the subjects brought up at the Subjects Committee meeting on the afternoon of Sunday, 13th instant, at which only old students and

officer members were present and presided over by Rao Bahadur J. Dharmaranga Raju there were some which were not considered necessary or even admissible to put forward as regular propositions at the regular business meeting which was to be held on the next day. One of these was with respect to the scale of salaries in the Department with special reference to the statement made in his speech by the Hon'ble Sir Harold Stuart. Another referred to the desirability of allowing old students who had failed to obtain the Diploma in the first instance to come up again under certain limitations to complete the Diploma. A third subject was with reference to the status and prospects of agricultural students who took up service as agricultural teachers in the Educational Department.

Resolved that Rao Bahadur J. Dharmaranga Raju be requested to interview the Director of Agriculture on the above points.

We have been greatly amused by the manner in which the question of starting Dairies in Madras, has been discussed in the papers. Some of the articles have been contributed by persons who have no detailed knowledge of the working of a Dairy Farm. Some have asked that Messrs J. R. Ranga Raju Bros., the Dairymen of Madras should supply the public with the requisite details. What we wish to point out is this. A Dairy Farm is a business concern involving the outlay of large sums of money. It requires an intimate knowledge of the treatment of cattle in health and disease, of the growing of fodder in a properly cultivated farm, of the regulating of diets according to the availability and market rates of concentrated foods of the method of manufacturing of the different varieties of dairy produce and of their preservation and disposal, and lastly of a well conducted system of accounts as carried on in an up-to-date firm. A project of this nature is more or less speculative. There may be money in it if properly managed and there may be a serious loss not only of profits but also of the capital, if not well managed. The proper course would be for those who venture to speculate on this subject to form themselves into a limited company with plenty of capital invested in a Bank, advertise for or otherwise secure a really competent man to manage the concern and entrust the management more or less completely to him. We know of instances where, for want of the above conditions, Dairy Farms have failed in the Madras Presi-

dency. We do not wish in any way to damp the ardour of those who wish to start a Dairy Farm of large pretensions in Madras. On the other hand we are convinced of the necessity for controlling the supply of milk and milk products in Madras and other large towns and only wish to point out "Start well and with foresight before you venture."

REVIEWS

The Madras Agricultural Calendar.

This Calendar, sold for a nominal price of one anna continues to give much useful information in the shape of notes and articles by Experts. Messrs. Sampson, Wood, Fletcher, Harrison, McRae, Hilson, and Aitchison have written popular articles on subjects pertaining to the different branches of agricultural science.

The Agriculturist.

This Tamil monthly has recently added one more form and is priced twelve annas per annum all the same including postage. Messrs. Ranga Raju & Bros. of whom Mr. J. R. Ranga Raju is the youngest have all received a sound agricultural training and are conducting this vernacular Journal purely for the good of the ryot classes. The work they have undertaken and have been carrying on for over four years would appear to be missionary in character and they are editing it in a thorough manner. Besides useful articles written by experts and by the three brothers a most interesting feature of Journal which seems to be developing is the system of questions asked by Subscribers and detailed answers furnished by publishers.

The Tropical Agriculturist.

This Journal was founded in 1881 by Mr. J. Ferguson and published by him for nearly forty years with conspicuous success. It has recently been purchased by the Ceylon Agricultural Society whose organ it will be in future. At a meeting of the Ceylon Board of Agriculture held in February last presided over by His Excellency, a committee was appointed to arouse public interest for the institution of a college of Tropical Agriculture and to point out the advantages of Ceylon as a site for such a college.

The recent publications put forth strong pleas for the same and we

shall be glad if Ceylon were selected by the colonial Government as we believe that some of the Indian agricultural students who wish to specialize in the cultivation of tropical plants would also be profited by it. Ceylon is as near to several Madras students as Coimbatore and the cost of living will not be high.

Central Agricultural Committee.

The Central Agricultural Committee, Madras, has begun to take, active steps to justify its existence. The help of the Director of Agriculture and of the Registrar of Co-operative Credit Societies has been secured for the purpose of forming agricultural associations on a co-operative basis. Diwan Bahadur M. Adinarayanayya, Retired Deputy Commissioner of Revenue Settlement, Madras, and one of the Secretaries of the Central Agricultural Committee has been deputed to make tours in the Districts and help in organising agricultural associations on co-operative lands. In this connection we beg to invite the attention of our readers to the proceedings of the District Agricultural Association, Coimbatore, printed elsewhere.

Extracts.

Agricultural College Day.

In the stimulating speech which he made at Coimbatore, on College Day the Hon'ble Sir Harold Stuart alluded to the great part played by the large landholders of England in agricultural improvement and development, and cited, amongst other instances the practical work done by a King and a Prime Minister. To those may be added the example of Lord Townsend, who retired from a Ministry and superintended the introduction of turnips—then a new crop—into Norfolk. Sir Harold Stuart continued that, in this country, the permanent settlement has conferred position, security and wealth on a class of large landholders, and one of the best ways in which they could discharge the obligations and responsibilities inseparable from those privileges would be by endeavouring to advance agricultural knowledge and improvement among their tenants. Such work possesses a great feature in that it repays close and detailed attention. The closer the attention that can be given to agricultural matters, the more attractive and absorbing do they become. But it is often too readily assumed that, if a Zemindar endeavours to practise new methods or to demonstrate improvements on his own farm, he is sure to lose financially, whereas the opposite should be the case. It is a question of competent management, and the more a Zemindar knows of the details of agricultural

methods and the closer the attention that he can give to the work on the farm, the less likely is he to suffer from incompetent Managers.

The home farms at Pittapur and Sivagiri are under careful management and are financially successful. Sivagiri has also shown that such farms can form centres from which improvements in agricultural practice may radiate. We believe we are correct in stating that one of the first places at which the growing of green manure crops, which has proved so profitable on so much of the wet land of this presidency, was tried was Sivagiri. It is certain that at the commencement of the spread of this work the Agricultural Department obtained much of their *kutinji* seed through the assistance of Mr. Rama Rao, the Manager of Sivagiri Farm. There is another practical reason why continued attention should be paid at present to improved methods, better implements and more expensive fertilisers. Though some improvements, e.g., single seedling transplantation of paddy and green manuring demand no initial outlay, yet frequently an improvement consists in purchasing a new and more expensive implement or buying more manure. The return and profit is found in the value of the increased crop. There is an old saying that "high farming is no remedy for low prices." But when prices are high and are rising, the value of the increased outturn resulting from the use of fertilisers, etc., is proportionally increased. The general level of prices in South India has been rising for some time, and the recent return of Sea Customs shows that trade is booming. This, then, is a time when it would pay to put capital and labour into land and build up fertility against the time when prices may fall; so both from enlightened self-interest as well as from a sense of duty, Sir Harold Stuart's appeal to the Zemindars of this Presidency was especially opposite. But to bear fruit it means that the Zemindars must take direct personal interest in agricultural work and understand it.

Turning to the papers which were read at the Conference, the best one contributed on Saturday was that of Mr. TIMMAPPA ALWA. In well phrased and at times humorous language he told of the confidence and initial failure of the boy who, in his College holidays, endeavoured to persuade the people of a neighbouring village to adopt a new method of making jaggery. The next year he tried again and this time the attitude of the villagers changed from derision to doubt. Again he tried, and one spirit bolder than the rest undertook to try the iron mill and large iron boiling pan, provided that if it failed Mr. TIMMAPPA ALWA would buy the apparatus. The villagers came and watched the trial and apparatus was not entirely successful. After another attempt the result was however satisfactory. The villager kept his mill and boiling pan and others bought them for themselves. This apparatus, though in common use in Godavery

and Coimbatore, was unknown in South Canara. As a result of the work of the men at Taliparamba, its advantages are now becoming known, and firms have opened agencies in Mangalore for the sale of such implements. This incident illustrates the perseverance and patience required to persuade villagers of the utility of new methods, and the absolute necessity for the would-be teacher to be a practical master of his subject.

Monday's discussion was opened by two good papers, by Mr. K. RAMASAWMY IYER and the Hon'ble Dewan Bahadur L. D. SWAMIKANNU PILLAY, respectively, on "Co operation in Agriculture" and "Improvement of Cattle." It was pleasing to hear the first speaker, who has had practical experience of co-operative work and is a firm believer in its possibilities, laying stress on the necessity of co-operative work being commenced in and primarily confined to the villages, and insisting that at first chief attention should be paid to the simplest forms of co-operative work, e.g., the joint purchase of special seeds or manures or implements. Other openings for joint work would be found as confidence and the recognition of common interests grew. It is more important to start Societies which possess the power and possibility of growth than to persuade a village to embark upon a more ambitious co-operative enterprise for which it is not ripe. Once a Society gains confidence and trust in itself as a result of what it has done, other chances of corporate action open out to it. In Madura recently the Forest Department was growing *datcha* seed for the Agricultural Department to be sold by it for the purposes of green manure. But a Co-operative Credit Society working in one of the ranges in which this was in progress, promptly bought the whole crop of seed at wholesale prices for the use of its members. The readers of these two papers reminded the members of the Students' Union that, unless a promising field of activity is to be neglected, those members of the Union who are engaged in spreading knowledge of agricultural improvements should make themselves familiar with the possibilities of co-operative work and draw the attention of villagers to it. For here, again, it is essential to interest men in this work who are possessed of detailed local knowledge. The custom of trade varies in different Districts, and a form of co-operative effort suited to one District may not be applicable to another. There are great possibilities before this work, but plans evolved from a detailed knowledge of local circumstances are infinitely preferable to schemes evolved on paper from headquarters. The recent Report published by the Central Agricultural Committee, whose Secretaries attended the College Day, foreshadows that they intend to try to find men possessed of detailed local knowledge and of influence in their villages, who will endeavour to see what possibilities for agricultural co-operation may exist in those villages. The credit movement started in the villages is growing and developing into Unions and larger organisations, and if agri-

cultural co-operation is ever to become firmly rooted, it seems to us that it must follow a similar course. The growth and progress will be slow, but there is then a fair hope that the movement may be genuine and not artificial.

The next paper, on the "Improvement of Cattle," illustrated one of the dangers which this Conference, if it is to prove useful, should most carefully avoid. The discussion showed a tendency to digress into one on forest policy, until checked by two of the Hindu officials of the Union. From the rules of the Union the object of the Conference is for members to relate their practical experiences and debate on the possibilities of work before them in conditions as they are. There are other assemblies and other means by which questions affecting the policy of the Government may be discussed, but there are few Meetings confining their attention to the results of practical work in agriculture and the possibilities of further work. This Conference will continue and increase in usefulness so far as it adheres to its own rules in discussing practical experiences, and practical or scientific work, accepting local conditions as they are. One of the healthiest signs of the Union is the manner in which the old boys of Saidapet have rallied to it. There is no break between the boys of Saidapet and those of Coimbatore, and this harmony was shown at the Meeting by the gift to Coimbatore by an old Saidapet boy of the portrait of his former Principal, Mr. Keess. The Meetings were well attended by members and visitors from many Districts, and the organisation reflected credit on the local members of the Committee, and it must have been exceedingly gratifying to all, especially to the older men, to hear Sir Harold Stuart's assurance of the continuance of the support by the Government and to hear H. E. the Governor's message. But if there is one Department which has its fate in its own hands it is the Agricultural Department. It has justified the faith which called it into existence; it remains for it to justify the increased confidence bestowed upon it. Police and Judges will remain so long as it is human nature to rob and to cheat. Doctors will be needed whilst disease remains to be fought, but expenditure of State funds on an Agricultural Department is only justified so long as the practice of agricultural improvements is spread throughout the Districts. Increased grants mean increased responsibilities, and the future of the Department lies in the work of all its members. *From the Madras Mail.*

The Agricultural Association.

COIMBATORE, 17th July.—A Meeting of the Coimbatore District Agricultural Association was held at the District Board Office on Monday. Those present included the Hon'ble Dewan Bahadur L. D. Sawamikannu Pillay, Dewan Bahadur M. Audinarayaniah, Rao Bahadur A. T. Tiruvengadasawmy Moodelliar, Rao Bahadur T. S. Balakrishna Iyer, Mr. M. G. Arokiasawmy Pillay, Khan Sahib Syed Dewan Abdul Razak Sahib, Messrs. D. T. Chadwick, I.C.S., Patta-

birama Rao, T. A. Ramalingam Chettiar, Vice-President and Secretary, Rao Bahadur C. H. Gowd, K. Ramasawmy Iyer, Mascarenhas and K. R. Subramania Iyer, Mr. F. R. Hemingway, I.C.S., the President of the Association, was in the Chair.

MR. HEMINGWAY'S SPEECH.

The Chairman, in opening the proceedings, spoke as follows :—

GENTLEMEN,—We ought to be grateful to Mr. D. T. Chadwick and Mr. Swamikannu Pillay and to our other distinguished visitors for their presence on this occasion. You know we have been anxious for some time to improve the activities of our District Agricultural Association, and really it is about time we did so. After all, with the exception of our successful management of the Tirupur Cattle Show, we have of late years done practically nothing. We have, it is true, collected a large sum in subscriptions and donations, and we have all been anxious to do something with this money for the improvement of agriculture in this District, but we have all suffered from a lamentable deficiency of ideas. It was with the hope of getting some good advice and some good ideas that we invited Mr. Swamikannu Pillay to be present, and arranged this Meeting on a date suitable to him. It is our good fortune that a Conference was held at the Agricultural College yesterday about the improvement of agriculture in rural areas by co-operation or other means, and a good many of us were, by the kindness of Mr. Chadwick, permitted to take part. I think we all feel that our minds were a good deal cleared by the discussion that took place, and I propose to describe briefly the discussion and the conclusions arrived at.

It became obvious at once that it is essential for any progress, that we should create small bodies of earnest and intelligent men in the villages to undertake practical agricultural improvements, and that little was to be expected from large bodies working in large areas. This was brought home to us by what has been done recently in Malabar, which was described to us by an Agricultural Assistant yesterday. What they did was as follows:—It was decided that the undoubted improvement of single seedling paddy planting should be introduced in that District, and certain members of the District Agricultural Association promised that they would induce a certain number of ryots in their own villages to try this experiment. An Agricultural Assistant was then directed to interview these gentlemen, and ryots in a number of suitable localities were induced to try the single seedling system of planting. The Agricultural Assistant went round the villages at the time of sowing and of planting, to see that the ryots were making no mistakes and generally to advise them. In this way you see, gentlemen, by a little pains a small body of workers was created. We then considered whether this sort of thing could

not successfully be introduced in this District and whether there were any demonstrated improvements in agricultural practice which could be confidently recommended to our ryots. We were fortunate in having good advice, and it was pointed out that green manuring and single planting would be an undoubted success on our wet lands. It was pointed out that in dry and garden lands, a good deal could be done by procuring pure seed of good quality, and it was suggested that new manures, namely, fish manure, and improved ploughs might be introduced with advantage, and it became clear that, with proper attention to detail, the Malabar plan might be introduced into this District. It was further pointed out by those interested in co-operation, though the question is not one of immediate importance to us, that it was possible that the ryots induced to introduce these improvements, might later on find it desirable to spend money jointly on their mutual agricultural needs, and to collect a joint fund for the purpose and might thereby form the nucleus of an Agricultural Co-operative Society. We may hope that this may be so, and it is easy to see that experience may point out many ways in which such bodies of ryots might find co-operation beneficial. The Agricultural Assistant and the Officer of the Co-operative Credit Department might well be on the watch for such possibilities. Of course, it is not necessary to the success of the Malabar system that co-operation of this kind should be introduced, and much can clearly be done without it; but we ought not to shut our eyes to such possibilities.

It was suggested that some attempt should be made to make use of our existing Co-operative Credit Societies for the purpose of agricultural improvement, in addition to the purely money business that they conduct already. The advantages were pointed out that in these Societies an existing organisation lay ready to hand, and that the members of those Societies were ordinarily of just the type we want, namely, prominent men animated by public spirit and a desire for progress. The more obvious dangers of such a course were at once pointed out by some gentlemen connected with the District Urban Bank (from which these Societies are largely financed), who said that co-operation in agricultural business was apt to be risky, and that there was a danger of Societies lowering their credit by such experiments. The matter was discussed for some time. I think most of us were satisfied by Mr. Swamikanon Pillay's answer that such enterprises would be safe, if the amount of money which Societies were allowed to spend in agricultural co-operation was limited to from 10 to 20 per cent. of their credit. Indeed, I am inclined to think that our fears were a little exaggerated, just as our hopes at the recent Co-operative Conference were a little sanguine. It seems reasonable that Mr. Swamikanon Pillay, with the advice of the Agricultural Department, would be in a position to stop anything really rash or dangerous. It was formally agreed, therefore,

that it would be a good thing for our Agricultural Assistant to interview the Panchayats of such Societies and discuss with them the possibilities of useful agricultural co-operation.

An alternative proposal was also discussed, namely, that entirely separate Societies for agricultural co-operation should be started in addition to the existing Credit Societies instead of an attempt to graft agricultural co-operation on the latter. But the feeling generally prevailed that it was better to use the existing organisations instead of having two side by side. It was also suggested that Societies which adopted agricultural co-operation or which should hereafter be created for that purpose should be financed not by the District Urban Banks, but by the District Agricultural Associations. The general opinion was opposed to this, partly because it appeared better to have one co-operative organisation instead of two, and partly because it seemed hardly a legitimate activity of a District Agricultural Association to undertake banking business.

Here, then, we have two definite and practicable lines of advance on one of which we can confidently make a start without a moment's delay. There is no reason to fear that we shall fail while Malabar is succeeding, and I am convinced we can find among gentlemen here present a sufficient number who are prepared to undertake to induce a body of intelligent and experienced ryots in their villages to undertake improved methods. We are to have, owing to the kindness of Mr. Chadwick, an Agricultural Assistant for this District, and it will be easy for him to go round and supervise those who adopt improved methods, and prevent their making mistakes. As for the second line of advance, it will be easy for the Agricultural Inspector to interview the Panchayats of existing Credit Societies to see whether agricultural co-operation would be possible and beneficial to them. We cannot in this case so confidently prophecy the result; but it would be our duty to watch our progress on both lines and to do what we can to make it successful.

Mr. T. A. Ramalingam Chettiar, Vice-President and Secretary of the Agricultural Association, translated the above speech in Tamil, while Dewan Bahadur Andinarayanayya spoke at some length in Tamil, Messrs. Chadwick and Swamikannu Pillay also made a few remarks.

The following gentlemen came forward to undertake the experiments themselves and also to induce some of their neighbours to do the same:

Sing Seeding and Green Manuring.*—Messrs. Kallapatty Ramasawmy Gowndan, M. G. Arokiasawmy Pillay, T. A. Ramalingam Chettiar, Nallaveerappa Moodaliar, Muthusawmy Gowndan, Malayandi Chettiar, Khan Sahib Syed Dewan Abdul Razak Sahib, Ananthasubramania Iyer, Sivarama Sastriar, Venkatesa Iyer and Timma Gowndan.

Fish Manure.—Messrs. Kuppusawmy Gowdan, Rangayya Gowdan, G. P. Venkatesa Iyer and M. G. Arokiasawmy Pillay.

Cambodia Cotton seed.—Messrs. Kuppusawmy Gowdan, Rangayya Gowdan and Raya Thevan.

The following Resolutions were then passed :—

(1) To accept with gratitude the offers of the above to carry out the above improvements noted against themselves and to induce between five to ten of their neighbours to do the same.

(2) To ask Mr. Chadwick to kindly direct his Assistant to co-operate with these gentlemen and

(3) To communicate to the Registrar of Co-operative Credit Societies the result of the endeavours of the gentlemen mentioned in Resolution 1 to interest their neighbours in agricultural development, and to express their sincere thanks to the public who have advised the Meeting, especially to Messrs. Chadwick Swamikannu Pillay, Audinarayanayya, Pattabirama Rao and Gowd.

Messrs. Audinarayanayya and Gowd congratulated the Agricultural Association on having such an enthusiastic President, and thanked Mr. Hemingway for the keen interest he has taken in the matter of agricultural development which they were personally able to see during these three days of their stay.

The usual votes of thanks brought the proceedings to a close.—(From the Hindu)

FARM NOTES.

BY

G. JOGIRAJU.

Superintendent, Estate Farm, Pillapuram.

The rainfall of 1912-13 has been peculiarly favourable in this locality. The total rainfall has been the least on record during the last 6 years (29.09" in 1907-08, 29.20" in 1908-09, 39.68" in 1909-10, 53.29" in 1910-11, 42.08" in 1911-12 and 26.60" in 1912-13) but its distribution was so well regulated that both the dry and wet crops were at their best during the year. With 42.08" in 1911-12 about 40 garces only of Paddy were produced while in 1912-13 with only 26.60" about 60 garces of Paddy were produced on the farm from nearly the same area. (A garce=600 kunchams or about 4200 lbs. of Paddy).

The total yield of rice and crushings from Paddy seems to depend a good deal on the quantity of rainfall. In 1908-09 when the rainfall was low, (29.20") the average yield of rice and crushings by weight (from 9 varieties cultivated) was 63.41%. In 1909-10 with a rise in rain in fall, (39.68") the average (from 14 varieties cultivated) rose to 65.60%. In 1910-11, with a rainfall of 53.29" which was the highest on record during the 5 years under observation, the

average (from 17 varieties cultivated) was also the highest on record being 70.20% again. In 1911-12 when the rainfall was lower (42.08) the average yield of rice and crushings, (from 19 varieties) also fell down to 65.81%. And in 1912-13 when the rainfall was the least (26.60%) the average (from 19 varieties) was also the least, having further fallen down to 63.25%. Tellakonamani rice (6.61%) and more of phosphoric acid also (40% against 32 %). The yield too is high, not falling below that of the Tellakonamani. Especially after selection of seed from a few well grown stools in 1910-11 the yield has been very satisfactory, having been in 1912-13 an average of 2920 lbs. per acre for 10.16 acres against an average of 2894 lbs. per acre of Tellakonamani for 7.21 acres of the adjacent and equally good, if not superior land, and thus beating the latter. The yield per acre has, in certain plots, risen up to 3405 lbs. per acre. The grain fetches a higher price than the Tellakonamani (from 8 to 12 annas per bag of 166 lbs.) and is thus more profitable. The percentage yield of rice and crushings is also slightly greater than that of Tellakonamani, being on an average for three years 66.82% by weight and 49.10% by volume against 66.42 by weight and 48.67% by volume. Two points, however, are against it. The Ratnachudi No. I crop cannot withstand drought while Tellakonamani can to a slight extent; and the grain is difficult to thresh out from the straw, adhering more strongly to the ears than in other varieties.

NOTES.

We beg to offer our hearty congratulations to Professor K. Rangachariar on the title of Rai Bahadur conferred on him on the occasion of H. M. the King Emperor's birthday and on his promotion in the Department.

Rai Bahadur K. Rangachariar was the first Botany M.A. of the Madras University and secured a first class in it, at a time when there was no regular instruction in that subject. Subsequently he passed the L. T. Degree Examination. For some time he was Headmaster of the Municipal High School at Anantapur, but later on he accepted service at the Government Museum, Madras as Herbarium Assistant. He did valuable work in the Museum, in conjunction with Dr. Thurston and his work as acting Superintendent of the Ethnological Survey received the approbation of Government. He acted as Professor of Botany in the Presidency College, Madras on more than one occasion and was the 2nd Assistant, in the Provincial Service, in the Teachers' College when his services were lent to the Agricultural Department 4 years ago, for employment as Chief Assistant to the Government Botanist on Rs. 200 in the grade Rs. 150—20—250. He soon got promotion on his permanent appointment in the Educational Department to Rs. 250 and then to Rs. 300. As there was no opening for an Indian Subordinate beyond Rs. 250 in the Agricultural Department and as his services were urgently required at the Agricultural College, the question of his future

status and salary engaged the attention of the Department and of the Government and it is gratifying to us to be able to announce that both the Agricultural Department and the Government have behaved handsomely towards Rai Bahadur K. Rangachariar, by appointing him as an independent officer with the designation of Government Lecturing Botanist, with the same status and privileges of other experts, on a salary of Rs. 330-30-000, which works out to the Provincial 2rds of the salary of Rs. 500-50-1,000, of the European experts.

This is the first instance of an Indian, purely with qualifications of an Indian University, being appointed to the grade of scientific experts and we hope that this will not be the last one.

Rai Bahadur Rangachariar will, in addition to teaching work at the College for which he will be entirely responsible, be in charge of the Herbarium, and will be assisted by a number of assistants and other staff.

Mr. K. Ramanaiahachari, L. Ag. has been appointed Assistant Farm Manager on probation and posted to Manganallur Farm.

The Government of Madras have appointed the Sanitary Engineer to Government, the Director of the King Institute, the Government Agricultural Chemist and the Principal of the Agricultural College to form a Commission to conduct experiments, enquire into and report upon questions of sewage disposal and the working of Sewage Farms in the Madras Municipality, which have been the cause of great vexation and annoyance to the residents and Municipal Commissioners for some time.

Whatever may be the conclusions to be arrived at by the Commission whose report we are awaiting, we may be permitted to suggest that the management of Sewage Farms should be in the hands of trained agriculturists, just as other Farms are. It will be of advantage to the manager of a Sewage Farm to have a training, if possible, in Sanitary Science; or, if the manager should be a Sanitary Officer, he should acquire agricultural knowledge to manage a Farm. We believe there are a few men in the service of the Madras Municipality who have made their mark in both capacities and it should be possible to utilise the services, offering them a better salary, if necessary.

The children's treat organised on the estate on the occasion of H. E. the Viceroy's birthday was a great success. A sum of Rs. 75 was collected and sweets and toys were distributed by Mrs. Sampson to over 200 children who also enjoyed the Merry-Go-Round and Peep-Show very much.

The Bromide Enlargement of Mr. Koess was made, for Mr. M. Parameswara Aiyar, by Mr. Athrishtam Pillai of Porsawalkam, and has been very well done. We beg to commend the young, rising artist to the notice and patronage of our readers.

The Conference Group Photograph, a halftone picture of which is sent along with this Journal, was taken by Mr. M. R. Pillai, Photographer, Coimbatore, who will be glad to supply copies of the original at Re. 1-0-0 for a silver print and Re 1-4-0 for a bromide print.

The Minor Zamindars of Newington, accompanied by Messrs. C. Morrison and Blunt paid a visit to the College on 4th and 5th July 1913 and played a Cricket match with the College Team defeating the latter.

A number of old students were deputed to attend the College Day and Conference, by the officers noted and the thanks of the Committee are due to them.

By the Pudukkottai Durbar.

Rao Bahadur J. Dharmaranga Raju, Dewan Peishkar and Mr. T. V. Srinivasachari, Farm Manager.

By the Court of Wards, Madras.

Mr. C. S. Madiab, Agricultural tutor and the Minor Zamindar of Wuyyur.

By His Highness the Rajah of Pittapuram.

Mr. G. Jogi Raju, Farm Superintendent

By the Deputy Director of Agriculture, Southern Division.

Messrs. T. R. Venkasami Rao, K. Sankara Aiyar, K. Unni Krishna Menon and K. T. Alwa, Farm staff.

Rai Bahadur Ganga Ram, C. I. E., a distinguished retired Executive Engineer, has endowed Rs. 1,800, for founding a gold medal called the Sir Louis Dane Medal, to be awarded annually at the Punjab Agricultural College, Lyallpur to the first student of the year in the Diploma Examinations.

We do not know what has been done with regard to the institution of the Sir Arthur Lawley scholarship, proposed to be endowed by the Zemindars of the Madras Presidency when some of them waited on His Excellency at the time of his retirement, asking for his permission to associate his name in connection with a scholarship for a deserving student of the Agricultural College, Coimbatore.

We have been asked by several subscribers to the Krishna Prabhu Memorial Fund what has become of it. We believe that, at a meeting held a short time after his death in 1904, a committee was formed with Mr. S. Babu Rao as Secretary and Mr. S. P. Swaminatha Aiyar as Treasurer, and that a small sum was collected at the time. Several other old students of the late Mr. Krishna Prabhu are anxious to join in the movement and, if nothing else be done, to present a good sized bromide enlargement to the College at Coimbatore. We

hope that the Secretary and the Treasurer will take steps to bring the affair of the memorial to a successful end. The amount collected should have nearly doubled in these 9 years, if it had been invested, say, in a Co-operative Bank.

The presence of a large number of gentlemen interested in Agriculture was utilised by the Joint Secretaries of the Central Agricultural Committee, Madras, to bring them together on the afternoon of 13th July 1913 at an informal meeting in the College Library for considering the subject of forming Agricultural Societies on a co-operative basis. Among those present were Messrs. F. R. Hemingway, D. T. Chadwick, H. C. Sampson, Hon'ble Dewan Bahadur L. D. Swamikannu Pillai, Dewan Bahadur M. Adinarayanayya, N. Pattabhirama Rao, Rao Bahadur J. Dharmaranga Raju, Rao Bahadur C. Hanumanta Gowd, Rao Bahadur T. S. Balakrishna Aiyar, Rao Bahadur A. T. Tiruvenkataswami Mudaliar, M. Sambandam Mudaliar, M. R. Narayanaswami Aiyar, T. A. Ramalingam Chettiar, T. R. Srinivasa Raghava Aiyar, M. G. Arokiasami Pillai, C. A. Venkatakrishna Aiyar, A. T. Lakshmanaswami Mudaliar, Ratnasabhapathi Mudaliar, J. Chelvaranga Raju, M. R. Ramaswami Sivan and C. N. Krishnaswami Aiyar.

The discussion was opened by Mr. Chadwick explaining the circumstances which led the Central Agricultural Committee to resolve at their meeting held in April last to concentrate attention on forming Agricultural Associations on a co-operative basis in the different parts of the Presidency. The circular letter of the Central Agricultural Committee on this subject was then distributed among the gentlemen present. After a full discussion which lasted for nearly 2½ hours in which Messrs. Hemingway, Ramalingam Chettiar, Srinivasa Raghava Aiyangar, Arokiasami Pillai, Balakrishna Aiyar, Chelvaranga Raju, Dharmaranga Raju and others took part and, after hearing the remarks of Messrs. Sampson, Adinarayanayya and Swamikannu Pillai, the general sense of the meeting seemed to be in favour of the following conclusions:—

1. That existing Co-operative Societies might be given in special cases (to be reported by the Registrar to Government) special additional credit for agricultural work to be done by such societies in their corporate capacity.
2. That new Societies on a co-operative basis should be credited for agricultural work, wherever practicable.
3. That the new societies to be formed for agricultural work should be on a limited liability basis.

The gentlemen who took part in the discussion gave interesting information from personal experiences in regard to the direction in which co-operative societies would be helpful for the improvement of Agriculture. Mr. Sampson said that fish manure was used for ragi cholam and sugarcane crops in the Central Farm and found to give good results. This manure and seeds of sunn-

hemp, daincha and wild indigo for raising green manure crops could be purchased and distributed to the members by village societies. Mr. Dharmaranga Raju remarked that the Tinnevely improved plough costing Rs. 6 was found to be an admittedly improved plough and village societies could purchase and supply them to their members. He pointed out also that seedlings for single seedling transplantation can be prepared by village societies and supplied to members. It was clear from the remarks made by the several speakers that, for the introduction of improved agricultural implements, good seed and manures, village societies would be useful and that, to avoid complications, these special societies might be formed on a limited liability basis in the beginning.—(From the Hindu.)

Obituary Notice.

We regret to record the death of Messrs. N. M. Rego, S. R. Ramalinga Aiyar B.S. Narayanaswami Aiyar & T. Ramaswami Aiyangar during the last quarter:—

Mr. Rego was a distinguished student of the first batch of the Saidapet College. He entered the Forest Department as a Ranger and had further training at Dehra Dun. At the time of his death he was District Forest Officer in Upper Godavari.

Mr. Ramalinga Aiyar passed out of the Saidapet College in 1885 and, for a long time, was Manager of Berekai Estate in Salem District. Retiring at a fairly early age from service, he was looking after his landed property at Suler and was carrying on business as a general merchant at Coimbatore. When the Coimbatore College was first opened, he was of immense help to the Indian Subordinates of the Agricultural Department.

Mr. B. S. Narayanaswami Aiyer, B.A., D.A., was Special officer for Coconut Plantation disease in Travancore. After passing out of the Saidapet College in 1892, he was selected by the late Mr. H. B. Grigg, then Resident in Travancore, as Superintendent of the Agricultural Demonstration Farm, Trivandrum, and he did very useful work in that State for nearly 20 years.

Mr. T. Ramaswami Aiyangar retired Sub-Judge, was Secretary and Vice-President of the District Agricultural Association, Coimbatore, and was a prominent figure at all Agricultural Shows and Demonstrations in the district. He delivered his last address at the Tirupur Cattle Show in May last and died at Coimbatore within a few days after his return from Tirupur.

We beg to offer our heartfelt condolence to the members of the families of the deceased gentlemen.

We regret to announce the death, at a very early age, of the wife of Rao Bahadur J. Dharmaranga Raju, one of the Vice Presidents of the Union for the last three years, on 18th July, at the Agricultural College, Coimbatore. The

deceased lady had come to Coimbatore along with her husband for the College Day, and was staying in the house of Mr. J. Chelvaranga Raju. Although she was ailing for some time from dyspepsia, she collapsed suddenly the day after Mr. Dharmaranga Raju returned to Pudukotta. We offer our sincere condolence to Rao Bahadur J. Dharmaranga Raju.

The above is one of the several cases which have happened on the estate where medical help was not available as quickly as may be desired. We beg to plead once more for the opening of a dispensary, by the Department, on the estate which will be a boon to the officers, students and coolies on the estate. The Forest College has already engaged the services of 2 sub-assistant surgeons.

Departmental Notes

The following appointments have been made in the Department :—

1. Mr. G. R. Hilson, confirmed as Dy. Director, N. Division.
2. Rai Bahadur K. Rangachariar, Chief Assistant to Government Botanist has been Gazetted as Government Lecturing Botanist for the Agricultural College, Coimbatore.
3. Mr. T. R. Ranganath, confirmed as Assistant in Mycology.
4. Mr. C. Narayana Aiyar, confirmed as Assistant to the Government Entomologist.
5. Mr. V. G. Dhanakoti Raju, to be Farm Manager, 2nd Grade.
6. Mr. K. Raghavachari, to be Assistant Farm Manager, Mangunallur.
7. Mr. D. Pankala Rao do—do—do Samalkotta.
8. Mr. Bhairya Siva Rao do—do—do Anakapalle.
9. Mr. V. Batnaji Rao, do—do—do Nandyal.
10. Mr. K. Ramanujachari do—do—do Mangunallur.
11. Mr. N. V. Visvanatha Aiyar to be Fieldman, Govt. Botanist's Office.

The following acting promotions are made :—

1. Mr. J. Chelvaranga Raju, Chief Assistant to the Principal, to act as Assistant Director of Agriculture, Southern Division but to help the Principal at the College.
2. Mr. R. Ramaswami Aiyer, Farm Manager, First Grade, to act as Chief Assistant to the Principal *vice* Mr. J. Chelvaranga Raju on other duty.
3. Mr. W. Raghavachari, Assistant Farm Manager, to act as Manager, 2nd Grade *vice* Mr. M. Mangesha Rao, seconded.
4. Mr. K. Ramanatha Aiyar, Asst. Manager to act as Farm Manager, 2nd Grade *vice* Mr. S. Raghunatha Rao on furlough.
5. Mr. S. Subbayya, to act as Farm Manager *vice* Mr. R. Ramaswami Aiyer on other duty.

The following transfers are ordered :—

1. Mr. D. Balakrishnamurti, Manager, 1st grade from the Central Farm, Coimbatore to Anakapalle Agricultural station.

2. Mr. A. V. Thirunuruganatham Pillai, Manager, 1st grade from Koilpatti to Central Farm, Coimbatore.
3. Mr. N. S. Kolandaiswamy Pillai, Manager, 2nd grade, to be in charge of Koilpatti Agricultural station.
4. Mr. V. G. Dhanakoti Raju, Manager, 2nd grade to Palur Farm.
5. Mr. T. R. Venkaswami Rao, Manager, 2nd grade to Palur Farm.
6. Mr. K. Narayana Aiyangar, Manager, 2nd grade, from Kurnool to Hagari Farm.
7. Mr. M. Raman, Assistant Farm Manager, from Sugarcane station, Coimbatore to Koilpatti, special duty—Tuticorin Circle.
8. Mr. T. S. Venkataraman, Assistant Farm Manager, from Hagari Farm to Sugarcane station, Coimbatore.

The following officers were granted leave during the last quarter :—

1. Mr. P. A. Raghunathswami Aiyangar, Chemistry Assistant, Privilege leave, 3 months.
2. Mr. K. Krishnamurthi Rao, Chemistry Assistant, Privilege leave, 3 weeks.
3. Mr. A. V. Thirunuruganatham Pillai, Farm Manager, privilege leave on medical certificate, 6 weeks.
4. Mr. Y. Ramachandra Rao, Assistant to the Government Entomologist, privilege leave, 1 month.
5. Mr. T. V. Rajagopalachari, Farm Manager, privilege leave, 1 month.
6. Mr. L. S. Natesa Aiyar, Farm Manager, Hagari Farm, privilege leave, 3 months and 3 months' furlough on medical certificate, in continuation.
7. Mr. V. G. Dhanakoti Raju, Farm Manager, privilege leave, 3 months.
8. Mr. T. S. Venkatarama Aiyar, Asst. Farm Manager, privilege leave on Medical Certificate for 3 months.
9. Mr. M. Raman, privilege leave for 2 weeks.

The resignation of Mr. S. Anantharama Sastri, D. A., who was Assistant Farm Manager at Samalkotta has been accepted.

The appointment of Mr. D. B. Sivarama Rao, L. Ag. as Assistant Farm Manager, Koilpatti, has been cancelled.

The Government have sanctioned that the Fieldmen of the different offices in the College will be started on Rs. 35 5/2-50 when Agricultural Students who have secured the Diploma are appointed to those posts.

CORRESPONDENCE.

We have much pleasure in publishing the following letter from Mr. R. C. Wood, Principal, now on leave in England :—

The Clive Vicarage, Shropshire, July 18th.

DEAR MR. EDITOR,

The promise which your importunity extracted from me before I left Coimbatore has been on my conscience for some time past. 'I

must try and see whether I can find anything to write to you which will interest the readers of your journal. My seven years' absence have coincided with considerable changes, many of which, however, are not worth recounting. Though not at present important from an agricultural point of view, the enormous increase in motor traffic strikes the home comer perhaps more forcibly than anything else: it is hardly possible to ride in a horse-drawn carriage in London now-a-days, as all the cabs and trams and omnibuses are now motor driven. This change has occurred almost entirely in the last eight years and has resulted not only in a general improvement of the roads which are now very largely made with tar and are much cleaner and less dusty, but is leading to the opening up of the country in a most remarkable way. With better roads and more reliable and cheaper motors, distance is annihilated, and the farmer who lives in the country is brought into much closer touch with the business methods of the towns. The motor has made as yet little progress in the cultivation of the land, though small oil engines for threshing, chaffcutting and the preparation of cattle food are coming into increasing use. The horse is still the only tractive force on the land, though I should think it is only a matter of time before he gives place, as he has in the towns, to the motor.

My first view of the country was on my journey to London from Dover, the point at which I landed from France. Our journey was not without incident, as the steamer was discovered to be on fire just before reaching Marseilles, and, though there was no personal risk and we all got safely off at Marseilles, our luggage was not so fortunate and was badly damaged. I am still corresponding with the Steamship Company about the compensation to be paid. From London I travelled to Hampshire where I stopped for some time near the sea. Next I went to Cambridge, then to Norfolk and I am now in Shropshire, in the west country, so that I have roughly seen the east, south and west of England, I was fortunate in getting a spell of warm dry weather for the first month or more which was of value to the farmers in getting in their early hay crops in good order.

The mention of this crop calls attention to what seems to me the main difference between the systems underlying the agriculture of England and S. India. The feeding of cattle, both bullocks and sheep,

and the consequent production of a rich and plentiful stock of manure is the central idea on which nearly all the agricultural systems found in England are based. The production of vegetables under a system of intensive cultivation in the neighbourhood of large towns, with the aid of large quantities of town rubbish and manure, is an exception and, so also are certain systems of dairy farming but, apart from such, and they are comparatively unimportant, the farmer depends mainly on his cattle and sheep to make his profit.

As a consequence of this, winter feeding, that is the feeding of the animals at a time when fodder is scarce, influences the farmer to no small extent in his choice of crops. The main fodders used are hay and roots with, of course, concentrated foods of various sorts, which, however, the farmer does not grow, and consequently they need not be considered. Hay is merely grass, including small leguminous weeds or clover, which is cut when at its maximum growth and dried and stored for further use. It may be either the natural herbage of a field, which is permanently grass and which is cut every year, in which case it is called "meadow hay", or it may be "seeds hay," which is the produce of a crop of grass seeds sown on arable land in the ordinary way. Hay harvest has been in progress, since I landed in England, and I will try to picture to you the conditions under which it is grown, emphasising the points which are likely to appeal to you in Madras.

Firstly the fields are all enclosed with good hedges or occasionally fences, so that the grass on a farmer's field, is his absolute property and cannot be grazed by the cattle of his neighbour. Some of their fields will be grazed throughout the season by store cattle or sheep, that is, animals which are not yet being fattened, while others will be kept secure to allow the grass to grow. This system of enclosing land is of comparatively recent date in English farming, and though its origin is due to various social and economic causes, it has undoubtedly been of enormous benefit to the farmer engaged in breeding and feeding. It encourages the individuality of the farmer, who can decide for himself and without interference from his neighbours how he shall treat his land, and what crops he shall grow, a state of things often impossible in India. These hedges, from a picturesque point of view, add much to the quiet beauty of the English landscape, as the green of the thorn trees

of which they are mostly composed, is relieved with roses, honeysuckle and other flowering climbers and plants. To one fresh from the close cropped roads of Coimbatore, the waste of grass bordering the roads, existing often in a strip two or three yards wide seemed most unusual, but I learnt that, with the increase in motor traffic, cattle were not allowed to graze on the roads, as they led to accidents.

The next difference is in the extensive use of hay making machinery. The sickle was the first implement used for cutting the crop, to be ousted by the scythe which increased the efficiency of the labourer very largely. Now nearly all the crop is cut by horse machinery with the exception of the corners into which the machine cannot be brought. The hay, as it lies on the ground, is often 'bedded' or tossed by a horse-drawn machine, gathered into rows by a horse rake, and lifted to the stack by a machine called an 'Elevator'. This extensive use of machinery is due to the shortage of labour which is dear and difficult to get. Hay-making wages run to 3d. to 4d. per hour.

The season of hay harvest is one which causes the farmer much anxiety, as so much depends upon the weather. The English farmer unlike the Coimbatore ryot, cannot count on fine weather, and as hay is a crop which rapidly deteriorates if left exposed to the wet, the difference between a good and a bad crop may be very great. The crop is cut just when in full flower and before the seeds are set: if left longer, it would shed many of the seeds, which, of course, contain the more valuable constituents. If the weather is fine the hay dries rapidly, is put up into cocks and, after a few days, is carted away to the stack. If the weather is wet, the cocks will be left, the farmer at every opportunity making them larger, by joining two or three. If wet hay is put into too large heaps it will heat and spoil, while if the cocks are too small, the rain will soak through them.

So far as I saw, the harvest in the south, was got in under very good conditions, the weather being hot and dry. In Norfolk more than three weeks ago, I helped to finish off the harvest, (two men were sick and we were temporarily short-handed). Here in Shropshire the farmers have been most unfortunate, and for the last three weeks they have hardly been able to do anything, owing to the incessant showers, while the hay is rapidly spoiling.

The root crop has recently been drilled and presents here an extremely pleasing and healthy appearance. The showers so bad for the hay, have done the swedes, turnips and mangolds (all these three are included in the term roots) much good and the crop is extremely thriving. The pleasant appearance of the crop is due to the wonderful regularity with which the seed is drilled, and the care with which it is weeded. The crop being sown last, there is ample opportunity to get it free from weeds, while the fact that it is drilled, enables horse hoes to be kept at work between the lines for some time. Horse labour is necessary to thin the crop, which is always sown rather thick in the lines, and which after germination is 'singled' much in the same way as we do with cotton in Coimbatore.

The corn crops generally seen are barley, wheat and oats, and they are just now flowering: in the earliest districts oats are almost ready to cut, and harvest will become general in the South in another fortnight. It is encouraging to note that, in spite of the competition of the many seed dealers who are engaged in breeding, selecting and testing new varieties of these crops, Prof Biffen, working on the strictest Mendelian lines, has obtained a great success with his new wheat "Little Joss" which is now grown extensively in the Eastern counties, and is spreading throughout the counties.

Well, this long letter must come to a close, for I find that, in spite of having no definite work to do, the calls on one's time are many. I hope to be able later to send you an account of my visit to the Royal Agricultural Society's Show at Bristol, and a visit which I paid to Holmes Chapel, where is the agricultural college where formerly Mr. Sampson was engaged in teaching.

Believe me

Yours very truly

R. CECIL WOOD.

PADDY AND PLANTAIN BEING THE CHIEF
SOURCES OF INCOME.

APPENDIX NO. I.

* SOME NOTES ON THE WORKING OF THE PITHAPURAM
ESTATE FARM

BY

G. JOGI RAJU, D. A., FARM SUPERINTENDENT

The Pithapuram Estate Farm is situated in the village of Pithapuram, the head-quarters of the Rajah of Pithapuram and adjoins the Railway station compound. It is 185.15 acres in extent, of which 132.42 acres were under cultivation in 1912-13, the rest having been occupied by grazing grounds, buildings, roads, etc. The greater part of the cultivated area, (115.94 acres) is single cropped wet land. On the rest of the area, some dry and garden crops are grown, maize and ragi among the former, and plantain among the latter, being the chief. There is also a graft mango garden and an orchard of various fruit trees.

The work of the farm consists in cultivating the land in the most profitable way, and thus demonstrating improved and profitable methods of farming. Such study and experiments, as do not materially affect the financial aspect of the farm, are also undertaken.

That the farm is being profitably cultivated can be seen by the fact that, during the year 1912-13, there has been a net profit of more than Rs. 7,000, as shown by the figures below.

	Heading.	Area in Acres.	Expenditure.	Receipts.	Remarks.
			Rs. A. P.	Rs. A. P.	
I	Orchard and mango garden.	7.61	400-1-5	404-6-3	Not yet in full bearing.
II	Plantains (bearing).	3.04	362-10-8	939-13-5	
	Do. (not yet bearing).	1.78	73-15-1	...	
III	Paddy (central portion).	57.52	1,555-14-4	6,318-8-11	Easily irrigable.
	Do. (outskirts).	45.75	1,548-10-3	3,288-13-11	Not easily irrigable,
IV	Pulses.	71.68	326-9-11	442-15-1	
V	Other crops.	...	580-5-1	650-13-0	
VI	Maintenance of cattle and other miscellaneous expenditure including supervision of maistries and night watching.	...	3,262-8-0	...	
VII	Value of the services of cattle (at 8 as. per pair per day) and other miscellaneous receipts.	...	...	3,312-14-8	
	Total...	...	8,117-11-0	15,358-5-3	

Net Profit—Rs. 7,240-10-3.

As regards the improvements adopted on the farm and being demonstrated to visitors, I may mention the chief items here before dealing with each separately. The first is the proper conservation of farmyard manure by the loose box and dry-earth systems. Green manuring is the next. Thin sowing of paddy in the seed beds, single planting and the consequent reduction of the seed rate per acre form one set of improvements. The profitable cultivation of plantain (rarely cultivated by ryots here) and the successful rearing of fruit trees, such as 'Sapota,' are the chief items under garden cultivation. The working of the scraper described (in p. 53 of the Agricultural Journal of India, Vol. IV) which has been found

* Paper read at the 3rd Agricultural Conference, held on 12th July 1913.

to be superior to the local 'Lolla' (లోలా) and that of the iron karem (కరెములు) manufactured largely at Kadiam near Rajahmundry, are two minor items of demonstration.

Conservation of manure.

I do not here propose to dwell long on the proper conservation of cattle manure, for I dealt with the subject in detail in a paper, which I contributed, the year before last, to this Conference, I have only to say that the forms of thatched cattle sheds I then recommend for the ryots, have been found, upon further experience, to be quite suitable, and all new sheds on the farm have been constructed on these lines.

Green manuring.

The advantage of green manuring paddy land is being demonstrated in two big plots 1.04 acre in extent. The yielding capacity of each plot was tested in 1910-11 (both the plots being unmanured), plot I yielding 2995 lbs. of paddy, and plot II 2732 lbs. The next year plot II was green manured with sunn hemp grown on $\frac{1}{2}$ acre, soon after the commencement of rains in June 1911*. The yields of the paddy crops which succeeded were 2921 lbs. and 2990 lbs. respectively from plots I and II showing thereby that, on account of green manuring, plot II which yielded less than the plot I in the previous year pulled up and yielded a little more than unmanured plot. During the next year (1912-13) both plots were unmanured and plot I yielded 2918 and plot II 3218 lbs. This large increase in the yield of plot II cannot but be attributed to the previous year's green manuring. Again after the harvest of the paddy crop sunn hemp was sown for fodder. Plot I yielded (roughly) 600 lbs. and plot II 850 lbs. Thus the effect of the green manuring has been seen in 2 successive paddy crops and 1 sunn hemp crop and to show this at a glance, the results are tabulated below.

No. of plot.	Area of plot.	1910-11. Paddy.		1911-12. Paddy.		1912-13. Paddy.		1912-13 Sunn hemp (Fodder) lb.
		Manure applied.	Yield of grain per plot lb.	Manure Applied.	Yield of grain per plot lb.	Manure applied.	Yield of grain per plot lb.	
I	1.04	Nil.	2995	Nil.	2921	Nil.	2918	600
II	1.04	Nil.	2732	Green manured	2990	Nil.	3218	850

The cost of green manuring was Rs. 4-4-0 and the value of

* The crop grew $4\frac{1}{2}$ ft. in height in about 5 weeks.



the extra produce in the three crops Rs. 31-12-0, thus leaving a net profit of Rs. 27-8-0.

Thin sowing in seedbeds.

The ryots in this locality sow from 80 to 100 kunchams of paddy seed in an acre of seedbed and the seedlings so raised in an acre, will be sufficient to transplant 8 to 10 acres, the seed rate thus coming to 10 kunchams or 70 lbs. per acre. On the farm, seed is now sown at the rate of 40 to 50 kunchams per acre of seedbed, and about 10 to 13 acres are transplanted from seedlings from 1 acre, the seed rate thus being 3 to 4 kunchams per acre transplanted. In selected and specially looked after plots it has been demonstrated that even less quantity of seed would suffice. To note an instance, 16 lbs. of Ratnachudi 1 paddy, sown in 5 cents of land, were transplanted in 1.15 acres, the seed rate per acre thus working out to only 13.9 lbs. or 2 kunchams per acre.

In another instance, the advantage of thin sowing in the seedbed was demonstrated. Two plots, 10 and 5 cents each in area, were sown with 26 lbs. Tellavari seed and 25 lbs. Rasangi seed respectively and particulars as to the area transplanted and other details are shown in the table below.

No. of plot.	Area of plot.	Seed sown, lbs.	Seed rate Per area.		No. of bundles of seedlings produced.	Area transplanted.	No. of bundles.		Seed rate per acre.	Remarks.
			lbs.	Kunchams.			Transplant- ed.	Transplant- ed per acre.		
I	10	26	260	37	1160	51	400	740	16.6	The grain of both the varieties is of the same size and the difference in variety does not affect the result.
II	5	25	500	71	725	55	410	745	25.7	

Single Planting.

The ryots here usually plant from 2 to 6 seedlings of Paddy in each place about 4" to 6" apart. Single planting is scarcely practised although it is the usual practice in many delta villages. On the farm the whole

area may be said to be planted with single seedlings with equally good, if not better, results.

The results of the experimental plots on the farm, though not clearly demonstrative of the advantage of the single planting system, at least show that the system is not inferior to the ordinary method. In one series of experiments the singles beat doubles, trebles and quadruples in 1910-11 (in which year the transplanting was done early and the season was good)* the average, yields per acre 2993, 2781, 2915, 2911 lbs. respectively. In 1911-12, perhaps owing to the drought at the end of the season, the singles did not fare as well as the trebles and doubles, the averages being 2744, 2825, 2831, and 2600 lbs. respectively. In 1912-13 the season being fair, the singles again proved better, the averages being 3035, 2977, 3023, 2888 lbs. In another series the yield of the singles, doubles, trebles, and quadruples plots, were in 1911-12, 2891, 2931, 3023 and 2608 lbs. respectively and 3223, 3243, 3023, and 2883 lbs. respectively in 1912-13.

In both the above series, the plots planted 6" apart on the whole proved better than those planted 9" apart, the average yields being respectively 2896 and 2692 in series I and 3069 and 2939 in series II.

PLANTAIN.

Plantain is rarely cultivated by ryots in this tract and not a few ryots believe that its cultivation begets evil to the owner. But during recent years, several ryots, observing the profitable nature of the crop in the farm and in the land of another enlightened gentleman, have begun to cultivate it. During 1912-13, the plantain garden in the farm, 3.04 acres in extent and consisting chiefly of Bontha, Karpurachakkarakeli, Amritapani and Chakkarakeli varieties, yielded a gross income of Rs. 939-13-5 while the expenditure on the plot was Rs. 362-10-8. The net profit per acre was thus about Rs. 190 per acre. Irrigation from February to June forms the chief item of expenditure, the water having to be baled from a well by mhote and from some temporary pits (పొంపులు) by piccotahs.

On calculating the yields of the 4 chief varieties separately, it is found that Karpurachakkarakeli is the most paying. 15' stools planted 14 ft.

* Average of the plots planted 6" and 9" apart.

apart (an acre holding 225 stools produced, in 1912-13, 352 bunches weighing 6463 lbs. worth Rs. 269-4-8 (at 8 pies per lb. which comes to Rs. 381-1-2 per acre. In one plot where there were 25 stools the yield per acre was Rs. 464-2-8 and in a case where the stools were 11 ft. apart (an acre holding 360 stools) the yield for 29 stools was at the rate of Rs. 845-10-0 per acre in 1911-12 and 660-6-2 per acre in 1912-13.

Next to Karpurachakkarakeli comes Amritapani 107 stools of which produced 273 bunches weighing 3937½ lbs. worth Rs. 123-0-8 (at 6 pies per lb.) which comes to Rs. 258-11-8. Next comes Bontha, 541 stools of which yielded 1503 bunches weighing 25,415 lbs. worth Rs. 529-7-8 (at 4 pies per lb.) which works out to Rs. 220-3-4 per acre. Chakkarakeli, though the most highly esteemed of all varieties in the Northern Circars, comes last in its yielding capacity, 58 stools yielding only 79 bunches weighing 411½ lbs. and valued at Rs. 25-11-6 (at 4 pies per lb.) and this amounts to Rs. 99-2 per acre. This variety, however, yields much better in the delta and fetches a very large profit. The low yield at Pithapuram is attributed to the want of a sufficient supply of water, the plants receiving the same treatment as the rest.

FRUIT TREES.

Of the fruit trees, graft mango is the chief and there are several varieties of it, Banganapalli being the chief. This variety is one of the finest in flavour and the plant is hardy, quick growing and heavy yielding. The Sapota is another valuable fruit tree, but it is little known in the south. It is one of the most delicious fruits and is considered healthy. The tree is a hardy one and the growth is moderately quick. The plant is usually propagated by inarching, the stock used being that of 'Mimusop Hexandra' plant (పొంపుకల్). The plant so propagated begins to bear even in the 3rd or 4th year, but it is not allowed to bear any fruit till the 5th or 6th year, lest the growth should be impeded. There are two varieties, one big and round-fruited, and the other rather small and oval-fruited. The fruits of the former variety weigh 3 or 4 to the pound, some weighing up to ½ lb. each and the fruits of the latter variety weigh 8 to 10 to the pound, some weighing up to 4 oz. each. The tree is a prolific yielder and the yield in the farm of some trees planted in 1906 was in 1912-13 about 6 Rs. per tree and in a few

years it is likely to be much higher. The tree yields every nearly throughout the year, the largest yield being in April and May.

Of the other fruit trees, Guavas, Roseapple, Kamrac (Averrhoa Carambola) Limes, sweetlimes, citrons, pomeloes are bearing, but there is nothing special to mention about them. The Kamada orange which is wild in the Hills of the Northern Circars, has proved indifferent under cultivation, the tree yielding few inferior fruits in 1910-11 and none since. There is a loquat plant which has been growing well and flowering for the last 3 years but no fruit has formed. The lichi plants which have been growing vigorously have not even flowered yet, and to make them bear, root-pruning and ringing have been tried without effect. The key-note to the successful cultivation of all fruit trees appears to be thorough drainage, coupled with a copious supply of water.

The Scraper.—The 'lolla' is the chief implement used in levelling lands by dragging the earth from the higher to the lower portions after ploughing the land well and is one of the ingenious and cheap, local implements unknown in many other parts of the presidency. The scraper described in the Agricultural Journal of India (Vol. IV) has been found more efficient than the lolla though somewhat more costly. It does at least double the work with the same labour and with greater ease.

The Iron Karem.—The iron kareem manufactured by a blacksmith at Kadiam near Rajahmundry and sold at Rs. 8 each is an improvement over the palmyra karom in being much lighter and requiring only one man to work it. It can be very easily shifted from place to place.

I have yet to say something about the several varieties of Paddy being grown and studied on the farm but, as I have already taken much of your time, I do not propose to enter into details. I may only state that, of the 22 varieties tried in 1912-13 and the previous 5 years, Bangarutigalu (5 months' crop) and Padshahhog No. II (4½ months') among the fine varieties, Ratnachudi I (5½ months') Turpusannakkullu (5½ months') and Kashmirsannalu (4½ months') among the medium varieties, and Tellakonamani, (5½ months') Gunmasari (5 months') and Rasangi, (4½ months') among the coarse varieties, have been found worthy of extensive cultivation.

The manurial experiment with Paddy and plantain are yet inconclusive and I do not enter into them now.

APPENDIX No. II

* THE FIRST IMPRESSIONS AND EXPERIENCES OF A RECRUIT.

BY

K. THIMMAPPA ALWA, L. AG., TALIPARAMBA FARM.

Of late years, the district of South Canara seems to have made appreciable progress in the direction of the introduction of Mauritius cane and the economical way of jaggery making. In the year 1908 when I returned home from the Agricultural College during the Christmas holidays, I visited some sugarcane growing localities in the Mangalore Taluk. There was then no Mauritius cane in these parts. Ryots were milling their canes with wooden mills and preparing the jaggery in small pans and earthen vessels. I spoke to them about the iron mill and its advantages. They laughed at the idea of purchasing iron mills and told me that they should have to purchase elephants to tie to these iron mills. They further added that the big pans and the improved furnace were not suited to their villages and jaggery could not be prepared in them. Although I entered these villages with a certain amount of hope that the villagers would respond to my suggestion, I had to leave these villages, sorely disappointed and with a certain amount of mortification.

Again next year I visited the same localities and found a few Mauritius canes growing in a certain village. I asked the cultivator whence he got the sets of Mauritius canes. He then told me that the Tahsildar had brought those sets and thrown them at his doors and so he was forced to put them in a corner of his field. These canes were decidedly superior to the local canes in growth and every one did observe it. Although the Mauritius canes seemed superior in growth, the villagers began to decry them by saying that the canes were bamboo-like and were not suited to their wooden mills. They asked me how these canes were milled at Coimbatore and I told them that iron mills were used in crushing them. They were convinced that, wherever these canes were grown, iron mills must be used. They asked me about the prices of these mills and how long they would last and began to compare

* Paper read at the 3rd Agricultural Conference held on 12th July 1913.

these prices with the prices of the wooden mills. After much calculation, they came to the conclusion that in the long run, iron mills were cheaper, but they expressed their difficulties of disposing of their wooden mills and doubting whether their animals could be yoked to these iron mills. In the meantime some ryots brought the mill of the District Agricultural Association and gave a trial to it. Then the ryots raised the objection that the begass become powdery in the iron mill and this powdery begass was not suited to their hearth. This gave me an opportunity to impress upon them the importance and need of the improved furnace. In addition to this, the cane cultivation in South Canara is mostly confined to river banks where the cane growers find the difficulty of fuel. When they heard that jaggery can be made with begass alone in these furnaces, they thought amongst themselves of giving a trial to this but, when the question of a big pan costing Rs. 25 was placed before them, their enthusiasm for the furnace evaporated.

Again I had to return from this village without realising much of my hopes. Yet there was a marked change in the attitude of the villagers towards my suggestion. Their contemptuous smile at my suggestions did change into one of doubt. In the first year when they heard me, they presupposed that what I told them was an utter impossibility, but in the second year they were doubting whether what I told them might not, after all, be true.

After finishing my course in the college, I visited these villages for the third time. As I had ample time now at my disposal, I went to these villages often, almost daily, when the ryots were preparing jaggery. My constant association with them gave them courage to enquire about my parentage and other social connections. When they came to know that I was the son of a man whom they know, their attitude towards me changed markedly and they asked me whether I required tender cocoanuts to quench my thirst. In this connection, I may mention, that the ryots in the sugarcane localities, at the time of milling, look upon an outsider, especially town's people with suspicion. They suspect every man, with a coat on, to be an Abkari officer in disguise who has come to concoct cases of illicit liquor manufacture. This is a great disadvantage to an agricultural officer who visits the village for the first time, especially during the sugarcane milling season.

I think, therefore, it would be better for the officers to visit cane growing localities during the growing period of the cane, make necessary suggestions as to cultivation, gain the confidence of the ryots and so prepare the way for a better reception at the time of milling canes and manufacture of jaggery. Now to return to my narrative, I induced one ryot of Bangarakollur village to purchase an iron pan, on condition that I would buy the pan from him, if it did not prove to be successful. A new furnace was put up, a pan was locally made and jaggery was manufactured in this pan. The manufacture of jaggery with this pan and furnace was a curiosity to the villagers and many criticisms arose in the village. On the first day many villagers assembled to see the fore-concluded failure of this process of jaggery preparation, and, to the great disappointment of the man who had purchased the pan and to mine who had suggested to him to purchase it, the prophecy of the villagers turned out to be a partial fact. For want of a sufficient number of moulds and for want of trained labour, the semi-liquid jaggery became hard before it was properly moulded. Every one around us laughed, except both of us who were looking at each other with dejected faces and parched up throats. The same evening, in the absence of the neighbouring villagers, we tried once again with a better result. The ryot, being an intelligent man, very soon learnt the secret of the process and began to prepare jaggery successfully. In course of time the villagers were convinced of the advantages of this process and some more bought big pans and started new furnaces that year. In the very same year two iron mills were purchased in this village. From that time the village is making steady progress in the introduction of Mauritius canes, iron mills and economical way of jaggery making. At present most of the villagers possess iron mills and big iron pans. By adopting the new method of jaggery making, there was a clear gain of Rs. 5 on every candy over the old method. The fuel difficulty was completely solved. It is surprising that big heaps of fuel which cane cultivators used to stack in front of their houses in former years, are not to be seen now. They prepare jaggery only with the aid of begass trash. Iron mills have added 25% of additional jaggery to their yield. A man getting four candies with the wooden mill gets 5 candies if he mills the cane with an iron mill. In certain localities Mauritius cane has given more than double the yield of the local canes. It can be roughly esti-

mated that there are about 50 to 60 acres under Mauritius canes in the district, chiefly in the Udipi Taluk. Although Mangalore Taluk is a bit backward in the matter of Mauritius cane, it is in advance of all the other Taluks in the matter of iron mills and improved furnaces. There are about 25 iron mills and more than 30 big iron pans in the Mangalore Taluk. One important feature in the introduction of Mauritius cane is that it has opened new areas for the cultivation of sugar-canes where there was no sugar-cane cultivation before. People who were not actual cultivators have taken up Mauritius cane cultivation out of curiosity. But yet there are sugarcane localities where the Mauritius cane is unknown and these localities have to be explored and attempts have to be made for its introduction. Generally milling begins in the month of December and continues up to March in different Taluks of the District. It would be of use to visit the important cane growing centres before the actual milling operations begin, and inform the ryots about the Mauritius sugarcane and the economical way of jaggery manufacture. If we approach a ryot when he has already commenced milling, he would plead the excuse of wasting his own local cane sets and the delay that would be caused in starting the new furnace.

From a letter which I received from Mr. M. D'Souza of Bangrakollur, I fancy that the suspicion of the ryots of this village has changed of late into confidence, and their jeer into cheer. When I went last to Mangalore, many of these cultivators came to me instead of my going to them and we exchanged thoughts and discussed on various agricultural points. It is hoped that, in a short time, the Basel Mission Iron Workshop at Mangalore will be able to supply the cane growers with iron mills at a cheaper cost and pans of any dimension will be locally made to order.

Mr. M. D'Souza writes :—"The ryots of Bangrakollur no doubt obtained a considerable benefit by the introduction of pans to boil sugar-cane juice. It is owing to you that they got this benefit. Now they have learnt to make strong pans. They will not cease to boil paddy in them, because they save much firewood and labour. People have fully learnt the use of large pans and iron mills."

I record these humble experiences of mine, to bring home to the minds of other recruits in the Agricultural Department and the stu-

dents of my *alma mater* who return to their villages during holidays with so much of new thoughts and ideas, and who think of revolutionising their villages in the matter of agricultural improvement, that agricultural improvement cannot be achieved during one or two holiday trips.

The three years' course with its pleasant and instructive tours, gives us much scope for observation and for gaining knowledge, practical and theoretical. But the true difficulty lies in understanding the real requirements of our villages and adapting the knowledge gained in the College to the needs and requirements of the respective villages. It is quite possible that a student, when he first returns to his village, might talk to his villagers with delight about nitrification, putrefaction, fertilization, assimilation and respiration, but this would seem to his hearers quite unintelligible or improbable and the student's stock of knowledge will be exhausted soon. The student should take delight in tapping the inexhaustible local experiences of the ryots whose knowledge is the accumulated treasure of ages, and drink deep of that fountain. In the matter of agricultural knowledge, he should not think that lecture rooms presided over by University men with gown and hood and fountain pen in hand, are the only places for acquiring the knowledge, but he should sit at the feet of the semi-naked rustic standing at the corner of his field with a spade or plough in his hand, and gather information by intelligent enquiries. It is quite possible that you have to pick out one or two grains of true knowledge in a bushel of words, but these one or two grains are golden grains and worth having by all means. Holidays should not be considered as days of relief from the hard practical work and tight supervision, and one should not think of making an easy time of it, but it must be a busy time for collecting local experiences, observing local conditions and thoroughly understanding local practices. One will begin to relish the College life when he begins to compare and contrast his new experiences gained in the College with the old ones which he gained in his village. It is by comparing and contrasting several agricultural practices, that real improvements can be suggested. It is a matter for regret that students leave the College in the middle of their course, and if they were asked why they left the College, they would answer that they had no taste for it. I fancy that

an Agricultural College cannot create a taste for agriculture in a student but it will only help him to cultivate that taste with which he entered the College. It is the previous knowledge or experience of a subject that creates a taste in one for that subject ; and this taste will inspire him to toil over that subject cheerfully and master it. A student possessing a thorough knowledge of the local conditions of his locality, will find the College course more profitable and will get through the course easily and with credit. It is to the advantage of both the student and the College that a system of writing holiday essays is adopted. Every student, on his return from home after the holidays, might be asked to produce an essay to the Principal on local agriculture with his own criticisms and suggestions. These essays, after necessary corrections, may be put in the Students' Reading Room for the benefit of other students coming from different localities of the Presidency. The writer of the essay should be prepared to answer all doubts and comments of his class-mates on his essay.

Now turning to the recruits in the Department, I may say that Agricultural improvements are not so easily effected as we once thought, sitting in the calm halls of the Coimbatore Agricultural College enjoying its cool climate and the pleasant College life. Then we were in the bosom of our *alma mater* in that palatial building protected and nurtured by so many experts and teachers. Now we are either basking in the scorching sun on the Black cotton soil of Tinnevely or drenching in the torrential down-pours of the West-Coast, standing unshielded amidst the taunts and criticisms of the ryots. We are no more to enjoy the pleasant walks in the company of so many of our class-mates who used to go round the Central Farm by the royal road under the pretext of observation. Now we are to walk alone on by-paths, lanes, foot-tracks and slippery bunds of paddy lands. We are no more to meet the encouragement or approbation, the confidence and cheer of our teachers and of those who were around us, but we are to meet the discouragement, poverty, ignorance, suspicion and jeer of the ryots and, I may add, of some of the wealthier and more educated classes. We might approach a ryot with the intention of suggesting some improvements to him and so better his lot, but he will put a bad meaning on our movement and think that we are Government servants who are paving the way for increasing the revenue at the next settlement.

This idea is not only cherished by the uneducated ryots but also as I said, by our educated men.

The path of progress is very slow. In the first place the dreamer of progress has to gain the confidence of the ryots ; secondly he has to be very careful in suggesting improvements and adapting them to local conditions ; thirdly he should not be discouraged and damped in his enthusiasm at the cold reception he meets at the hands of the ryots and the first failures he might meet. Brethren ! Brethren ! Strive on ; the cause is noble, the path is rugged, but the goal is sure.

APPENDIX No. III

*BIOLOGICAL ACTIVITIES OF SOILS.

By

N. KUNJAN PILLAI, M.A., B.Sc., PH. D.

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The business of the farmer is the production of food-stuffs for man, and materials for the manufacture of his other perquisites. Soil and air are the chief media, and organisms, especially the microflora of the soil, are the chief agencies concerned in the production of these materials. The action of the micro-organisms and their relation to agriculture have been brought to light only in very recent times. From the time of Davy and Liebig till a few years ago, chemistry was considered to be the corner-stone of scientific agriculture. Naturally, therefore, all the investigators of the nineteenth century looked to chemistry for the solution of the scientific problems relating to agriculture. Chemistry, in spite of the rapid strides of progress it has made, has not yet come to a stage where soil and air can be made to combine directly to form human food and other materials. Such a combination, however, takes place in nature through the action of micro-organisms and the science dealing with them is, therefore, of far greater importance to the agriculturist than chemistry or any other science.

The soil, as a rule, contains various substances which can serve as food for plants. As the quantity of these substances in any particular soil is limited, it would appear that by continuous cropping the soil would be deprived, in course of time of all its plant foods and would not thereafter be able to carry any crop. But as a matter of fact, such a stage is never reached even if the loss of fertility caused by the removal of crops is not made good by the application of manures. The results of experiments conducted at Rothamsted for more than seventy years have shown that the yield of crops, such as wheat, barley and oats from plots which have not been manured during the whole experimental period, was no doubt considerably less than that from the manured plots, and

showed a small decline in the first few years, but gradually reached a limit beyond which it seldom declined. The maintenance of a fairly constant yield for more than half a century, though the plots have not been manured at all can only be due to the existence in nature of some means for the recoupment of the loss which the land sustains. The circulation of food-materials in a cycle is one of such means, so that what is once taken from the soil ultimately returns to it in some form or other. From the soil the food-materials generally pass through the plants to men and animals and from them they go back to the soil. The permanence of agriculture may be said to depend upon this circulation of food-materials. In considering the biological activities of soils we are concerned chiefly with the influence of micro-organisms on the above food cycle.

The micro-organisms of soils consist mainly of two classes: (1) *Fungi*, such as moulds, mushrooms, &c., which are many-celled organisms possessing no chlorophyll and developing long slender threads known as *mycelia* and (2) *Bacteria* which are single-celled organisms without chlorophyll, which multiply by a process known as fission, i.e., division of a cell into two equal halves. The morphology, physiology and other characteristics of the above organisms need not detain us long. All that we should know for our present purpose is some of their general characteristics which may be briefly stated here.

(1) All these organisms have no chlorophyll, and hence do not possess the power which the green plants have, of manufacturing complex food materials from simpler substances with the help of sunlight. They have therefore to get their food-stuffs in some ready made forms.

(2) According as the food-materials are derived from dead organic matter or living organisms fungi and bacteria are classed as *saprophytes* or *parasites*. All those organisms which bring about the decomposition of dead organic matter are saprophytes, and those that attack and feed on living plants and animals—the disease-producing germs—are parasites.

(3) Intense light is injurious to most of the micro-organisms. They develop best in darkness and may die when directly exposed to sunlight for a few hours or days.

(4) Heat is likewise of much influence on the growth of micro-organisms. Each species has its own maximum and minimum temperature.

* Paper read at the 3rd Agricultural Conference held on 14th July 1913

perature beyond which it easily succumbs. The temperature most favourable for the growth of these organisms lies between 25°C and 35°C.

(5) The presence of oxygen is another factor influencing the growth of micro-organisms. Some will not live in its absence while others do not grow in its presence. The former are called *aerobic*, and the latter *anaerobic* organisms.

(6) When conditions are unfavourable for proper growth, some micro-organisms develop what are known as *spores*, which being enclosed in a fairly thick skin are able to tide over unfavourable conditions and germinate on the return of favourable circumstances.

(7) The soil is, as a rule, full of living organisms. In the case of bacteria alone, it has been estimated that one gramme of soil may contain from a few thousands to several millions of them. Their number usually varies with the nature and the depth of the soil. In sandy soils the number is comparatively small, while in rich garden soils it is extraordinarily large. Again in any one soil the number varies with its depth, the largest number being found on the surface and hardly any existing below 8 or 9 ft.

With this brief description of the general characteristics of micro-organisms let us proceed to the consideration of their functions in the soil and the relation in which they stand to agriculture.

The study of micro-organisms was first taken in hand in connection with the investigations of the diseases of men and animals. As early as 1695 the Dutch microscopist Leeuwenhoek gave a fairly accurate description of the small organisms called bacteria; but for nearly a century and a half since then very little attention was paid to the further study of these organisms. It was only towards the middle of the nineteenth century the importance of bacteriology began to dawn upon the scientists. Even then it was only thought to have some connection with the diseases of men and animals and was, therefore, studied chiefly from the pathological point of view. Investigations on this line have led to many important discoveries about the causes of diseases and the methods of curing them. The pathological side of bacteriology is so well-known that no more need be said about it on this occasion. The point I wish to urge is that the study of micro-organisms was first taken up in reference to their relationship to the diseases of men and animals, and that in consequence for a pretty long time they were

considered to have no function in nature other than the causation of diseases. This view, we now know, is erroneous. The first man who clearly showed to the world that micro-organisms, and especially bacteria, do something more in nature than merely produce diseases was Pasteur. In 1860 he established the agency of bacteria in the souring of milk. Since then a great deal of attention has been paid by Pasteur and other scientists to the investigations of the various parts which bacteria play in nature. As a result of their labours many hidden truths have been brought to light and several processes in nature, most of which are related to agriculture, have been traced to bacteria. Many have worked and are still working in the field of agricultural bacteriology and yet so far only the outer fringe of it has been touched. Many discoveries which are of immense value to the practical farmer have been made, and many more are bound to be made as investigations proceed. I shall not tire your patience by dilating further on the importance of this young science, but shall proceed to give you a brief account of the functions of micro-organisms, especially bacteria, in the soil, which is the subject proper of my paper. Of course I am leaving out of consideration the pathological aspects of the subject.

The soil consists of inorganic and organic materials. What influence micro-organisms have on the formation and transformation of these materials is what we have to consider now. It was thought till recently that the transformation of the inorganic materials of the earth is the result of the action of certain physical and chemical agencies involved in the process of what is known as "weathering." But very recent investigations have shown that there are certain bacteria which take part in the disintegration of rocks and the formation of soils. The subject has not so far been fully investigated, but sufficient has been done to show that there are certain minute organisms, such as *Sulphur Bacteria* and *Iron Bacteria* which eat into the mineral constituents of rocks, and thereby cause their disintegration. We are still in the dark about the exact mode of action of these organisms and the actual changes they bring about. Investigations on these lines have been neglected so far, as the mineral ingredients of soils have been looked upon as the result of purely chemical and physical actions. Moreover the importance of the question of organic materials, including that of nitrogen, in the soil is so great that it has practically engrossed the attention of agri-

cultural bacteriologists. All that can be said, therefore, about the mineral ingredients of the soil is that they are formed by the disintegration of rocks brought out by the agencies of chemical and physical forces and probably also by the action of certain micro-organisms. To what extent the disintegration of rocks is due to chemical and physical forces and to what extent it is due to the action of micro-organisms can only be decided by further investigations. The question of organic matter in the soil has been pretty thoroughly studied from the biological point of view. It has been definitely shown that the decomposition of such matter takes place almost exclusively through the action of micro-organisms. One of the chief factors that contribute to the fertility of a soil is the presence of organic matter in it. However much a soil may contain the various mineral plant-foods, the entire absence of organic matter will render it thoroughly unproductive. Apart from the physical characteristics which the presence of organic matter imparts to a soil and which go a great way in determining its fertility, the question of nitrogen is also inseparably bound up with it. The most difficult problem in agriculture is that of maintaining a sufficient supply of nitrogen in the soil, and a knowledge of the sources from which it is derived and of the methods by which it becomes available to plants ought to be of great interest to the agriculturist.

The organic matter in the soil consists of dead and decaying parts of animals and plants. These can be brought under two classes: (1) Nitrogen-free compounds such as starches, sugars, fats, cellulose &c., (2) Nitrogenous compounds such as urea, gelatins, proteids &c. All these organic compounds undergo decomposition through the action of micro-organisms. As a result of such decomposition, complex organic compounds are invariably reduced to simpler substances. Thus, for example, sugars are broken up by yeasts into alcohols and carbonic acid gas, starches are likewise broken up ultimately into alcohol and carbonic acid gas; cellulose into carbonic acid gas, hydrogen, volatile acids and sometimes alcohol; and woody tissues are first attacked by fungi and later on by bacteria which reduce them to various gaseous compounds. One of the final products of the various kinds of decomposition mentioned above is carbonic acid gas which escapes into the air.

Plants derive the carbon they require for their growth from the

carbonic acid gas of the atmosphere, and animals get it from the plants. Part of the carbon is converted into carbonic acid gas by the plants and animals in their respiration and the rest of it remains in them in some form or other. When, however, plants and animals die a small portion of the carbonaceous compounds of their tissues is oxidised by chemical agencies to carbonic acid gas, but the major portion of them is acted upon by various micro-organisms converting most of the carbon in them into carbonic acid gas which goes back to the atmosphere. This in short is the story of the carbon cycle in nature.

Coming now to the question of nitrogen we find that it is absorbed by plants from the soil generally in the form of nitrates and sometimes also in the form of ammoniacal compounds. The nitrogen that thus goes into the plants is built up in combination with carbon and other elements into various complex compounds, usually proteids. A portion of these proteids goes back to the soil as such through dead vegetable matter, and a portion goes into the systems of animals feeding on the plants. In the animal system the proteids undergo some transformation, by which a portion of them is reduced to urea and uric acid which are excreted through urine, and a portion remains in the system as proteids, gelatins and other complex substances, which ultimately return to the soil after the death of the animals. Thus we find that the nitrogen of the simple nitrates and ammoniacal compounds absorbed by plants from the soil return to it in the form of urea, gelatins, proteids and other highly complex compounds; but the nitrogen in none of them is available for plants. If then there had been no agency in breaking up these compounds so as to make the nitrogen in them available for plants, the question of nitrogen supply in the soil would have been far more difficult than it is at present. Fortunately there are such agencies in the numerous micro-organisms present in the soil, and they carry on their work untiringly whenever favourable conditions present themselves.

The decomposition of nitrogenous organic compounds may take place in the presence or absence of oxygen. If it takes place in the presence of oxygen it is technically called *decay*, and if in the absence of oxygen it is called *putrefaction*. Decay is caused by aerobic and putrefaction by anaerobic organisms.

The simplest nitrogenous compound that returns to the soil from

plants or animals is urea, and this, when acted upon by certain bacteria, is transformed into ammonia and other products. The more complex nitrogenous compounds, such as proteids, gelatins, &c., are first attacked by putrefactive bacteria which convert them into less complex substances which are ordinarily grouped under what is known as *humus*. During the formation of *humus* a small portion of the nitrogen escapes as ammonia, while the greater portion of it remains locked up in the *humus* in an unavailable form. A marshy land with plenty of vegetable matter may contain a large quantity of nitrogen, but as it is locked up in the *humus* in an unavailable form the land will be nitrogen-starved, until, by proper drainage and aeration, decomposition of the *humus* is brought about and the nitrogen is transformed into an available form. The decomposition of the *humus* can take place only in the presence of oxygen, for it is brought about by aerobic bacteria. The first stage in its decomposition consists in the conversion of nitrogen into ammonia.

Thus we see whether it be the decomposition of urea, proteids or *humus* the nitrogen in them is converted primarily into ammonia. This ammonia may combine with the acid radicles found in the soil and form ammoniacal compounds. These form direct food only to a limited number of plants. It is believed that the rice plant has the power of absorbing ammoniacal compounds. Whatever it be, most of the plants do not possess this power and to them nitrogen must be presented in the form of nitrates.

Nature has made provision for the conversion of ammonia into nitrates, and that also through the agency of bacteria. The formation of nitrates from ammonia is a process of oxidation, and was long believed to be the result of direct chemical action, until it was demonstrated by Schloesing and Muntz in 1877 that nitrification is associated with living organisms in the soil. Following the experiments of Schloesing and Muntz, Winogradsky, a Russian naturalist, succeeded in isolating the particular bacteria concerned in nitrification and was able to study thoroughly their life history and mode of action. By his experiments he proved that nitrification takes place in two stages:— (1) Conversion of ammonia into nitrous acid which, combining with the alkalis of the soil forms nitrites and (2) Conversion of nitrous acid into nitric which form nitrates. Two distinct classes of bacteria are concerned in the above two processes. Those that form nitrous acid are called *Nitrosomonas*, and

those responsible for the formation of nitric acid are called *Nitrobacter*. The activity of these bacteria depends upon a number of conditions, and a knowledge of these is of practical utility to the agriculturist. Neither the nitrous nor the nitric bacteria will grow in the presence of organic matter. Unlike other bacteria they have the power of feeding on inorganic substances. It has not been definitely shown how they get carbon, but it is surmised that they get it from the carbonic acid gas of the atmosphere. Unlike other chlorophyll-free organisms these possess the power of breaking up the carbonic acid gas and utilizing the carbon therein, without the help of sunlight. The energy required for this purpose must naturally come from the process of oxidation in which they are constantly engaged. In thus being able to build up organic substances from simple inorganic compounds such as carbonic acid gas, ammonia, &c., without the help of sunlight these organisms offer a possible explanation of the beginning of soil formation and the subsequent growth of vegetation on it. As they do not require any organic compounds as food they can grow on bare rocks using up their mineral constituents, extracting carbon from the carbonic acid gas of the atmosphere, and obtaining ammonia from the air for oxidation. Under such conditions they are able to live and convert inorganic materials into organic substances. Thus they may not only cause the disintegration of rocks, but also add a certain amount of organic matter to the soil which may serve as food to higher organisms later on. The above statements are only inferences from certain known facts. Whatever they be, it is certain that the presence of organic matter checks the activity of nitrifying bacteria. Acidity in soils is likewise injurious to these organisms. In forest soils, swamps, and such other places which are sour, nitrifying bacteria are not found and if at all only in very small numbers. On the other hand in good arable land they exist in plenty. Even in lands which are sour the addition of lime will markedly increase the number and activity of these organisms. Another factor that influences the growth of nitrifying organisms is oxygen. Nitrification will not take place in the absence of oxygen and hence the intensity of this process depends upon the aeration of the soil. The more thoroughly the soil is aerated, in other words, the more thoroughly it is cultivated, the more vigorous is the action of nitrifying bacteria. The presence of a certain amount of moisture in the soil is

likewise essential for the growth of these organisms. The question of temperature is not of much importance in this part of the world, for action of these organisms stops completely only when the temperature falls below 5°C , a condition never reached in the plains of India. We see, therefore, that nitrifying bacteria do not grow in the presence of organic matter or acids, or in the absence of oxygen or when the soil is completely dry. But whenever conditions are favourable they grow and carry on the work of nitrification.

The formation of ammonia and its conversion into nitrates are processes helpful to the former. But side by side with these there may go on in the soil under certain conditions a process highly harmful to cultivation. This is what is ordinarily known as *denitrification*, i. e. the liberation of free nitrogen from nitrogenous compounds. The nitrogen that is thus set free escapes into the air and is lost. Denitrification, like nitrification, is the work of certain bacteria which fortunately do not thrive under conditions which are favourable for the growth of nitrifying bacteria. The former, unlike the latter find ideal conditions for their growth in swamps and marshy places where there is plenty of organic matter, and where oxygen is either entirely absent or only present in very small quantities. Thus the actors that contribute to the activity of nitrifying bacteria check the action of denitrifying bacteria, and this is indeed a consolation to the farmer. Denitrification, however, does take place in nature, and thereby a portion of the nitrogen is lost from the soil. This is one of the sources of the loss of nitrogen. Another source is the washing away of nitrites and nitrates formed in the soil by bacterial agency through drainage water. Analysis of drainage water invariably shows the presence of a certain amount of nitrites and nitrates. Again, by the cultivation of crops a certain portion of nitrogen is removed from the soil. In these various ways nitrogen is lost from the soil. In spite of such losses it has been shown by the experiments at Rothamsted that continuous cropping for a number of years reduces the yield only to a minimum, but this minimum yield is maintained with very little variation through the land receives no manure at all. With regard to the mineral portions of the plant-foods it may be said that they are being gradually liberated from the rock-constituents of the earth and made available to plants. In the case of nitrogen, however, this explanation does not hold good,

for in the first place the amount of nitrogen originally present in the soil is comparatively small, and then there is a constant lessening of this quantity by denitrification, washing away through drainage water, and by the removal by crops. If there are not some sources by which the nitrogen thus lost is returned to the soil, it will not be able to produce a constant yield of crops, however small it be, as shown by the Rothamsted experiments. In fact there are several such sources for the replacement of nitrogen in the soil. These are (1) the remains of the crops such as roots, leaves, &c., which return to the soil at least a portion of the nitrogen they absorb, (2) the rain water which leads into the soil a certain amount of ammonia from the air and (3) certain organisms in the soil which have the power of assimilating atmospheric nitrogen. The last factor was first brought to light by the researches of the Russian naturalist, Winogradsky. He isolated a bacterium from the soil which he called *Clostridium pasteurianum* and which in pure culture showed in a considerable degree the power of assimilating free nitrogen. *Azotobacter* is another organism found in most soils, which has been shown to possess this power of nitrogen assimilation. In recent years several organisms have been shown to possess the same power in some degree or other, so much so that some scientists are inclined to the view that this is a common attribute of all micro-organisms. Though there is not sufficient proof of this assumption it has been shown without doubt that several species of micro-organisms are able to feed upon atmospheric nitrogen. I myself was engaged in some investigations connected with nitrogen-fixation while I was a student in the Agricultural Institute at Leipzig, and then I isolated from a sample of soil specially got down from Trivandrum an organism which I named *Bac. malabarensis* and which showed the power of nitrogen-assimilation as much as Winogradsky's *Bact. pasteurianum*. An account of *Bac. malabarensis* has been published in Vol. XIX of *Centralblatt für Bacteriologie*, pages 87 to 96.

Nitrogen assimilating organisms are one of the sources by which the nitrogen in soils may be increased. So convinced have been the bacteriologists of the importance of these organisms that they have attempted to place them in the market in pure cultures for inoculating soils with. The product placed in the market under the name of *Alnit* was a culture of these organisms, but it proved to be of

very little practical utility. Attempts at the artificial introduction of nitrogen assimilating organisms in soils have ended in failures, and attention has therefore been directed to the production of favourable conditions for the development of the organisms that are usually found in soils, by such means as cultivation, drainage &c.

The encouragement of the growth of free nitrogen-assimilating organisms of the soil is only one of the ways at the disposal of farmers for increasing the store of nitrogen in the soil. A second and more practical method is the cultivation of leguminous crops. It has been well established after a series of experiments extending over a number of years by a great many eminent scientists that the plants of the order *Leguminosae* possess, unlike other green plants, the power of absorbing atmospheric nitrogen and assimilating it in their system, and that this they do in conjunction with certain bacteria found in the nodules which are usually seen on the roots of such plants. The existence of these nodules was observed as early as 1866 by Woronin. In 1874 Erickson found in the nodules certain thread-like bodies which he regarded as micro-organisms of some sort. These bodies were afterwards isolated and their action studied in pure cultures under various conditions. The man who worked most in this field was Beyernick who called these bacteria *Bac radicicola*. Further researches have shown that the bacteria enter the roots of young leguminous plants from the soil, fix themselves at certain points and begin to grow on the food materials manufactured by the host plants. At each of these points the irritation set up by the invading organisms causes the roots to swell out and produce nodules. Opinion is not unanimous as to the exact nature of the process of this nitrogen-assimilation. The commonly accepted theory is that the actual assimilation is carried on by the nodule bacteria acting in symbiosis with their leguminous hosts. Whatever it be, the formation of nodules on the roots and the consequent absorption of atmospheric nitrogen take place only when there is not a sufficient supply of nitrogen in the soil itself. This fact is of considerable practical importance.

Nodule bacteria are generally found in almost all soils, except perhaps in extremely sandy soils. This does not mean, however, that any kind of legume will develop root nodules on any such soil. Experiments have shown that some species of legumes develop more nodules

than others in the same land. This difference has led some bacteriologists to believe in the existence of different species of nodule bacteria. This opinion is hotly contested by others who believe in only one species which undergoing certain physiological changes adapts itself to the conditions under which it is placed, and which, therefore, appears to be different species. According to this view the bacteria in a particular soil which have been found to develop nodules on the roots of one legume will not so easily develop them on the roots of another, until they get accustomed to the latter and adapt themselves to the altered conditions.

The question of selecting a proper legume suited to a soil must be decided by experiments. Sometimes it is found that a legume which produces nodules only sparingly during the first season produces them more abundantly during the second and following seasons. In all cases, as far as possible, the legume that is selected for cultivation in a soil should be one which grows luxuriantly and produces nodules plentifully in that soil.

With a view to meet the requirements of soils which are deficient in nodule bacteria, bacteriologists have in recent years attempted to place at the disposal of farmers pure cultures of these organisms with which they can inoculate their soils. These cultures have been placed in the market under several names by German, American, and English bacteriologists. The most commonly known product is *nitragin* prepared in Germany. Whatever may be the theoretical value of these cultures, experiments conducted in fields have seldom shown that they are of much practical value. I myself had occasion to conduct some inoculation experiments with groundnut and horse-grass and the results obtained have not at all been encouraging. In some cases, no doubt, inoculation has resulted in an increased yield and a more vigorous assimilation of nitrogen. If inoculation is to be successful the following conditions must be satisfied. (1) The culture for inoculation should be of the specific bacteria adapted to the particular legume to be grown. (2) The soil itself should be deficient in nodule bacteria. Good soils, as a rule, contain a sufficient number of them. But soils which are not fertile and which do not support legumes properly, such as sandy soils, will respond readily to inoculation with artificial cultures of nodule bacteria. (3) The soil should not be rich in nitrogen.

In the cultivation of leguminous crops the farmer has any easy means of increasing the nitrogen supply in the soil. The legumes may either be used as green manure in the land direct or cattle may be fed on them, and their dung and urine which will contain the major portion of the nitrogen of the crop may be used as manure. In either way it is a source of nitrogen supply to the soil. The advantages of green manuring which is now fast spreading in India, consist then chiefly in the increase of the soil nitrogen, and also in the addition of organic matter to the soil. I have analysed a number of samples of the soils of Travancore and have invariably found them deficient in humus, and nitrogen and sometimes in phosphoric acid also. Green manuring is the easiest and cheapest, method of removing the deficiency in humus and nitrogen and therefore deserves to be very widely practised by our ryots.

I have so far dealt with the different activities of the various micro-organisms of soils, and there yet remains for me only to say a few words about a very recent discovery, one that has aroused a fierce controversy between some of the English and American bacteriologists. I mean the discovery made by Russell and his co-workers about the effect of partial sterilization of soils. It has long been known that the continuous cultivation of a crop in a land results in the production of a sort of sickness, after which that particular crop does not grow properly in that soil. Russell and others have set to work on this question and have found out that the so-called sickness can be cured by the partial sterilization of the soil. In the course of their investigations they have also shown that by partially sterilizing the soil its bacterial activity increases and the quantity of available plant food also rises. The increased bacterial activity, they have attributed to the destruction of certain protozoan organisms which are usually found in soils, and which are said to inhibit the activity of useful bacteria. The existence of protozoa and their influence on bacteria are contested by some of the American scientists who are inclined to attribute the cause of soil sickness to the accumulation of certain poisonous excretions from the roots of plants, which they call toxins. Partial sterilization of soils will, however, destroy the toxins and thus cure soils of their sickness.

Whatever be the real nature of the changes brought about by par-

tial sterilization, it is admitted on all hands that it has a very beneficial effect upon soils and is hence a method deserving consideration at the hands of farmers. According to Russell and others partial sterilization can be effected either by heating the soil or by treating it with certain antiseptics. Direct heating of the soil is not so easy or cheap a method as to admit of its being practised on a large scale. With regard to antiseptics it has been found that formaldehyde, taking all circumstances into consideration, is the best. But even in this case the present price of the stuff is too high to make its application in the soil practicable. Until the method of partial sterilization has been brought within the range of practicability it need not be considered by farmers. There is, however, one method which very nearly approaches that of partial sterilization and which the Indian ryots can easily adopt, and that is ploughing the land at the commencement of the hot weather and exposing it to the sun. It has been proved by the experiments conducted at Pusa that hot weather ploughing increases the bacterial content of the soil resulting in an increased rate of ammoniacal formation and in the inhibition of the activity of such anaerobic spore-forming organisms, as the denitrifying bacteria. An account of these experiments has been published in the Report of the Agricultural College, Pusa, for 1910-11, page 74. There can be no doubt that the exposure of ploughed land to the scorching sun for two or three months will bring about certain changes, bacteriological as well as chemical, in the soil which will tend to increase its productivity. My experience in Travancore fully confirms this view. In Travancore there is the practice of ploughing the paddy lands immediately after harvest in February. The land thus ploughed is exposed to the hot sun for more than three months, before it is ploughed again and sown. The experience of the practical farmers has taught them that the land so ploughed and exposed to the sun is more productive than unploughed lands. From a consideration of the above facts and in the light of the investigations of Russell and others, hot weather ploughing can safely be recommended for wider adoption wherever conditions permit.

I am afraid I have already overstepped the limit of time allotted to me, and I cannot therefore do better than conclude my paper by summarising the important points I have touched upon.

1. The soil contains a large number of micro-organisms, the

number depending upon the nature of the soil and its depth. The more fertile the soil is, the larger is the number, and the largest number is usually found on the surface, hardly any existing below 8 or 9 ft.

2. The micro-organisms of soils consist chiefly of fungi and bacteria, and probably also of protozoan organisms if we accept the theory of Russell and others.

3. Of the fungi and bacteria found in soils there are a good many species concerned in the production of diseases of animals and plants. They are parasitic organisms.

4. Of the other classes of micro-organisms of soils there are some which are helpful to the farmer and some which do nothing but harm to him.

5. The friendly organisms consist of (a) bacteria which take part in the disintegration of rocks (b) fungi and bacteria which bring about the decomposition of organic bodies (c) bacteria which cause ammoniacal fermentation and produce ammonia from nitrogenous organic substances (d) bacteria concerned in the formation of nitrites and nitrates from ammonia (e) organisms which assimilate atmospheric nitrogen by themselves and (f) bacteria which in conjunction with leguminous plants assimilate atmospheric nitrogen. Under the harmful organisms the most prominent are the denitrifying bacteria which cause the liberation of free nitrogen from nitrogenous compounds.

6. The farmer must do all he can to facilitate the growth of friendly organisms and inhibit the action of unfriendly ones. He has within his reach several means of doing this:—(a) thorough cultivation and drainage of the land so as to aerate it properly. This will favour the growth of nitrifying bacteria and nitrogen fixing organisms and check the action of denitrifying bacteria. (b) Keeping a fine mulch on the surface of the land especially during the hot weather so as to reduce the evaporation of moisture from the ground. The presence of a certain amount of moisture in the soil is necessary for the proper activity of nitrifying and nitrogen-assimilating organisms. (c) Liming the land occasionally so as to remove the acidity, if any, and also to afford a base to combine with the nitric acid formed by the nitrifying bacteria. (d) Cultivation of green manure crops, particularly legumes, and if necessary inoculation of the soil with the proper nodule bacteria before cultivating the legumes. (e) Partial sterilization of the soil either by

heating it or by treating it with antiseptics, if practicable, and if not at least ploughing the land at the commencement of the hot weather wherever conditions permit. (f) Avoiding as far as possible the application of nitrates with bulky organic manures, for otherwise there is the chance of the nitrogen of the nitrates being liberated by the action of denitrifying bacteria.

What I have laid before you in this paper is mostly the result of the bacteriological investigations in the Western countries supplemented, wherever possible, by my observations and experience in Travancore. Agricultural bacteriology has not yet received its due share of attention in India. That it is a science fraught with immense possibilities for the development of our agriculture is I hope clear to you. If my paper has at least been able to arouse some interest among you in this young branch of agricultural science, so that it may receive better attention than at present at the hands of agricultural experts, I shall consider myself amply rewarded for my labours.

Appendix No. IV.

CO-OPERATION IN AGRICULTURE.*

BY

MR. K. RAMASWAMI AIYAR, B. A., B. L.

(Secretary, Ramnad—Madura District Agricultural and Co-operative Association, Madura.)

No movement is so full of promise and has such potency for the well-being of the people, as the Co-operative movement, and its relation to Agriculture is so intimate, that it is not possible to overlook the importance of this movement, in considering the improvement of this industry in this country. People here are mainly dependent on Agriculture. In spite of the best efforts made to improve the situation of the Indian ryot, the picture is still dark enough, and calls for the greatest share of our attention. His methods of cultivation are primitive, and often wasteful; and in disposing of his crops, he is entirely in the hands of local traders from whom he gets rarely any adequate price for the products of his soil. He is still using the rude implements, which his forefathers have been using. Labour-saving appliances used in modern Agriculture in other countries are still unknown to him. He knows little or nothing of commercial fertilisers and various other kinds of manure which are applied for enriching the soil with the necessary ingredients for getting a good out-turn. In most places sufficient care is not bestowed in the selection of seeds. In the case of poorer ryots, the seed grains are often consumed before the commencement of the next cultivation season and his only resort lies in the purchase of ordinary grains which are often sold as seed-grains at a much higher price than he would get them for his household consumption.

Technical and scientific knowledge, which play such an important part in Agricultural countries of the west, is wholly unknown. Those who have taken part in organising and working Co-operative Credit

* Paper read at the 3rd Agricultural Conference, on Monday, 14th July 1913.

Societies, feel sanguine, that there is considerable scope for the exercise of Co-operative practices in the development of Indian Agriculture. In Europe, the condition of Agricultural classes was in the same state about the middle of the nineteenth century, as it is in India to-day. The marvellous improvement, that has been effected, and the astonishing changes both in magnitude and rapidity that have taken place in the Agricultural condition of Europe to-day, are due mainly to the adoption of Co-operative ideals by its people.

In the words of H. W. Wolfe "Co-operation applied to Agriculture has become a familiar institution and a great economic power almost all over the continent, to the admitted material benefit of the countries in which it has found a home." The Co-operative society enables the small farmer in Europe to cultivate scientifically, to get a good seed and manure and implements at cheap rates. It creates a certain and steady market for his crops. It fosters agricultural education and encourages improved cultivation. The societies form a huge unpaid agency for the dissemination of the knowledge of the latest improvements of Agricultural science and economy in almost all parts of the country.

As has been graphically described by H. W. Wolfe "We find Co-operation cheapening supplies, increasing returns, strengthening human power for work. Everybody who has tried it bears witness to this; milk, eggs, corn, all fetch better prices; and implements, feeding stuffs, and fertilizers are bought with less money. The reckoning up of its benefits should not, however, be restricted to the consideration of gain, directly calculable in money. The indirect and immediate effects of Co-operation, its diffusion of knowledge, its remarkable educational capacity, its powerful stimulation of thought, which among them, teach men to cultivate better, to select the most paying crops for each particular case, to turn their produce to more profitable account, to settle in groups promoting well-being all round, and to make the country the more prosperous and the 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." Such are the inestimable advantages which Co-operation can offer for the improvement of Agriculture. Though the

departments of Agriculture and Co-operation, have been created by the Government independently about the same time, and have been working separately, it is now strongly felt, that unless they work together, it is not possible to achieve any measure of success in the near future. Year after year the Scientific Department of this College has been demonstrating the value of a particular method of cultivation, or of an improved implement or of adopting remedial measures for preventing the destruction of crops by pests; numerous leaflets have been published at considerable cost describing them. But they seldom reach the ryot. Co-operative societies can be made good channels by which these improvements can be carried to the ryots. In the words of Mr. Buchanan, "If the two departments so work together and if, most important of all, the people themselves, and especially the more enlightened classes co-operate, the history of the next fifty years will have much to tell of improvement in the lot of the Indian peasantry." I shall briefly enumerate the advantages, which Agriculture may receive from co-operation with special reference to the conditions of this Presidency.

(1) By collectively buying manure, seeds, machines and all raw articles or products used in Agriculture, a considerable saving could be effected in the prices of such articles. A collective purchase of manure has been adopted in one or two Co-operative societies with remarkable success. The first experiments having proved exceedingly profitable, great eagerness is felt for the collective purchase of commercial fertilizers such as superphosphates &c., from wholesale firms. With regard to the seeds of particular crops, especially with reference to cotton, there is already a great demand for it. Owing to the bad quality with respect to the Karunganni cotton, which the ryots secured in the ordinary market, ryots in the Taluks of Tirumangalam and Sattur are reported to have suffered great loss, from the very poor out-turn they had. Many of the societies, situated in the cotton tracts have already applied to me to secure them seeds of reliable quality. I foresee there is a great future for Co-operative enterprise in this direction. I cannot say the same thing with respect to the supply of implements, as those that are now in use are still of a primitive type and do not cost much.

(2) The sale of Agricultural products is at present entirely in the hands of middlemen, who go from village to village, or appear at weekly

markets and purchase such commodities at prices which are distinctly unfavourable to the ryot. Once they are taken to the market, it is not profitable to take them back. The dealers form themselves into a ring and force these people to sell at the price offered by them. Very often they are taken to retail dealers, in urban areas, where similar combinations are not uncommon. Except in the case of very large land owners, we have never seen farmers getting any favourable terms for the sale of their produce. There is ample scope for a Co-operative organisation to step in under such circumstances and relieve the ryot of much of the hardship that he is put to at present in the sale of his produce.

Already the existence of two well-conducted societies in a paddy producing area has attracted the attention of the Manager of a large rice-mill near Madura who has offered to purchase all the paddy grown in such area through these societies and negotiations are now progressing. It may not be possible to make great progress in this direction except in certain isolated centres until our people become thoroughly acquainted with the management of business concerns.

(3) In many cases it is advantageous to transform the raw products so as to render them fit for immediate consumption; such as converting canes into jaggery and sugar, paddy into rice, corn into flour, conversion of milk into butter and ghee, and so forth. These can be done by means of Co-operative organisation but it is a risky thing, to embark on such enterprises, in the present stage of Co-operative movement in this country. But we have to popularise such ideas among the masses so that they may be readily assimilated and translated into action in the near future.

(4) There are several villages in which it is possible to introduce labour saving machinery which can be purchased and owned collectively. I have noticed that in places, where betel vines are grown largely, it is highly economical to lift water by means of oil engines. Flour and oil-mills, paddy husker and cane crusher can be owned in common. As in the previous case, time is not ripe for starting such enterprises on a large scale. We have to proceed with extreme caution.

(5) The subject of Agricultural Insurance which is so successfully adopted in the European countries is quite foreign to this country. Very little information is available to us and it will take a long time before

any attempt can be made in this direction. Cattle insurance societies have been started in Burma but they are only in an experimental stage.

(6) Protection of crops against various causes of destruction by means of collective vigilance is another form of co-operative activity, which our country is not yet prepared to take up on hand.

(7) There is the greatest need at present for Co-operative action in the improvements in stock of cattle by collective purchase and ownership of the best animals. As I said before, our people have to be thoroughly trained to business habits, before they can be entrusted with the management of such concerns.

It would be impossible to reckon up the full force to which co-operation in Agriculture can be grown, and the value of the precious gifts which it could confer on husbandry. Co-operation, as we have seen, is a useful ally to Agriculture. The students of Agriculture will do well to realise the importance of the Co-operative movement as being one of the factors in the development of Agriculture in this country. (*Cheers.*)

APPENDIX No. V.

ON CO-OPERATION AS A MEANS OF IMPROVING THE RELATION BETWEEN LAND-LORD AND TENANT.*

BY

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Mr. Chairman, Ladies and Gentlemen,

I have been asked by the Secretary to the Madras Agricultural Students' Union to address you on the subject of *Co-operation as a means of improving the relation between land-lord and tenant*. A better subject could not have been selected for me, because some of you, students, represent the land-lords' interest, and others represent the tenants' interest in the soil. Again, some of you are about to go forth into the world, while others are there already engaged as preachers and advocates of agricultural improvement, and it will no doubt occur to you as a difficult problem, how to adjust the relation between land-lord and tenant in the business of co-operation. Those among you who are in the fortunate position of being more or less considerable proprietors, commanding wealth and influence, will no doubt feel that the responsibility of wealth rests in double measure upon their shoulders, because they are students of agriculture as well as owners of land and they feel that it is doubly incumbent upon them to promote the spread of co-operation among their tenants. Those of you who belong to middle class ryot families will sometimes feel discouraged and despondent because they find it impossible, without the concurrence and co-operation of the richer landed folk in their villages, to effect any agricultural improvement, however much they may feel its need as well as its practicability. To all alike, therefore, who are interested in agricultural improvement, it is of importance to try and secure in the first place a proper adjustment of the relation between land-lord and tenant.

* Paper read at the 3rd Agricultural Conference, held on Monday, 14th July 1912.

Before discussing, however, how that relation can be improved by co-operation, it is necessary for us to try and understand clearly, the terms and conditions of the problem. Co-operation, relation of land-lord and tenant, and agriculture, connote, in fact, three different subjects, the business of co-operation, the science of agriculture and the law relating to land-lord and tenant. I might come to you to learn something about agriculture, you might come to me to learn something about co-operation, but we shall both have to go to a lawyer to settle differences and misunderstandings between land-lord and tenant. I have mentioned the legal aspect of the problem in order to remind you that co-operation and agriculture are not the only factors in its solution. The practical advice I have to give you in the matter is that this third factor will not disturb us very much if we resolve to do without lawyers and Courts of Law. It may not sound to you as very practical advice, but I can assure you that associations and communities that have resolved to neglect this third factor have succeeded very well and have in fact succeeded better than those communities where differences between land-lord and tenant have had to be adjusted by the costly intervention of the law and lawyers. But even if you do not consider it practicable to dispense with the law, yet it is possible to deal with the theoretical problem before us by following the method of mathematicians who, when three conditions have to be satisfied in a problem, approach the solution of it on the assumption that one of those conditions either does not exist or is already satisfied. Similarly if we disregard for the moment one of the conditions of our problem, there remain two conditions to be dealt with by us. Co-operation between landlord and tenant and agriculture.

Here I must remind you that the Co-operation, we are discussing to-day, is not the sentiment of co-operative or the general feeling of good will and sympathy which it is sometimes taken to mean, but a business with terms, rules, and procedure of its own, just as well defined as the terms, rules and procedure of agriculture. It is just as much a mistake to suppose that the co-operation of Co-operative Societies consists in a general feeling of good will and sympathy as it would be to suppose that the science of agriculture consisted in sowing the seed at a certain season and reaping the

harvest at another. I do not mean that the business of co-operation is a science beyond the reach of the average intellect, or even beyond the reach of the uneducated intellect, taking education in the sense of the learning of the schools, but I do mean that co-operation is a business in which those who are about to engage in it and those who are already engaged in it must undergo a certain process of education. If you wish to practise co-operation with benefit to yourselves and those around you, you should study it in its elementary, its intermediate, and its advanced stages, just as, if you wished to study agriculture, you should either learn it by working with the ryot in the field, or take a course of lessons, theoretical as well as practical, at a school of agriculture. In other words, neither you nor I can hope to dispose of the subject of co-operation by a few remarks made in the course of a morning's address. I have placed these difficulties before you, not to drive you away from the co-operative fields, in the hope that some of you will take up in earnest a regular study of co-operative measures by working in and for co-operative societies; this is the only way in which useful co-operative knowledge can be acquired. I will now give you only a first lesson by impressing on you that co-operation is business and business of a pecuniary kind, which will be judged to have been well or ill done according as it lands you in pecuniary success which we call profit, or pecuniary failure which we call loss. The success or failure of a co-operative enterprise is tested and ought to be tested, let me repeat it, by its profit or loss and not by its establishing good will or sympathy or by its carrying out experiments to successful conclusions. You will find that all co-operative societies already registered and now working are societies for earning profit, and the single exception is that peculiar and necessary class of societies which, to use a Horatian simile, fulfill towards other societies the functions of a strop to a Razor, that is, which, without earning any profit themselves, ensure that other societies do earn a profit and which are called Unions.

In inviting land-lords and tenants to take part in co-operative societies, we need not and should not lay before them any ideal inconsistent with that of their attaining mutual profit. To urge land-lords to put themselves to loss for the sake of tenants or to urge tenants to make a profit at the expense of land-lords is not co-operation. By profit and

loss I mean eventual profit and eventual loss, because it is perfectly justifiable to persuade land-lords to expend money on their tenantry with the object of eventually securing a better class of tenants or a better return from their lands.

Subject to these remarks there are chiefly two ways in which land-lords can co-operate with tenants to their mutual advantage. A resident land-lord, that is one who resides in the village where he owns land, can best help his tenant by establishing a co-operative society where they as well as he will be members. It is not a good thing for an absentee land-lord, that is, for one who does not reside in the village where he owns land, to try to become a member of a co-operative society in that village, because it is obvious that he can seldom visit it and still more seldom take part in the celebrations of the society.

No one can do much good in a co-operative society who does not meet his fellow members very often and who is not in a position to be a member of the managing committee or panchayat of the society. Members of a Joint Stock Company need not know one another and, in fact, they may live in different parts of the world, but the law wisely requires that the members of a co-operative society should all live within a limited area, if possible, within the limits of the same village or town, and in any case, that the limits of the residents of members should be fixed in the case of each society.

But there is another way in which a landlord can do good to his tenants through co-operative societies, and that is, by investing his money in the societies to which his tenants belong. The law does not require that a person who invests money in a society, that is who lends money to it or deposits money in it, should be a member of the society. The wider the area from which a society can draw money the better will be its credit, and the law encourages societies to attract money and deposits from far and near. But when a society is just starting on its career and is, as it were, beginning to feel its way, it is not likely that people will be tempted to entrust it with their money, even if they happen to live in the same town or village. A society which has a large subscribed share capital may find it easy to obtain further working capital by means of deposits. But a society, like most of our Co-operative Societies in India, which have to start work with little or no capital, has to be helped specially either by

the law or by its friends with the capital necessary for its working. The law has done its part by enacting that societies may be formed on the basis of unlimited liability and it thus enables Co-operative Societies with little or no capital to obtain loans and deposits on the joint credit of all the members. Most of our Co-operative Societies are founded on the unlimited liability principle, and they obtain their funds from central and district banks. In return for this privilege, however, they have to submit to a very rigid scrutiny which is enforced mostly for the benefit of their creditors and they are strictly circumscribed as to the transactions in which they may engage, because their creditors are naturally anxious that they should not engage in business of a speculative character, that is, in business where the chances of failure are not negligible. In a Co-operative Credit Society, that is, a Society which lends money to members and borrows money for the purpose of lending it to them, and does no other kind of business, the chances of loss are very small and the creditors are safeguarded even against this small risk, first, by the principle of unlimited liability and secondly, by the provision of a reserve fund in every such Society.

But Co-operative Societies should do something more than borrow or lend money in order that their members, more especially when they are agriculturists, may benefit by co-operation. They should gradually learn to do that kind of business in common, which the members carry on, each individually for himself; and they should endeavour to supply their members with those articles and appliances which are required for scientific agriculture and which the members cannot buy for themselves except at a greater cost or under circumstances of greater inconvenience. Societies doing such work are called distributive or productive Societies, and they have necessarily to be conducted on a basis of limited liability, because those who subscribe or contribute to their working capital have to be guaranteed against losses which, even under careful management, may be considerable. For the same reason it will not be possible for such Societies to tap distant sources for their capital since the mere fact of distance engenders suspicion. It is precisely here that the land-lord, whether resident or absentee, can come to the help of his tenants. He is fully aware of the extent of their credit and can lend to any Co-operative Society of which his tenants are members, the capital necessary for its engaging

in distributive or productive work. He will, of course, get a proper return for his capital in the shape of dividend or interest and he will also benefit directly by the increased yield of his land and the improvement in the prosperity of his tenants. A land-lord may be unwilling to sink much money of his own in costly improvements, but he may, without undertaking much risk himself, lend money to his tenants through Co-operative Societies, thereby enabling them to make improvements for his benefit as well as their own. It is obvious that the land-lord should reimburse to his tenants the cost of such improvements by allowing them an adequate share in the net annual result and an adequate period for enjoying the benefit of the improvements. It is here generally that the law has to step in to regulate the relation between land-lord and tenant, but land-lords and tenants who are members of Co-operative Societies or who are jointly interested in them should endeavour to regulate their relations by the custom of the land rather than by the letter of the law, which, when made, is more often evaded than observed by both parties. A permanent tenancy or fixed occupancy right is the most advantageous position for a tenant who wishes to make improvements, and a yearly tenancy or a tenancy at will is the least advantageous position for him. Land-lords will find it to their interest to grant long leases on favourable terms to intelligent tenants who understand what improvements to make and are anxious to make them.

There are numerous other ways in which co-operation between land-lords and tenants may be improved, but the two I have referred to above, namely, the formation of Co-operative Societies by resident land-lords and their tenants and the starting of distributive and productive societies by means of capital lent by land-lords, whether resident or absentee, are the most practical suggestions that occur to me. One thing is certain, that, when land-lords and tenants understand that the productiveness of land and the return from live-stock can be increased enormously by scientific agriculture and by the scientific breeding and feeding of stock, they will find it to be to their common interest to have Co-operative Societies for the purpose of making and maintaining agricultural improvements. This right understanding of means and ends can come only from education and to you, students and diplomates in Agriculture, it especially pertains to impart the necessary preliminary education to land-lords and tenants. Secondly agricultural improvement cannot be

expected to burst upon a people like a revolution in a day but must be the result of persistent many-sided effort, a little here and a little there, a word in place, telling examples, a winning manner, and an attitude of one who concedes as much as he is anxious to impart. Thirdly, the education must be systematic, that is, conducted on an organized plan, carefully laid out beforehand and gradually worked up to by all interested in the campaign. Conferences are especially useful for organizing the campaign against ignorance and indifference, and I hope you will use aright the present golden opportunity to take stock of what you have done in the past year and resolve what you shall do in the next year.

I thank you, ladies and gentlemen, for inviting me to address you on this practical subject and for the patience with which you have listened to me. (*Loud cheers*).

APPENDIX No. VI

* IMPROVEMENT OF AGRICULTURAL CATTLE IN THE MADRAS PRESIDENCY

BY

*The Hon'ble Mr. K. Chidambaranatha Mudaliar, Shiyali, Tanjore.
District.*

It is remarkable, that cattle in this Presidency receive so little attention as they do from the people and the Government, especially looking to the fact that they occupy in its material economy, a place next only to man himself. About 33.75 millions of acres of cultivated land and 28.62 millions of people or about 70% of entire population directly depend upon their labour, while the entire population of 41.87 millions of the Presidency, and a large population outside indirectly depend upon it. Mr. A. C. Dobbs in an article in the last *Agricultural Journal of India* expresses his belief that cattle will ultimately give way to engines everywhere in the cultivation of the plains of India. Every agriculturist should really feel jubilant over the prospect of such a change coming in. The experience however of a country like England should serve as a safe-guide in this respect. Mr. Fream opens his article on Agriculture in the United Kingdom in the *Encyclopædia Britannica* which brings it down to 1900 in the following words—"The great future that seemed to await the application of the utilisation of steam power in the tillage of the soil has proved illusory". Such has been the experience of a country with a comparatively cheap and limitless supply of fuel. As far as can be seen it will not be too much to say that it cannot be any the less illusory in India. The day when steam power will displace the labour of cattle in this country and prove the salvation of the Indian agriculturist, is at least far too distant and prospective to come within the scope of the practical consideration of questions relating to the future of agriculture in this country. It behoves us, therefore, to carefully consider the present condition of cattle to see if they call for

* Paper read at the 3rd Agricultural Conference on Monday, 14th July 1913.

any improvement, and if so, in what directions. The cattle of this Presidency have been generally divided into four or sometimes five species; but there will be found to be in reality at least twice as many distinct breeds with peculiarities of their own, if only what are often called village or mongrel cattle in the several districts are carefully observed. These are the breeds that supply, in the main, the agricultural cattle of the country. It is no doubt true that these smaller local breeds are getting every day more and more mixed up, though not yet quite so much as to lose all their distinctiveness. The more important breeds are still naturally better cared for than others, and also command far higher prices. Each district, by itself or with one or two adjacent districts, has its indigenous breed of cattle peculiarly suited to the conditions of climate, the nature of the soil and its water, the fodder available and the kind of work they have to do. It is essential that every attempt should be made to preserve all that is desirable in these several breeds that supply the agricultural cattle of the different areas. A striking instance which will bring home the necessity of preserving the purity of such breeds just at present, may be mentioned.

The Tanjore District has a breed called the Southern Breed, (சென்னைப் பருங்கு) found in its deltaic portion always reputed for their extraordinary sturdiness, both as plough and draught cattle. They command nearly double the price of the other breeds of cattle of the same size and age. But "Cheap and nasty" is the maxim that guides the majority of buyers. The deteriorated specimens of this very breed and the relatively cheaper, but far less sturdy species from the Ariyalur and Udayarpalaiyam taluqs of Trichinopoly district form the bulk of the agricultural cattle at the present day in Tanjore. The pure native breed is less and less in demand, and consequently less and less reared. The fine qualities of the breed are now, in most places, only a matter of history, and it is only a question of time for the breed to disappear altogether. A more deplorable state of things cannot be imagined. Such instances are not rare. This is the fate, the inevitable fate of almost every good variety in the other districts as well. It may here be pertinent to inquire whether this is a state of things which can be looked on with complacency. Turning now from the purer breeds to the mixed breeds, the position is even worse. These are heavily deteriorated

ting day by day in strength, stature, and staying power. The reason is not far to seek. These are mostly born of imperfectly castrated sires, really good sires becoming altogether unknown in most villages and towns, more so in the latter, where a large number of dairy cattle are usually found. Often, the female cattle do not get crossed in season, merely for want of bulls even of the imperfect kind. Of the calves that are born a large percentage die young or grow to be weak and inefficient all their lives. This state of things certainly needs an imminent remedy. The public and more particularly the agricultural public should be more keenly alive to the seriousness of the situation than they are. Breed Societies should be formed as in the Western Countries in all the more important centres throughout the Province and a more scientific and systematic attempt made to preserve, and to improve all the deserving varieties. The societies should live and work all through the year. The cattle shows that are held at present here and there will then be less of a show and bear more real significance and far better fruit.

But presently a doubt arises whether such Breed Societies will come into existence and working order as early as may be desirable and necessary. Judging from the general trend of the life and growth of such institutions in this country, it is well nigh impossible to be reasonably hopeful in the matter. The necessity of preventing the rapidly growing deterioration seems so urgent that the remedy can hardly be delayed without yet further serious damage. In these circumstances a prompt beginning in the way of an effective remedy suggests itself. The cattle pounds of the Presidency are so evenly distributed throughout the Province that they appear to form imaginably the most convenient units from which a reform in this direction could be started. Every cattle pound in the Province has a decent area, with a safe enclosure, and is, in charge of the headman of the village. Select sires of the varieties prevalent in the respective areas may be purchased by Government or furnished by liberal citizens and maintained in special compartments attached to each pound. The savings from cattlepounds, supplemented by small fees, might, I suggest, be devoted to the cost of maintaining the breeding bulls.

Next in importance to the question of the breed and quality of the cattle comes the consideration of the food on which they live. The large herds of cattle that used to live in a wild state even in the minor forests of the country and which were periodically caught and trained to use have now rather long disappeared. The numerous herds that used to be owned by the people and entrusted to shepherds who take them over at the different seasons to different places when and where they get their grazing and which supplied largely the cattle needed for agriculture have also practically disappeared. The cattle that are kept and reared by the people themselves in villages and towns are practically the whole of what constitute the cattle existing at the present day. The one great evil that young ones suffer from the beginning is the extremely inadequate supply of milk-food, often verging on starvation. There is no harder truth than the fact that all the strength, the stature, and the staying power of any living animal depends almost entirely upon the milk-food they get as young ones. The immense increase in the consumption of milk as such, and in its other forms, the immediate and higher individual profits that accrue from them as dairy-cattle rather than as breeding cattle and the decline, in general, of a feeling of natural kindness towards them which, with Hindus, becomes even a religious duty have all sadly but powerfully tended to diminish the quantity of milk-food the young ones obtain, as well as, the period during which they get the milk-food. Further every kind of cattle food is becoming dearer and dearer every day. In the dry areas owing to the ever-widening cultivation of groundnut and other industrial crops, the output of the stubble of the dry grains and cereals has enormously diminished. In the wet areas the quantity of straw yielded is ever decreasing owing to the poorer and poorer growth of the plants. Even in forests, more particularly in minor forests, pasture has become extremely poor and scarce as a result of less rain, and the existing rainfall often unseasonable and unevenly spread through the year. In the cultivated areas and more particularly in the wet tracts there is very often hardly moving room for cattle after the lands are cultivated which is, in fact, deplorable.

Of the cattle food given other than stubble and straw, cotton-seed, groundnut and gingelly cakes and rice-bran form the chief articles. owing to the large export of groundnut as such, out of the country and also groundnut cake for manurial purposes, not only has the price of

cake risen but what is a more serious evil the purity of the cake is seriously tampered with. They very often contain a large admixture of sand and other indigestible stuff constituting a serious danger to the health of the cattle. Its use for cattle is rapidly diminishing and is sure to die out if the present conditions should continue. The output of gingelly cake is rather limited and whatever is available is generally confined to the feeding of dairy-cattle. And ever since the rice-mills began to multiply, the rice-bran is no more the soft, sweet, nutritive outer coating of rice but only finely powdered hard chaff mixed perhaps with a very small percentage of real bran. The use of such bran does much more harm than good and is now practically limited to people who cannot possibly help using them for want of anything better at about the same or even a little higher cost. Its use is also decreasing as it must unless its quality essentially improves. In these circumstances the enormous number of cattle in the Presidency is entirely thrown upon the one main remaining food of cotton-seed. Its retail price has risen nearly 25% during the last 5 years. While the price has risen the quality of the seed has become worse. The seed of the old indigenous variety of the Tinnevely District is infinitely superior in its nutritive capacity to the seed of the Cambodia cotton now spreading fast over the cotton areas, and what is more, the export of cotton-seed out of the country has increased by 50% within the last three years, the average being 179,600 cwt. in 1909-10 while in 1912-13 it has gone up to 241,558 cwt. Difficulties like these in obtaining good and cheap cattle food contribute to the further deterioration of the number and quality of the existing cattle. Every step must therefore, be taken to substantially improve this state of things and ward off a crisis. The sale of harmful articles of food for cattle should be rigorously dealt with. Societies for the prevention of cruelty to animals should grow throughout the province to prevent every kind of cruelty to cattle in the food it is given and the work it is made to do. Every endeavour should be made in the vital and permanent interests of the country to minimise, if not altogether stop, the export of cattle-food to foreign countries. The land coming under cultivation yearly increases and industrial crops, wherever possible, prevail over grains and cereals. The extent of pasture and the fodder available are thus and otherwise progressively diminishing and are bound to diminish ever more. The extreme importance

under these conditions of the preservation of cattle food like cotton seed and groundnut cake within the country cannot be over-rated. About 50% of the groundnut exported goes as groundnut out of the country. If only the simple process of converting them into oil could be done in this country, the gain in cattle food to the country would be something very substantial. Cotton-seed as really the most valuable of all cattle-food, deserves the first attention. A cheaper price would render it useful to a far larger number of cattle thus relieving and raising the level of the cattle of the whole province. It may be confidently said that cattle as a whole as well as agricultural cattle are better looked after in almost all districts than they were a decade or two back, and if only the conditions regarding the preservation of the quality of the cattle and the supply of cattle food should improve, not only will the cattle be far better than they are but the quantity of work turned out will also be far more than it is.

The suggestions herein made are the result of careful personal observation and experience. It is hoped that they will commend themselves to every one interested in the welfare and progress of the Province, its agriculture and all those who depend upon it and that it will be ever the constant endeavour of all to contribute each his mite towards their realisation.

Note:— * * * A few sentences in the Hon'ble Mr. K. Chidambaranatha Mudaliar's paper, were deleted, as they were, in the opinion of the committee, criticism of Government policy, the publishing of which is not consistent with the objects of the Union.

APPENDIX No. VII

"A PEEP INTO MALABAR AGRICULTURE"

BY

VENGAIL K. KRISHNAN NAYANAR,
Kuttoor, Taliparamba, N. Malabar.

My subject to-day is "A Peep into Malabar Agriculture." It is a wide subject, and placing myself, as I am now here, in the midst of many competent authorities and experts on the subject, I am afraid how I would be able to acquit myself in the discharge of my duty to-day. Still, with the little practical knowledge I have gained as a result of the course I have had in this College, and emboldened and encouraged by my success for the past four years in putting into practice all that I have been able to gather both from the theoretical and the practical classes during my course here, I venture to place before you my humble views on the subject based mainly on my practical experiences in the working of my Farm. Last year about this time, I had the privilege of reading a paper before this Conference embodying my personal experiences as a practical agriculturist and offering some suggestions as to the improvements to be effected in the agricultural industry of our country. This year I propose to give a general survey of Malabar agriculture, to indicate certain drawbacks in the system of agriculture carried on in Malabar, and to demonstrate from my personal experience the advantages that can be derived by the adoption of the improved methods of agriculture recommended by the Department of Agriculture, Madras. I shall also try to indicate the lines on which improvements can be effected and the way how they should proceed.

I shall begin by stating my opinion as to who can be called a practical agriculturist. In my view a practical agriculturist is one who considers agriculture as his profession and takes a personal interest in the agricultural works carried on in his farm. It is not enough if he sits in his arm-chair and entrusts his maistries with the whole work. He must put his head and heart into the business.

* Paper read at the 3rd Agricultural Conference on Monday, 14th July 1913.

give practical suggestions to his coolies and supervise personally the work going on in his farm. As remarked by Mr. Chadwick, Director of Agriculture, Madras, in one of his addresses to the Student's Club, last year, "the owner's foot is the best manure for his land."

Taking the case of Malabar agriculture with which I am mainly concerned, there are indications to show that the condition of agriculture in ancient Malabar was not so backward as it is now. Though scientific methods of intensive farming were wholly unknown, the agriculturists of those days, by dint of their hard work and timely operations, took from the land the best it would yield under the circumstances. As time went on, the agriculturists grew more idle and careless about their work, so much so that it is even now a prevalent notion in Malabar that agriculture is a work best fitted for idle, useless persons who are not competent enough to engage in the more active occupations of the day. At present the earnestness and caution which the ancient commerce of Malabar displayed have entirely disappeared and the modern methods of scientific agriculture have not come to be extensively followed. Agriculture in Malabar is thus passing through a transition period and it is of importance to know the main characteristics of this important period.

The present languished state of agriculture in Malabar, I would ascribe to two important causes. The first is the tenacity with which the Malabar agriculturists cling to the deteriorated methods of agriculture, and the second is the slight use which has been made of the recent advances in agricultural knowledge by the cultivators of the country. In Malabar, as elsewhere in India, there is a strong reverence to the customs and usages of the past and an equally strong aversion towards innovations of any kind. Whenever a progressing cultivator or an enterprising jemmy introduces any slight change in the methods of agriculture, as, for example, if he makes use of an improved implement, he is mocked and ridiculed by the whole village as one pretending himself to be wiser than his forefathers who were satisfied with the original methods. The Malabar agriculturist has, it is admitted, a capacity for hard work and if only he is provided with adequate funds and made active to adopt the modern methods of scientific agriculture, the prosperity of the country could be increased manyfold. But, how best to achieve this is a question well worth considering. I shall deal with this later on. In the meantime I shall discuss some of

the salient features of Malabar agriculture under the heads: (1) soil, (2) manures, (3) seeds, and (4) plant.

Treatment of the soil:—First in importance among the ordinary agricultural operations is the treatment of the soil. It is the proper treatment of the soil that is mainly responsible for success in agriculture and as such it deserves due notice at the hands of every cultivator. He should have a thorough knowledge of the nature of his soil and the amount of the different plant-food ingredients it contains before attempting to cultivate it. A sandy soil requires a different treatment from a loamy soil, and again a clayey soil has to be treated in a different manner altogether from either of these. In the matter of drainage also, different soils have to be dealt with in different ways, and to know the proper methods of procedure, an exact knowledge as to the constituents of the soil is quite indispensable. In fact, a great deal of the success in agriculture depends upon this knowledge, and it is the duty of every progressive farmer to acquaint himself thoroughly with the conditions of his soil. Soil analysis is a thing unknown in Malabar as elsewhere and the cultivator deals with every soil according to the time-honoured customs which, in his eyes, are invested with peculiar sanctity and holiness. In the selection of proper crops also, he is careless. A certain crop which thrives well in a clayey soil may not grow so well in a sandy soil, and it is the duty of the cultivator to determine beforehand what crops are best suited to the different kinds of soil he has in his farm and to grow in each soil that particular crop to which it is best fitted by reason of its nature and the amount of the plant-food ingredients it contains. In Malabar no such soil distinctions are observed and any crop is grown in any kind of soil with the inevitable result that the crop fails for want of proper nourishment. Another defect in the treatment of the soil in Malabar is that in Paddy lands proper bunds of sufficient size and strength are not constructed. In Malabar the floods are very high and, as such, the small bunds that are constructed there give way, causing a loss of manurial matter and even fine grains of soil. Moreover in some cases the bunds are silted up with sand and gravel causing much harm to the crops. High bunds will be able to withstand the strength of the current and divert it into water channels as desired. The damage caused by floods will, in

such cases, be little or none at all. Therefore it is desirable to have strong and better bunds in the paddy fields of Malabar.

Another subject to be discussed in this connection is the tillage of the soil which is not properly attended to. The different kinds of work carried on in tillage operations are (1) ploughing, (2) cultivating, (3) harrowing and (4) roiling. In Malabar the last two operations are practically neglected and, for the first two operations, the agriculturist still makes use of the primitive implements which have been proved to be quite inadequate by the experiments conducted in the Government Agricultural Farms. Although new and improved implements have been discovered to meet the needs of different soils, the agriculturists do not adopt them, in some cases, owing to their natural reluctance to change the old ones, and in other cases owing to their inherent poverty. There is no doubt that a great deal of improvement can be effected in Malabar agriculture if only the farmers are made to adopt the modern methods of cultivation and the improved implements. This can be achieved only by practically demonstrating to them their advantage and utility by the establishment of model agricultural farms in different centres of agricultural activity. The educated landholders can also do this on a small scale on their own farms if they have the will and the desire to do so.

Manures:—Having given to the land the necessary tilth, the next thing that the farmer should be careful about is manuring. Manures should be applied according to the needs of the soil and of the crop that is to be raised on it. Plants, as they grow in the soil, take from the land the necessary materials for their growth, and if the productiveness of the land has to be maintained, fresh materials in the shape of manures have to be added to the soil. If this is not done, every successive crop leaves the land poorer and poorer and eventually the land reaches a stage of barrenness. In the case of most lands in Malabar, this actually takes place through indiscriminate and insufficient manuring. In Malabar, forest leaves, wood ashes and farm-yard manure are almost the only manures known and these are indiscriminately applied for every soil and for every crop.

In my experience the best manure for paddy has been found to be those bulky organic manures producing humus, such as farm-yard manure and green leaves. These should be applied at least

a fortnight before transplanting, as decomposition must take place before the manurial ingredients become available as plant-food. If applied just at the time of transplanting, these manures, on the contrary, may be harmful to the crop.

The next point to be considered in this connection is about the collection and storage of farm-yard manure. Of the three systems that are in general use for this purpose, *i. e.*, the box system, the pit system and the heap system, the first has been found to be the most economical, as it preserves the urine which has been found to contain a larger proportion of the most valuable manurial ingredients. In most places in Malabar, the pit system is in general use, although this has the great disadvantage that the most valuable manurial ingredients are lost by exposure to sun and rain. In every case the first thing to be careful about is not to allow the contents of the manure pit from getting too dry as such a state stops the decomposition of the manure. The system of penning cattle in paddy fields is practised with advantage by the farmers of Malabar and I would strongly recommend it to all cultivators who wish to increase the productiveness of their land by a cheap and easy method. Attention should be paid in this connection to see that as soon as the penning is over, the land is ploughed and the manure covered.

Green Manure:—In this connection the importance of growing green manure crops such as sunhemp and daincha as manure for paddy has to be taken into account. These have to be grown according to the nature of the land and the interval between successive crops. In one-crop land, the seeds have to be sown by the end of October, and in the month of March the crop can be harvested and the seeds collected. The fallen seeds sprout again by the aid of the first April showers and get themselves ready to be puddled into the land at the transplantation time. In the double-crop lands, on the contrary, it may be sown by the end of March so that it may take advantage of the April showers to grow and mature by the end of June, *i. e.*, the transplantation time. It is the custom in our parts to bring forest leaves at great cost to the fields and to puddle the same. Although in places where forest leaves can be got easily, this system can be profitably carried on, in localities where green leaves cannot be easily procured, as in most places in South Malabar, the raising of green crops

can be tried with advantage. The only thing to be borne in mind is that it should be supplemented by other manures to give the land the necessary potash and phosphoric acid. Green manuring with cow gram can also be successfully adopted. It has proved a success at the Taliparamba Farm and I do not see why ryots should not more frequently enjoy its benefits.

Seeds:—The next subject on which I wish to say a few words is seeds. After having tilled and manured the land properly, it is to be sown with a proper quantity of fine healthy seeds. Seed is the mother of the plant and, as such, it is only the healthy seed that can bring forth the healthy plant. In Malabar the farmer pays no attention to the selection and preservation of seeds and, consequently, the seeds continue to deteriorate every year. In one measure of ordinary paddy seed, different varieties of paddy requiring different periods, of growth can be seen to be intermingled. This is due to the want of proper attention on the part of the farmer in selecting and preserving the seeds. There is a Malayalam saying, the meaning of which is "what is seen as a rich crop in the field is not so in the thrashing ground." This is chiefly to be attributed to the mixed nature of the seed that is sown in the field, which makes the early matured grains fall to the ground by the time the crop is harvested. I myself have conducted some experiments on selected seeds and the results have conclusively proved the immense profit that can be derived from a proper selection of the seed. At the harvest time, those plants that have grown well and given out the largest number of tillerings, with uniform ear-heads of closely grained corn, should be selected and separately thrashed and the resulting paddy will very well serve as seed for the succeeding year. If this process is continued for a number of successive years, the nature of the paddy and the annual out-turn will certainly show decided signs of improvement. I may state without exaggeration that almost the whole of my success for the last four years has been achieved by the close attention I have been paying in the matter of seed selection. In my place the seed rate for planting one acre ranges from 40-60 M. M. on an average. I have great pleasure in stating that I have been able to reduce my seed rate to 15 M. M., in a seed-bed of 20 cents for planting the same area singly, and that the seedlings I now get are stout and healthy. I have no doubt

that I can reduce it further and make it at least 10 M. M. for one acre.

The Plant.—Having dealt with seeds, I shall now come to the plant itself and point out some of the defects in the methods now obtaining in Malabar. In the following lines I shall mainly concern myself with paddy which is of course the staple crop of Malabar. In this connection the first thing to be considered is transplanting. The system in vogue in Malabar is to transplant in bunches of two to six plants. The disadvantages of this system are many. The plants have no room for proper growth and they struggle with one another at the start, ultimately getting weakened. If, on the other hand, the modern system of economic transplantation is followed, and with seedlings raised from selected seeds, each individual plant grows strong and puts forth a large number of tillers. Consequently the crop looks healthier and stronger. Speaking from my own experience I have found the system very advantageous and I can confidently recommend it to the agriculturists of Malabar.

Lastly I come to harvesting and in this connection I have to say a few words about the system of thrashing prevalent in Malabar. In my paper read before this Conference last year I had dwelt at length on this subject and so I shall conclude by saying a few words. The system of thrashing paddy by the help of coolies must be discontinued—the sooner the better—and the more profitable system of getting it done by the help of bullocks or buffaloes must be introduced. Although this system is in vogue in some of the hills for thrashing hill paddy, it has not come to be extensively employed in the country parts.

Dry Cultivation.—Extensive tracts of dry land are left uncultivated in Malabar. These lands can be made productive and fertile by adopting the system of rotation. By this means and by proper manuring, the wasteful method of ponam cultivation can be done away with. This method of cultivation, requiring fresh lands every year, necessitates the clearing up of large areas of jungle land year after year. This has materially affected the climate, rainfall and perennial and temporary springs which are the chief sources of irrigation for wet lands. It also reduces the supply of green leaves for manure, and of fuel and timber in the localities. In a word it impoverishes the country. Therefore the system of rotation can be largely extended in Malabar in the dry farming

areas. In my experience I have found that ginger and chillies, moden and groundnut and also ragi can be successfully rotated. Speaking of Malabar I would recommend ginger to be rotated with moden and cereal crops, since it has the advantage over groundnut in having a ready market.

SOME PRACTICAL EXPERIMENTS.

I think that it will not be out of place in this connection to enumerate the practical experiments that I have been conducting with some success, as some of them go to substantiate my remarks about Malabar agriculture and I shall give a short account of them.

1. An experiment was conducted to compare the yields from economic transplantation with selected and non-selected local paddy seeds. Equal plots were transplanted with seedlings raised from different nurseries where different proportions of local seed-rate were sown and the result was that the plot which was transplanted with seedlings raised from the nursery in which only one-fourth local seed-rate was sown, gave $1\frac{1}{2}$ to $1\frac{3}{4}$ times the yield derived from the plot which was transplanted with seedlings raised from the nursery where full local seed-rate and non-selected seeds were used. This establishes beyond doubt the importance of seed selection and the necessity for reducing the seed-rate.

2. The drill method of sowing single-crop land was compared with broad-cast system. Side by side with my transplantation plot, I laid out in my one-crop land four other plots to compare the drill system with the broad-cast system. Two of these plots were broad-casted with six and seven measures of selected Banku seeds and the other two were sown under drill system with $2\frac{1}{2}$ and $1\frac{1}{4}$ M.M. of the same selected Banku seeds. The crop under the drill system was found to be fresh, green, healthy and vigorous whereas the other was pale and unhealthy. When they were reaped and thrashed separately the out-turn from the former was $1\frac{1}{2}$ times that from the latter. I have been adopting the drill method for the last three consecutive years and I have found it successful and profitable, so that I have every reason to recommend it to my fellow agriculturists for general adoption.

3. Plots were laid out to compare the effects of, (1) loose-box manure, (2) ordinary cow-dung manure and (3) farm-yard manure.

Of these three, the box manure has been found to be the best and my yield calculating from accounts for the last three consecutive years was greatest in the plot manured with loose-box manure. To be precise, they were on an average in the proportion of 2, 1 and $1\frac{1}{2}$.

4. Indigenous and foreign varieties of paddy were compared in my experimental plots. I have found as a result of my experiments for the last three years that, among the foreign varieties, Banku, Rascadam and Jeerakasala can safely be cultivated both in the first and in the second crop seasons. They compare favourably with the local varieties in point of yield and growth. On the whole my opinion is that, if properly cultivated and if the principles of seed selection are adhered to, the local varieties yield better than the foreign varieties.

5. A rotation plot is also maintained by me according to the model of the one in the Palur Farm which I am rotating with groundnut, moden, ginger and ragi instead of with cumbu, thenai and cholam. From my experience I can say with some surety that, when moden is rotated with groundnut, the yield of the former is higher than when rotated with the other crops. Speaking of Malabar, I would recommend ginger to be rotated with cereal crops and moden, since it has the advantage over groundnut in having a ready market.

6. *Green manure experiments.*—For three consecutive years I have been conducting these manurial experiments, and from my experience I can very well assert that green manuring is more effective in one-crop lands than in double-crop lands. One reason for this is that in wet lands the manures are more liable to be washed away than in dry lands. Consequently special precautions have to be taken in growing leguminous crops in wet lands. The land should first be protected by small embankments and the crops should be ploughed in dry soil sometime before the monsoon breaks, to give it time to decompose and mix itself with the soil. Among other green leaves I have found forest leaves and Erukum leaves good manures for paddy.

7. *Raising of Seedlings (Paddy).*—This year owing to the want of timely rain I had some difficulty in raising my seedlings. So I had to take recourse to the irrigation method for preparing my seed-beds. Thus I had an opportunity of conducting an experiment on the different ways of raising seedlings. Four plots were opened

for this purpose. The first plot was kept as it was, to be sown at the breaking of the monsoon, the second was given a good tilth by constant ploughing and harrowing and manured with ashes, the third was harrowed and mulched with dry leaves and the fourth was heavily manured. All these plots were irrigated simultaneously by means of the piccotah. In the first plot the soil was caked and the seeds sown as well as last year's fallen seeds all grew together giving a mixture of several kinds of seedlings. In the second and third the seedlings were healthy and robust and in the fourth there was a large growth of grass and the seedlings were pale. This shows the importance of a fine surface tilth and mulching for the seed-beds and the injurious effects of heavily manuring the seed-beds. A fine surface tilth and also mulching preserve the soil in a moist state, the first by preserving the surface water and the second by checking the evaporation of the soil moisture. It is not advisable to manure the seed-beds profusely as it has the effect of checking the growth of seedlings and damaging the young plants. It is also found that seedlings transplanted from a richer to a poorer soil do not thrive well.

Sugarcane. Surely sugarcane can be successfully cultivated all throughout Malabar. The ryots rightly appreciate the preachings of the managers of agricultural farms during their tours. They have understood that it is a profitable concern, but they are not in a position to take it, up, chiefly because they are lacking in means. This remark applies in the main to the other crop also. But the cultivation of paddy is undertaken as they are dependent upon it for their livelihood. Anyhow from experience with the crop for the last four years, I did not meet with any discouragement or loss, my main success being due to the timely attention I have been paying in the matter of drainage and irrigation. In Malabar where the water gets logged up during the monsoon, manuring is of secondary importance. The varieties I have are B. 208, Mauritius and stripped Mauritius. Of these three, B. 208 has been found on analysis to yield the richest juice and also it turns out a jaggery of a superior kind. This year I have extended my area of cultivation on a similar soil and I am giving a trial to the three chief ingredients of the soil i.e., nitrogen, phosphoric acid and potash, reserving a special non-manure duplicate plot to know the relative value of these manures. I wish the cultivation of sugar-cane may be exten-

sively taken up by the people of Malabar so that, in the near future, Malabar may be proud of having a sugar factory as a model to the other districts.

I am afraid I am taking too much of your time and let me hasten to conclude with certain suggestions for improvements.

SUGGESTIONS FOR IMPROVEMENTS

The prosperity of a country means the individual prosperity of the people inhabiting it, and for a country like India where agriculture is the staple industry, the prosperity of the people can well be said to be bound up with the success of their agriculture. It has been said that 65 per cent. of the population of India are dependent on agriculture, either directly or indirectly, and so long as this industry which thus supports about 19 crores of people remains in its present backward condition, the salvation of India can never be said to have begun. The comparatively large number of famines that occur in India is in itself a positive proof of the dependence of the people of India on agriculture. It is thus of fundamental importance to the Indian public as well as for the administrators of the country to enquire into the reasons that led to the present degenerate condition of Indian agriculture and to devise methods for its regeneration.

In agriculture, as in all the other branches of industry, co-operation is the basis of success. Many things which at first sight seem impossible, can often be achieved by the aid of co-operation. The agricultural history of almost all European and American countries shows plainly that co-operation is the secret of all success in agricultural matters. The revival of agriculture began in Europe only 30 years ago and at the present day Europe occupies the pre-eminent position in agricultural prosperity. This splendid success has been achieved by the sole aid of co-operation. Taking a concrete example, if the farmers of the village join together, they can achieve so many things which individually they may not be in a position to achieve. This means that the peasantry must combine for all purposes connected with agriculture, i. e., for the provision of credit, for the sale of their produce, for the purchase of cattle and for the supply of seeds, manure, agricultural implements and such other necessities. If in every village such institutions are organised on really co-operative lines, I can confidently assert that ere long a

complete regeneration of our agricultural industry will take place. In Belgium which is at the present day one of the greatest agricultural countries of the world, the first step towards co-operation was taken through the exertions of a parish priest who enlisted seven of his parishioners as the members of a "Peasants' Guild". From this small beginning there arose gradually a number of Guilds and associations with the result that at the present day more agricultural associations can be seen in Belgium than in any other European country.

In Malabar, as I said, the greatest obstacle in the path of agricultural progress is the want of adequate funds to undertake agricultural improvements. It is an acknowledged fact that the Malabar agriculturist is not a capitalist. Even for ordinary agricultural works, the farmers have to borrow money from the village sowcar who demands an exceedingly high rate of interest from them. As soon as the harvesting is over, almost the whole of the paddy turned out will have to be given to the sowcar to clear his debt, and for the next year also the same process has to be repeated. Thus in order to improve the condition of the Malabar peasant he has, first of all, to be freed from the hands of the sowcar and secondly there must be some institution to take the place of the money lender. This end can be achieved by the establishment of co-operative credit banks in every village. Of course, owing to ignorance there may be some mistrust in the beginning, but in course of time this can be overcome. In this connection the splendid work that is being done by our Government towards the establishment of co-operative credit societies cannot be overlooked. It is always a mistake to expect the Government to do everything in matters concerning the welfare of the people. The Government can only show us the way, the major portion of the work resting with the people themselves. In Malabar, although it is satisfactory to note that, through the exertions of a number of public-spirited gentlemen a few societies have been established, it must be admitted that there is room for many more and it rests with the landed proprietors and the educated section of the people to do all in their power to establish them, if not in every village, at least at important centres of agricultural activity all throughout Malabar. There are two distinct advantages to be gained from the establishment of a system of co-operative credit societies all throughout the country. In the first

place, the agriculturists can at a reasonable rate of interest get money for their agricultural works and as a result they can undertake improvements and purchase new implements; and secondly this system will foster a spirit of co-operation and mutual help among the villagers. In the words of Sir H. Plunkett, co-operation means for the peasant, better farming, better business and better living.

Another suggestion that I have to bring forward is to establish village agricultural associations throughout the District under the guidance and supervision of a Central District Association. At present there is an Agricultural Association at Tellicherry which, I would say, must do better work. It must be admitted anyhow that what the association has to teach is truly practical only to a very limited extent, and that the benefits of the Association are not felt and appreciated by the general body of agriculturists for whom it is intended. Although occasional meetings are held and agricultural topics discussed under the auspices of the association, it is a regrettable fact that the majority of cultivators do not take advantage of them. The reasons for this are evident. Most of the lectures are delivered in English and the majority of the farmers are ignorant of the language and consequently they do not take the trouble of going over to the meeting place and attending the proceedings. Village Associations, on the other hand, if established, will focus interest and create in the villagers a genuine desire to take advantage of them. Occasional lectures in vernacular on agricultural subjects and, if possible, a small experimental farm also will greatly enhance the value and usefulness of the associations. In my paper read last year I had indicated the necessity of starting Village Associations which, if encouraged by the secretaries of the different Associations through co-operation with the Jemmies, Malabar could really boast of several such useful associations conducive to the agricultural welfare of the land.

Another great obstacle in the path of Agricultural progress in Malabar is the system of land tenure prevalent in those parts which gives to the cultivator only a temporary interest in the land, and he is deprived of the genuine interest in the same which is essential to induce him to improve it. The pernicious influence and the misuse of the powerful weapon of Melcharth referred to in my last year's paper are too numerous to mention. I can only repeat here

what I concluded as my remark on the subject in my last year's paper:—"Village Associations, then, with fixity of tenure represents the solution of the agricultural problem in Malabar." I am glad that the Government is taking some definite steps in these matters and I earnestly hope, they will enact some measures to remove this stumbling block in the path of Malabar agriculture.

Lastly I have to bring forward a new suggestion. A large number of Elementary Schools have been opened recently in various places in Malabar, under the management of the District Board and out of the Imperial Educational Grant. My suggestion is to impart agricultural education to the rising generation of cultivators through the medium of these schools. The landholders in the various places can, without much difficulty, open agricultural classes attached to these schools and give the young students object lessons in agriculture. If the scheme proves successful, I am sure the Government will help the project by appointing officers to supervise the work and by giving suitable grants to encourage them in the noble work. I am strongly of opinion that this system has great potentialities and, if it is given a practical shape, it will, in course of time, undoubtedly give a strong impetus to the agricultural progress in Malabar.

I have given in a general way the methods of agriculture carried on in Malabar, and indicated the lines on which improvements can be effected. If the wealthy landholders of the district co-operate and work earnestly and steadfastly on the lines indicated above, I have no doubt that most of the improvements can be easily effected and the condition of the Malabar agricultural industry materially improved.

Appendix VIII.

A. HONORARY MEMBERS.

With Donations to the Permanent Fund.

LIST OF MEMBERS OF THE UNION.

(Corrected up to 1st August 1913).

Serial No.	Name.	Address.	Donation, if any.
1	Abraham Pandithar, M.	...	Rs. 50
2	Annasami Thevar, A.	...	A. 0
3	Anstead, R. D., B. Sc.	...	P. 0
4	Adinarayanah, M.	...	...
5	Barber, C. A., M.A., Sc.D.	...	...
6	Benson, C., M.R.A.C.	...	...
7	Chadwick, D. T., M.A., I.C.S.	...	...
8	Chatterton, A., C.I.E.	...	...
9	Conchman, M. E., I.C.S.	...	...
10	Ettiapuram, Rajah of	...	...
11	Fletcher, T., Cambridge, F.E.S., F. Z. S., R.N.	...	...
12	Gangarazu Pantulu, M.	...	...
13	Harrison, W. H., M. Sc.	...	...
14	Hilson, G. R., B.Sc.	...	...
15	Kalunga Kayar, K.	...	...
16	Kasimkoda, Zemindar of	...	...
17	Keess, W., M.A., M.R.A.C.	...	...
18	Kenny, John	...	...
19	Krishnaswami Iyengar, N., B.A., B.L., Rao Bahadur	...	...
20	Kunjan Pillai, N., M.A., B. Sc., Ph. D.	...	...
21	Lonsdale, J. M.	...	...
22	Manavedan Raja, K.C., Raja, B.A.	...	...
23	McRae, W., M.A., B. Sc.	...	...
24	Narayana Rao, K., B.A., B.L., Dewan Bahadur	...	...
25	Nicholson, Sir F. A.	...	...
26	Pattabhirama Rao, N., B.A.	...	...

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27	Runabhadra Naidu, V., Hon. Dewan Bahadur	...	...
28	Raman Umi Vair Navar, Rao Sahib	...	...
29	Ramasastri Naidu, K. R., B. Sc.	...	...
30	Robertson, F. W. B., I.C.S.	...	...
31	Samson, H. C., B. Sc.	...	...
32	Secund Brat, J., Rao Sahib	...	...
33	Shepperson, C. J. W., B. Sc.	...	...
34	Shunmukh Pillai, S. T.	...	...
35	Southon, H., B.A.	...	...
36	Sreenivasan Pillai, K. S., B.A., Rao Bahadur	...	...
37	Stuart, G. A. D. I.C.S.	...	...
38	Subba Rao, N.	...	...
39	Suvaranua Aiyar, Sir S., B.L., K. C. I.E. Dewan Bahadur	...	...
40	Subraya Aiyar, P., B.A.	...	...
41	Swamikannu Pillai, L. D., M. A., B. L. (Madras), & L.L. B. (Lond), Hon'ble	...	...
42	Vasudeva Raja Valla Nambidi	...	...
43	Venkatadhar, C.	...	...
44	Yegnanarayana Aiyar, A. K., M. A. Madras & Cantab.	...	...
Total			...

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B. BENEFACTORS.

(Old Students).

No.	Name.	Address.	Life Subscriptions		
			RS.	A.	P.
1	Kochu Kunjuni Achan, P., L. Ag.	...	50	0	0
2	Krishnan Nayanar, Vengal. K.	...	50	0	0
3	Raman Nayanar, Hon'ble Vengal. K.	...	50	0	0
4	Virarayan Tirumalpad, T. N.	...	50	0	0
Total			200	0	0

C. FIRST CLASS MEMBERS.
(*Old Students and Officers.*)

No.	Name.	Address.	Subscriptions.		
			RS.	A.	P.
1	Alwa. K. T., L. Ag.	Assistant Farm Manager, Taliparamba	10	0	0
2	Ananda Rao, D., B. Sc.	Assistant Director of Agriculture, Northern Division, Rajahmundry	10	0	0
3	Appa Kow Pantulu, D.	Kasimkota, Vizagapatam Dt.	10	0	0
4	Chelvaranga Raju, J.	Ag. Assistant Director of Agriculture, Southern Division, Agricultural College, Coimbatore	10	0	0
5	Deviah, K. C.	Fairlight, Mercara, Coorg	10	0	0
6	Dharmaranga Raju, J., Rao Bahadur.	Divan Peishkar, Pudukottah	10	0	0
7	D'Silva, S. L.	Veterinary Assistant, Agricultural College, Coimbatore	10	0	0
8	Eapen, George, M., L. Ag.	Laboratory Assistant, Agricultural Department, Trivandram	10	0	0
9	Gurumatha Pillai, V. S.	Retired District Forest Officer, Punganur, N. Arcot	10	0	0
10	Hayavadana Rao, K. R.	Kambamallur, Salem Dt.	10	0	0
11	Iswaran Pillai, I. C.	Mittadar, Hanji, Via Tenkasi, Tinnevely Dt.	10	0	0
12	Narayana Rao, D. L.	Proprietor, Nursery Gardens, Hyderabad, Deccan	10	0	0
13	Panchapakesa Aiyar, M., D. A.	District Forest Officer, Central Circle, Coimbatore	10	0	0
14	Parameswara Aiyar, M., D. A.	Chemical Assistant, King Institute, Guindy, Saidapet	10	0	0
15	Patuck, N. H.	Gilder Street, Grant Road, Bombay	10	0	0
16	Raghunatha Rao, S.	Form Manager, Ist Grade, Nandyal (on Furlough)	10	0	0
17	Ramaswami Aiyar, R.	Ag. Chief Assistant to the Principal, Agricultural College, Coimbatore	10	0	0
18	Ramaswami Sivan, M. R., B. A., D. A.	Chief Assistant to the Agricultural Chemist, do	10	0	0
19	Rangachariar, K., M. A., L. T.	Government Lecturing Botanist, do	10	0	0
20	Ranganath, T. R., L. Ag.	Assistant to the Government Mycologist, do	10	0	0
21	Ranga Raju, J. R.	Messrs Ranga Raju Bros., Dairymen, Mount Road, Madras	10	0	0
22	Ratnaji Rao, V., L. Ag.	Assistant Farm Manager, Nandyal	10	0	0
23	Sankara Aiyar, M. S.	Beach House, Mylapore, Madras	10	0	0
24	Srinivasa Rao, H.	District Forest Officer, Hassan	10	0	0
25	Subrahmanya Mudaliar, V. P., G. B. V. C.	Deputy Superintendent, Civil Veterinary Department, Vepery, Madras	10	0	0
26	Sundaresa Aiyer, M.	Local Fund Overseer, Atur, Salem Dt.	10	0	0
27	Tadulinga Mudaliar, C., B. A.	Assistant to the Government Botanist, Agricultural College, Coimbatore	10	0	0
28	Venkata Rao Badami, L. Ag.	Agricultural Department, Bangalore	10	0	0
Total			280	0	0

D. FIRST CLASS MEMBERS.

(*Students.*)

No.	Name.	Address.	Subscriptions.		
			RS.	A.	P.
1	Govinda Rajan, K. R.	Student, Class II, Agricultural College, Coimbatore	2	0	0
2	Muthayya, M.	do	2	0	0
3	Ramaswami Aiyer, T. S.	do	2	0	0
4	Sankunni Menon, K. P.	do	1	0	0
5	Siva Rao Badami	Class III	3	0	0
6	Subba Rao, K.	do	1	0	0
7	Vyasrajan, C. P.	do	2	0	0
Total			13	0	0

ORDINARY MEMBERS.
(Old Students and officers).

No.	Name.	Address.	Rs.	A.	P.
1	Anantharama Sastri, S.	... Timnevelly	5	0	0
2	Andinarayana Chetty, B.	... Kunarapalayam, Bhawani, Coimbatore District	5	0	0
3	Azizudeen Sahib, Muhammad, D. A.	... Curator, Government Forest Museum, Coimbatore	5	0	0
4	Babu Rao, S. D. A.	... Sanitary Inspector, Choolai, Vepery Post, Madras	5	0	0
5	Balakrishnamurti, D., D. A.	... Farm Manager, Aitakapalle	5	0	0
6	Bhandary, K., T. L. Ag.	... Assistant Farm Manager, Central Farm, Coimbatore	5	0	0
7	Chandrasekara Mudaliar, A. R.	... Veerapillai Street, Bangalore	5	0	0
8	Cheriyin Jacob, L. Ag.	... Assistant in Botany, Agricultural College, Coimbatore	5	0	0
9	Chinnadurai Pillai, A., L. Ag.	... Assistant Farm Manager, Agricultural Station, Kottipatti	5	0	0
10	Daniel, S., L. Ag.	... Agricultural Inspector, Bangalore	5	0	0
11	Dhanakoti Raju, V. G., D. A.	... Farm Manager, Palur, South Arcot District	5	0	0
12	Dwarakanath, B., L. Ag.	... Post Graduate Student, Research Institute, Pusa	5	0	0
13	Ellappa Chetti, C. L. Ag.	... Davanagere, Mysore Province	5	0	0
14	Ganapathysundaram, T. S.	... Diwan's House, Kottakulam, Timnevelly	5	0	0
15	George, M. C., L. Ag.	... Mahal House, Enathuva via Tiruvella, Travancore	5	0	0
16	Gopalswamy Mudaliar, S.	... Mirasdar, Kottur, Mannargudi, Tanjore District	5	0	0
17	Govinda Kidavu, M., D. A.	... Farm Manager, Taliparamba, N. Malabar	5	0	0
18	Guru Raja Rao, K. M., L. Ag.	... Swetudri Farm, Yellandur, Mysore Province	5	0	0
19	Javarayya, H. C., L. Ag.	... Assistant Curator, The Lal Bagh, Bangalore	5	0	0
20	Jogi Raju, G., D. A.	... Home Farm Superintendent, Pittapuram, Godavary District...	5	0	0
21	John, W. J.	... Messrs P. John & Sons, Allepey, Travancore	5	0	0
22	Kanakshi Row, G.	... Messrs Ninfekar & Co., Chemists and Druggists, Pycroft's Road, Triplicane, Madras	5	0	0
23	Kerava Pillai, N., L. Ag.	... Deputy Ranger on Special Duty, Munar, Travancore	5	0	0
24	Krishna Aiyar, D., L. Ag.	... Palur, Travancore	5	0	0
25	Krishna Aiyar, A., L. Ag.	... Assistant Farm Manager, on Special Duty, Madura	5	0	0
26	Krishnamurthi Rao, K., D. A.	... Chemical Assistant, Government Sugar-cane Breeding Station, Chettipalayam, Coimbatore	5	0	0
27	Krishnan, P. G., D. A.	... Superintendent, Seedstores, Agricultural Department, Sibpur, Calcutta	5	0	0
28	Krishnaswamy Aiyar, K. V.	... Farm Superintendent, Kavalapara Estate, via Shoranur	5	0	0
29	Kumbambo Nambiyar, M., L. Ag.	... Assistant Farm Manager, Central Farm, Coimbatore	5	0	0
30	Lakshman Rao, T., B. A.	... Assistant to the Government Agricultural Chemist, Agricultural College, Coimbatore	5	0	0
31	Lakshmana Rao, T. S., D. A.	... Park Overseer, Mysore	5	0	0
32	Madhava Rao, B.	... Robertsonpet, Masulipatam	5	0	0
33	Madiah, C. S., L. Ag.	... Agricultural Assistant, Newington Cathedral, Madras	5	0	0
34	Mangesh Rao, M., D. A.	... Farm Manager, Government Sugarcane Breeding Station, Chettipalayam Coimbatore	5	0	0
35	Muthuswamy Aiyar, V., D. A.	... Farm Manager, Samalkota	5	0	0
36	Narayana Aiyengar, K., D. A.	... Farm Manager, Hagari	5	0	0
36a	Narayana Aiyar, C., D. A.	... Assistant to the Government Entomologist, Agricultural College, Coimbatore	5	0	0
37	Narayana Aiyar, K., L. Ag.	... Palur, Travancore	5	0	0
38	Narayanaiah, S., L. Ag.	... Assistant Farm Manager, Palur Farm, via Nellikuppam, South Arcot District	5	0	0
39	Narayana Rao, T. V., D. A.	... Farm Office Manager, Central Farm, Coimbatore	5	0	0
40	Narayanaswami Aiyar, V. S., D. A.	... Farm Manager on Special Duty, Chittur, Chittur District	5	0	0
41	Punakala Rao, D., L. Ag.	... Assistant Farm Manager, Samalkota	5	0	0
42	Pundit, R. P.	... Biscuit Factory, Mangalore	5	0	0
43	Raghava Aiyangar, S., D. A.	... Supervisor, Elementary Schools, Avenasi; 303, Danappa Mudaly Street, Madura	5	0	0
44	Raghavachari, K., L. Ag.	... Assistant Farm Manager, Mangalallur	5	0	0
45	Raghuaitha Swami Aiyangar, P. A., D. A.	... Assistant to the Government Agricultural Chemist, Agricultural College, Coimbatore	5	0	0
46	Rajagopalachari, T. V., D. A.	... Farm Manager on Special Duty, Ellore	5	0	0
47	Rajagopala Nayudu, G.	... Editor, South Indian Agriculture, Periapalayam via Ponneri...	5	0	0
48	Ramachandra Rao, Y., M. A.	... Assistant to the Government Entomologist, Agricultural College, Coimbatore	5	0	0
49	Ramalinga Vadhar, C. S., D. A.	... Chittur, Cochin State via Palghat	5	0	0
50	Ramanujachari, K., L. Ag.	... Assistant Farm Manager, Mangalallur	5	0	0
51	Saldanha, Isidore.	... Koguinhal Estate, Balehonnur P. O., Kadur Dt.	5	0	0
52	Sankara Aiyar, K., D. A.	... Farm Manager, Mangalallur, Tanjore Dt.	5	0	0
53	Sankaranarayanan, K. R.	... Care of K. R. Srinivasa Aiyar, B.A., B.L. Danappa Mudali Street, Madura	5	0	0
54	Sankaran Nayar, Kumhi, L. Ag.	... Kannambra Puthuode P. O. via Lakkidi, S. Malabar	5	0	0
55	Satagopal Aiyangar, N., L., Ag.	... Home Farm Superintendent, Parlakimedi, Ganjam Dt.	5	0	0

ORDINARY MEMBERS—continued.

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No.	Name.	Address.	Rs.	A.	P.
56	Seshachari, C. V., L. Ag.	Assistant Farm Manager, Central Farm, Coimbatore	5	0	0
57	Sethurama Aiyar, A. D. A.	Nidamangalam, Tanjore Dt.	5	0	0
58	Sivaramakrishna Aiyar, N. L. Ag.	Porur, Travancore	5	0	0
59	Sivarama Rao, D. B., L. Ag.	Agricultural Inspector, Bangalore	5	0	0
60	Siva Rao Bhargava, L. Ag.	Assistant Farm Manager, Anakapalle Farm	5	0	0
61	Srikantiah, S. V., L. Ag.	Agricultural Inspector, Pudukottah	5	0	0
62	Srinivasachari, T. V.	Farm Superintendent, Pudukottah	5	0	0
63	Srinivasa Das, L. L. Ag.	Care of L. Subbannachari, Aunaiyur	5	0	0
64	Subramaniam, Pantulu, R.	Minor Irrigation Sub-overseer, Guntur	5	0	0
65	Subramaniam Aiyar, C. S.	Agricultural Inspector, Training School, Trichur	5	0	0
66	Subramaniam Aiyar, R.	5-1182 Sandipetta Street, Madura	5	0	0
67	Subramaniam Aiyar, S. D. A.	Farm Manager, Palur, via Nellikuppam, S. Arcot Dt.	5	0	0
68	Subramaniam Sastri, V. S., D. A.	Assistant Farm Manager, Hageri, Kellary Dt.	5	0	0
69	Sundara Aiyar, K. P., L. Ag.	Do. Koriyatti, Tinnevely Dt.	5	0	0
70	Sundaram Aiyar, K. D. A.	Tank Square West, Rummad	5	0	0
71	Sundaram Aiyar, S., M. A.	Assistant to the Government Mycologist, Agricultural College, Coimbatore	5	0	0
72	Tillu, K. K., D. A.	Assistant Settlement Officer, Indore, Central India	5	0	0
73	Tirumangalakudi Pillai, A. V., D. A.	Farm Manager, Central Farm, Coimbatore	5	0	0
74	Umi Krishna Menon, K., D. A.	Do. Taliparamba, N. Malabar	5	0	0
75	Vaidyanatha Aiyar, K.	Minor Irrigation Overseer, Dindigul	5	0	0
76	Vekkatarama Aiyar, D. K.	Vadipatti, S. T. R., Madura Dt.	5	0	0
77	Venkataraman, T. S., B. A.	Assistant to the Government Sugarcane Expert, Agricultural College, Coimbatore	5	0	0
78	Venkataramiah, R.	Madhavayyari Street, Nellore	5	0	0
79	Venkuswami Aiyar, P. S., L. Ag.	Care of P. Subbaya Aiyar, B. A., First Grade Pleader, Madura	5	0	0
80	Vinayachandrasekhar, V.	Purseywalam, Madras	5	0	0
81	V. Venkataswami Aiyar, N. V.	Freeman, Government Botanist's Office, Agricultural College, Coimbatore	5	0	0
Total			410	0	0

ORDINARY MEMBERS.—(Students.)

No.	Name.	Address.	Rs.	A.	P.
1	Anaswami Aiyar, C. R.	Student, Class I Agricultural College, Coimbatore	1	0	0
2	Audinaravara Rao, K.	do do	1	0	0
3	Balakrishnan, M. A.	do do	1	0	0
4	Budhavidehya Rao, T.	do do	3	0	0
5	Gopalakrishna Raju, K.	do do	3	0	0
6	Gopalakrishnaiah, A.	do do	1	0	0
7	Gopalan Nayyar, A.	do do	1	0	0
8	Jacob, K. M.	do do	1	0	0
9	Jeevan Das, R.	do do	1	0	0
10	Kunhappa Nambiyar	do do	1	0	0
11	Mad, Rajagopal, G.	do do	3	0	0
12	Manga Raju, K.	do do	2	0	0
13	Manickam Mandalayar, V.	do do	2	0	0
14	Narasimha Raju, C.	do do	3	0	0
15	Paranavandam, T.	do do	2	0	0
16	Pranathurthibara Aiyar, S.	do do	2	0	0
17	Ramanathan, V.	do do	1	0	0
18	Ramiah, K.	do do	3	0	0
19	Renga Keddy, C.	do do	1	0	0
20	Sanjeeva Rao, K. N.	do do	1	0	0
21	Sankarankumar, L.	do do	2	0	0
22	Sankaran Pillay, K.	do do	1	0	0
23	Shinappa Tolari, B.	do do	1	0	0
24	Sitarama Chetty, S.	do do	3	0	0
25	Sitaram Pathrudu, S.	do do	2	0	0
26	Srinivasachari, S.	do do	2	0	0
27	Srinivasan, C. P., S. R.	do do	1	0	0
28	Subramaniam Aiyar, P. R.	do do	3	0	0
29	Thiruvengkatachari, S.	do do	3	0	0
30	Vellodi, M. U.	do do	2	0	0
31	Vinayachandrasekhar, V.	do do	2	0	0
32	Viraswami, K.	do do	2	0	0
33	Vittal Rao, U.	do do	1	0	0
34	Vrudhachalam Pillai	do do	2	0	0
35	Yesudasani, A.	do do	2	0	0
Total			62	0	0

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