

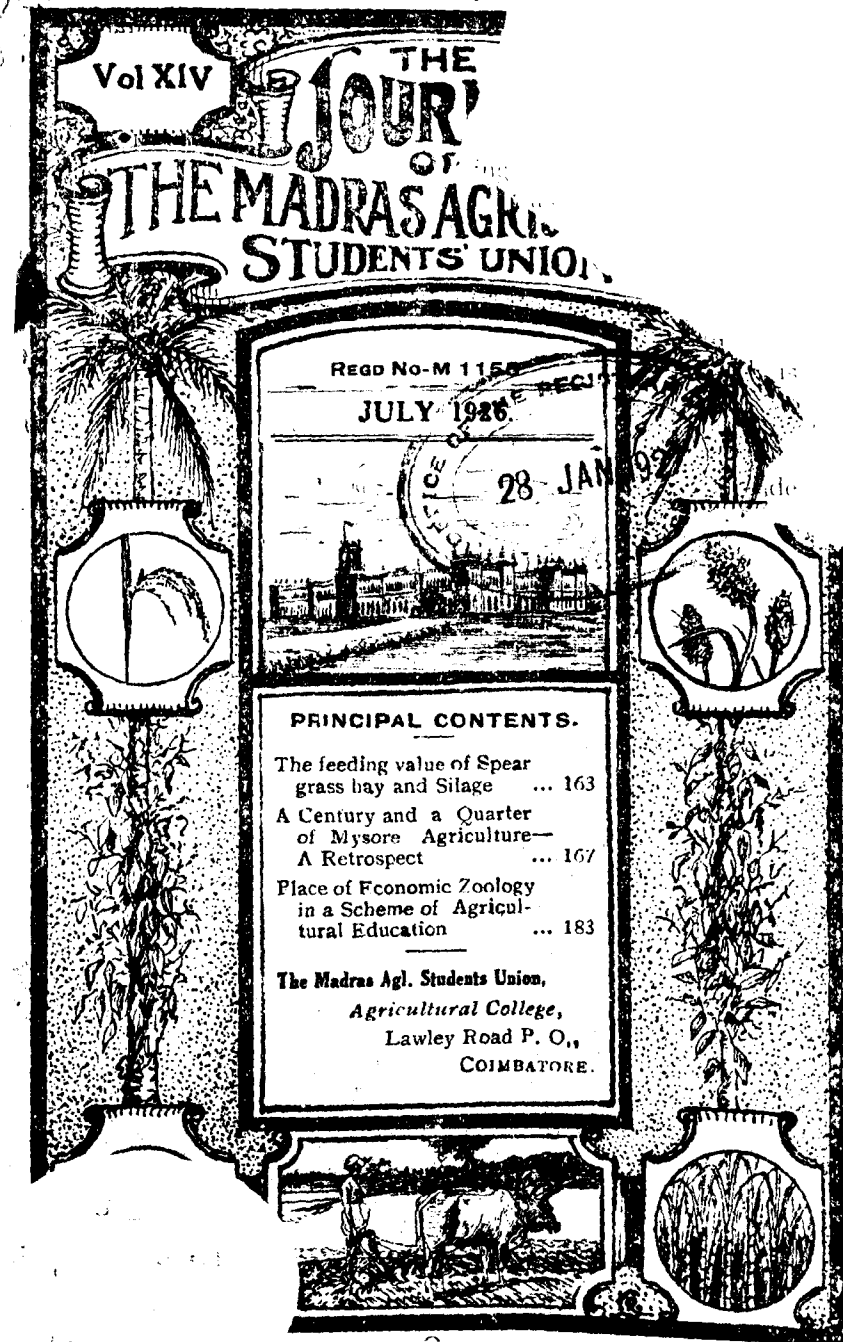
Journal of the Madras
Agricultural Students Union.

V 14. No 7. July 1926.



JL
J, 8, m211, n13
n26
169927

606



Rs. 4.

Single copy As. 6.

(ii)

Fertilisers for all Crops

SPECIALITIES FOR

Paddy, Ragi, Sugarcane, Tobacco, Cotton,

Coconut, Tea, Coffee, Rubber, &c.

Manufactured under European Expert Supervision.

(ANALYSIS GUARANTEED.)

Fertiliser Materials ground and Mixed to order

or sold separately.

BONE MEAL (Steamed and Unsteamed.)

Superphosphates, Crushed Poonacs, Sulphate of Potash,
Muriate of Potash, Kainit Basic Slag, Sulphate of
Ammonia, Saltpetre, Nitrate of Soda, Milled Fish, Fish
Guano, Blood Meal, Nitric acid, etc.

For Pamphlets on Manuring and quotations F. O. R. any

Station or C. F. I. any Port in Southern India.

APPLY TO:—

Messrs. PARRY & Co.,

MANAGING AGENTS,

The Presidency Manure Works, Ltd.,

CALICUT & MADRAS

(iii)

EDITORIAL BOARD.

EDITOR.

V. MUTHUSAMY AIYER.

MEMBERS.

T. V. RAJAGOPALACHARYA.

M. C. CHERIAN.

K. M. THOMAS.

P. N. KRISHNA AIYAR.

S. NARAYANIAH.

S. MUTHUSAMI AIYAR.

ATTORNEYS.

Mathur, Coimbatore District.
Mudaliar, Zamindar of Chunampet,
Chingleput District.
Madras.
Abdulla Haji Kasim Sahib Bahadur, Udipi,
S. Kanara District.
Malinga Rayar, Kumara Zamindar of Uttukuli, Coimbatore Dt.
Sree Krishnachandra Gajapati Narayan Deo Garu,
Raja of Parlakimidi Ganjam District.
Sri Madana Mohana Simha Deo Garu Zamindar of Dharakota,
Kollengode, Malabar District.
Malayandi Chettiar, Udamalpet, Coimbatore.
Rao Bahadur Sir A. P. Patro, Madras.
Raja Rajeswara Sethupathi alias Muthuramalinga Sethupathi,
Rajah of Ramnad, Ramnad District.
Dewan Bahadur V. Ramabhadra Nayudu Garu, Zamindar of
Doddappanaickanur, Madura, District.
Rao Bahadur, T. A. Ramalingam Chettiar, Coimbatore.
Sir C. P. Ramaswami Ayyar, Madras.
Rao Bahadur C. S. Rathnasabapathy Mudaliar.
M. Sambandam Mudaliar, Coimbatore.
Reerarayan Thirumalpad, Nilambur, Malabar District.
V. C. Vellingiri Gounder, Coimbatore.
Venganad Rajah Sir Vasudeva Rajah, Kollengode, Malabar District.
C. R. Venkataramana Ayyangar, Coimbatore.

BENEFACTORS

Kochu Kunjunni Achan, Cochin.

ASSOCIATES

A. Devappa Punja, Mangalore, S. Kanara District.

(i)

PRODUCE BETTER AND BIGGER CROPS.

You can do so. How? By making sure that your crops are properly fed. Plants require food just as do human beings, otherwise they become unhealthy and sickly and do not yield their best.

BY USING

artificial fertilisers, you supply your crops with the food they require. The most important of these is Nitrogen which is contained in

NITRATE OF SODA

in the Nitrate form, the only form in which nitrogen is made use of by plants.

Further all the nitrogen (10%) contained in Nitrate of Soda is immediately available; it requires to undergo no further changes in the soil before it is used as plant food.

Try it and satisfy yourself that it is the cheapest and most efficient fertilizer on the market.

YOU'LL BE SURPRISED

at the wonderful results which you will obtain.

Nitrate of Soda may be had in any quantity. Four pound tins at Rs. 9/- per dozen and one maund package at Rs. 10/-, freight extra. Larger quantities at a much lower rate.

Stocked by all the best dealers.

For names of nearest dealers, free literature and further particulars apply to:-

**THE DIRECTOR,
CHILEAN NITRATE COMMITTEE
(Indian Delegation)**

**Post Box No. 469,
CALCUTTA.**

THE JOURNAL
OF
The Madras Agricultural Students' Union.

JULY--1926.

CONTENTS.

	PAGES.
The feeding value of Spear grass hay and Silage <i>By F. J. Warth, M. Sc. B. Sc.</i>	... 163
A Century and a Quarter of Mysore Agriculture—A Retrospect— <i>By A. K. Yegnanarayana Aiyar, M. A., Dip. in Agri. (Cantab), N. D. D. F. C. S.</i>	... 167
Place of Economic Zoology in a Scheme of Agricultur Education— <i>By T. V. Ramakrishna Aiyar B. A. F. Z. S.</i>	... 183
EXTRACTS :—	
Sugar outlook	... 188
Science and the common farmer	... 191
Notes	... 192
Departmental Notification	... 195
Appendix I—Report of the Working Committee for year ending 30th June 1926	... 1—4
Appendix II—Abstract of Papers, read at the Jubilee Conference	... 1—20

Farming will never be a success unless the farmer
had more voice in the disposal of
his produce—P. Morrel.

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

Vol. XIV] JULY 1926. [No. 7.

The feeding value of Spear grass hay and Silage.
F. J. WARTH, M. Sc. B. Sc.
Physiological Chemist, Bangalore.

During the past year some preliminary feeding tests were carried out at Hosur by the Nutrition Section of the Imperial Department of Agriculture. The work done forms the first stage of a comprehensive enquiry which should yield increasingly valuable information as it proceeds. The experiment which has just been completed aimed primarily at comparing the nutritive values of spear grass hay and silage. Sixteen young animals were selected and divided into two groups for the test. One group received spear grass hay, the other group received silage made from the same kind of grass cut at the same time. All the animals received a daily ration of 3 lbs. of concentrate (2.7 lbs. dry matter) consisting of 1 lb. groundnut cake and 2 lbs. rice bran. The roughage was fed in large excess and every encouragement was given to the animals to eat as much as possible. In this respect hay consumption was especially encouraged. The contents of the manger were repeatedly turned over when the animals stopped eating and fresh amounts were added at frequent intervals. The daily roughage consumed by each animal was determined by weighing the amount fed and the amount remaining uneaten. The moisture content of the hay and silage was regularly determined and from these figures the amount of dry matter consumed daily was found. The feeding experiment was carried out for 13 weeks during which time the animals were weighed daily. The results obtained were by no means very uniform. Within each group some animals ate much more than others and some animals increased in live weight more than others. In this paper the subject of experimental error cannot

be discussed. It must suffice to say that in spite of variations in individual results, there is a very sharp difference between the two groups.

The following figures are the averages of the experimental results.

	Daily roughage consumption of dry matter per head.	Av: Live weight per head.	Live weight increase in 48 days
	lbs.	Final lbs.	Initial lbs.
Silage group.	8.363	514	485
Hay group	5.860	471	474
			+29 -3

These results are most instructive in a number of ways.

In the first place the experiment has proved that spear grass silage produces better growth than spear grass hay.

Secondly it has shown that the higher production is due to greater consumption rather than to a superior nutritive value.

Thirdly without going into details which cannot be conveniently discussed here it appears that weight for weight (considering dry matter) the silage and hay have very nearly the same nutritive value. The value of the silage is perhaps slightly higher but the difference is hardly significant.

Fourthly the hay ration has been a failure and the failure is due mainly to low consumption of hay. The practical significance of these observations is discussed under three heads.

It must be recollected here that these are average results which may be expected from a herd. With both fodders some animals will do better and some worse than the averages.

(1) *The Consumption of Spear Grass Hay.*—The low consumption of hay is the most significant fact brought out by the experiment. It is no new information that young animals do not relish spear grass hay, but it is news that they eat so little of it. Encouragement of every possible kind was given. The fodder was provided in superabundant excess, the animals almost wallowed in it and yet they only ate as much as they were forced to by the maintenance demands of the body. This is a striking result. Very little can be done with a fodder of this kind except to carry stock in spare condition over a period of shortage. It is practically useless to increase the concentrate because any increase in concentrate would lead to an immediate increase in the consumption of hay. We would simply be substituting concentrate for roughage. A small increase in body weight would probably be obtained but its cost would be prohibitive.

We learn from this experiment in a most convincing way that rapid rearing of stock must be based on good roughage.

(2) *Food requirements for Growth.*—Assuming that the nutritive values of hay and silage are equal (this is not quite correct but the small difference is immaterial here) we have the following information relating to the two groups. The hay group ate 2.7 lbs. dry matter as concentrate and 5.860 lbs. dry matter a day. This ration barely sufficed for maintenance. The silage group consumed 2.7 lbs. dry matter as concentrate and 8.363 lbs. as roughage. The total dry matter consumed therefore amounted to 11.063 lbs. a day. These animals gained 27 lbs. in 80 days or roughly $\frac{3}{8}$ of a lb. a day. That is to say, 8.363 lbs. a day suffices for maintenance and 11.063 lbs. produce a daily increase of $\frac{3}{8}$ lb. To produce this increase therefore a consumption of 2.5 lbs. in excess of maintenance is needed. The rate of increase depends entirely upon the excess of food consumed and excess consumption depends upon the nature of the roughage. In our experiment silage has the advantage over hay chiefly because it is softer and the spears are less troublesome.

3. *The Relation between food consumption and Milk Production.*—

The cow produces milk from the excess of food which it consumes. The excess eaten may be used either for milk production or for fattening. The characteristic of the good milker is that she does not fatten; she uses all the excess for milk production. But the heavy yield cow must possess another essential characteristic. She must have the ability to consume and deal with a large amount of food. This is undoubtedly an inherited character, but the conditions necessary for its development must be provided. The growing heifer must learn to eat a lot. The significance of our experiment becomes apparent now. An animal will not learn to fill itself out if it is given bad roughage. At present we cannot hope to provide good roughage for all our animals, but we can do something to develop the eating capacity of the heifers which are intended to become milk producers. The Hosur experiment has shown that grass silage is likely to be distinctly useful for this purpose.

In conclusion I would like to make some remarks on the activities of the Imperial Department at Hosur. In the first place the proposal to carry out experiments at Hosur came from me and I am greatly indebted to Mr. R.D. Anstead for agreeing to the general idea of utilising the resources of Hosur for carrying out feeding experiments. I am further indebted to him and to Mr. Littlewood and his Colleague Mr. Woodford for help given unstintingly during the course of the work. I gratefully tender my thanks for all the assistance which the Nutrition Section has received.

169927

JL

J, g, m 211, N13
N26

Secondly. There is an aspect of this work at Hosur which deserves special notice. The resources of two distinct Departments have been brought together here for mutual benefit. With such an arrangement we ought to be able to look forward with confidence to substantial results.*

Discussion.

Mr. Anstead (Director of Agriculture) congratulated Mr. Warth on his excellent paper and said that silage from the point of view of every one was a reserve fodder, that the question was worth investigating, that he had already approached Government for appointing a special officer for carrying out investigations on animal nutrition and that when he was actually appointed the section at Coimbatore would be properly equipped.

Mr. K. Raghavachari observed that this year's experience at Hosur had shown that silage with this grass if made in time made very good fodder.

Mr. J. Chelvaranga Raju referring to Mr. A. Carruth's opinion of silage in the Salvation Army Criminal Settlement wished to know the conditions under which silage could be properly prepared, in what season of the year and in what parts of Presidency, what the percentage of loss through shrinkage was likely to be and whether any analysis had been made.

Mr. M. Govinda Kidavu remarked that under Taliparamba conditions silage made was quite satisfactory and was relished by cattle.

Mr. T. V. Rajagopalachariar observed that silage was prepared on the Central Farm several years ago; it was quite satisfactory but could not be kept long.

Mr. R. W. Littlewood (Deputy Director Live Stock) said that on the Coimbatore Farm, green fodder was available but in the months of February, March and April when no green fodder was available, silage prepared ahead would form excellent fodder and help in tiding over the dry season. His experience was that silage in pits kept open for even three months did not suffer any deterioration in quality.

Mr. C. J. Warth replying particularly to Mr. J. Chelvaranga Raju said that shrinkage would amount to 7 to 8 per cent and that if precaution was taken against subsoil water, silage made from pits would be quite satisfactory that local conditions would have to be carefully studied and that system which was suitable should be adopted.

* Paper read at the M. A. S. U. Golden Jubilee Conference July 1926.

A Century and a Quarter of Mysore Agriculture

A Retrospect.

BY A. K. YEGNA NARAYANA AIYAR, ESQ., M. A.,
*Dip. in Agri. (Cantab) N. D. D., (Eng.), F. C. S., Deputy Director
of Agriculture in Mysore.*

Introductory.

In presenting a paper before an Agricultural Jubilee gathering it occurred to me that a subject of a somewhat historical nature dealing with a brief retrospect of the changes that have come over Indian agriculture during the last hundred years may be found appropriate and not a little encouraging to all of us who are engaged in bringing about changes calculated to make agriculture more efficient and more remunerative. For the theme is really to furnish an answer to the question, does the ryot change, does he respond to altered conditions, or is he so conservative, so wedded to his ways as to baffle all attempts at improvement? If there have been changes, be they to his advantage or to his disadvantage according as we may differ in our views of such changes, it inspires us with confidence that the results of our labours will not be falling on an inert, thriftless and unchanging mass of people but will induce a responsive change profound or otherwise, according to the character of our results and the economic environmental conditions that may prevail. Were it not that I have heard it repeatedly said to me that the ryot is adamant in this respect, that he will not move, will not change, I should not have taken up this theme at all, which to many may appear not to admit of any answer other than in the affirmative. I am purposely avoiding in this narrative any reference to the results achieved by the Mysore or any other department of agriculture; I wish to deal only with the past, which alone can afford us incontestible evidence of the mentality of the ryot, without the chance of any of the changes being put down to a mere passing phase or fashion, or due to a temporary artificial stimulus.

Dr. Buchanan's travels in Mysore in 1800—01.

This subject is very large and the materials on which to base one's statements very meagre, but fortunately in regard to the tract of country to which this paper relates it happens that we have in the account of Dr. Buchanan a very detailed description of the state of agriculture, arts and industries in the period covered by his travels in Mysore, viz., the year 1800 and 1801, that is, just a century and a quarter ago. Despite inaccuracies in many portions, these two volumes must be considered still as far as agriculture is concerned a

very detailed and minute record of the then state of affairs, which thus affords as accurate a picture as can be desired of the past with which the present can be compared. The account is indeed so full, detailed and comprehensive that one will be justified in drawing inferences from even what may be called negative evidence.

Change in External Conditions.

(a) *Peace and Security and Trade Facilities.* Before taking up the changes that have come about in specific agricultural methods and appliances, let us look for a moment into the external conditions and circumstances that serve to mould the ways of life in the country more or less automatically and with irresistible force. The foremost among these factors is certainly the long reign of peace. Until about a hundred years ago, invasions, warfare, destruction, pillage and devastation, these appear to have been the normal state of affairs; no village was too petty, no collection of huts too miserable but was in need of a mud fort, or thorn hedge or some means of crude defence against marauding hordes which roamed over the country. The larger villages lived in perpetual dread, for the unfortunate people were the victims of the greed and rapacity of both friend and foe alike; while the one plundered and stripped the country as the spoils of war, the other devastated and destroyed with fire and sword lest the enemy should find the means of support on the route of his march. It is from this picture that we turn to the blessings of peace and of a strong settled government which the people have been enjoying and which certainly have wrought the most beneficent changes. Security of person and property on the highways of trade, the means of quick transport by land and by sea, the opening of the world markets and the demand for tropical produce of all kinds for use in the multitude of manufacturing industries of Europe and America, in these the development of agriculture along new lines has found its most potent aid and stimulus. Such changes as we shall note have gone on gradually as there has been progress in these auxiliary causes and though the peculiar climatic conditions have set limits to the sympathetic changes in agriculture, still within such limits it will be seen that the character and the rapidity with which changes take place are in proportion to the progress of these factors.

(b) *Emancipation of the Ryot.* The second great factor in the change is what may be called the emancipation of the ryot from the fetters of official or village control. That the State is the owner of the land is a dictum we often hear, only when abstract questions of the law of rent and taxation are discussed; but the control, a hundred years ago, has been such that the State was very much of a landlord; what to grow and even how to grow it, were matters ordered by the

officers of revenue. The system of sharing the produce of the land between the state and the ryot helped to make the control very direct and irksome and it is no small advance that the present system of payment of the land tax in money implies. The proprietorship in the land conferred on the ryot and the system of dealing with each landholder direct that the ryotwari system introduced have led to most radical and important changes, the most notable being certainly the independence of the ryot. We may occasionally deplore it in as much as it has led to the disruption of the village communal system and to a serious lack of cohesion therein practically killing the autonomy of the village, but the gain from the individual point of view has been much greater and indeed of such a nature that even these very drawbacks are likely to be set right by the common consent of the villagers themselves instead of being imposed upon them by coercion or official decree.

Rainfall Record of 90 years Reviewed.

Talking of changes during a hundred years, the rural population invariably harks back to a time of plenty, when the rains were plentiful, the crops unfailing, the land flowing with milk and honey, in strong contrast with the present day when it looks as though God's scourge lies on the land. This complaint is universal not only on the countryside but even among most well informed people; and the very difficult season, through which we in Mysore have been passing for the last few years, with all our deepest wells failing, our 'talapariges' or spring heads drying up, large tanks and reservoirs never filling at all or to anything like their normal capacity, makes even the best of us inclined to nod assent to the ryots' opinion. Should this be true in an industry dependant so vitally upon the rainfall, it is a serious matter for which no other circumstances however favourable can ever make up. To what extent this may be true is rather difficult to ascertain. The record of rainfall for one thing does in no way confirm it; in the accompanying chart (Fig-1) are plotted the rainfall of Bangalore City during a period of ninety years commencing from the year 1857 A. D., the whole period for which records are available. It will be seen that the annual rainfall fluctuates a great deal from year to year and even violently in some years above and below the average; there is nowhere a steady rise or a steady fall over any prolonged period.

Agriculture in Mysore is so very much dependant on the rainfall and the economic condition of the people too is such that a period of two successive years of rainfall below the normal brings on acute distress, even though that period may immediately follow a year of good rainfall. If this is so then it will be seen that in the last 90 years there have been many such periods of distress and the past has

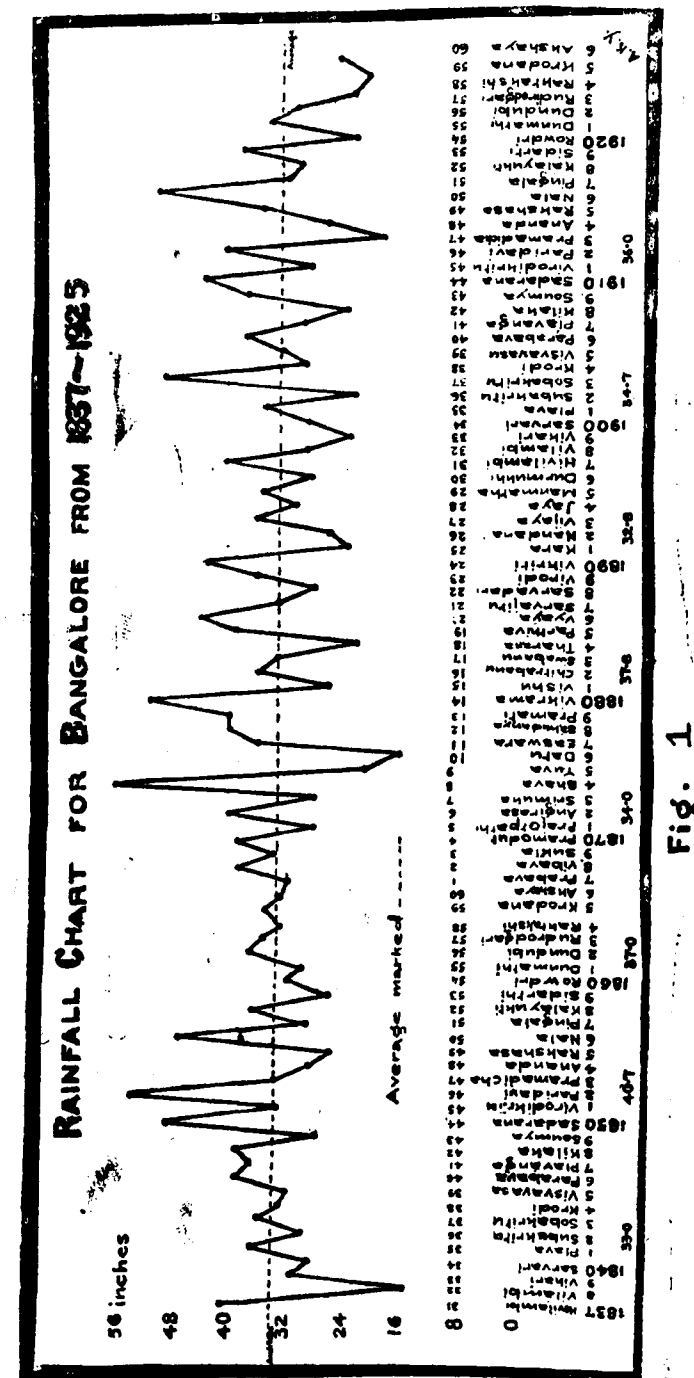
therefore not been any different from the present in this respect. On the other hand the distress must have been more acute owing to lack of facilities for moving produce and to the fact that money was scarce. The chart reveals however that the last five years have been exceptional, in that it has been a period of continuously low rainfall, a situation to which the past 85 years afford no parallel. Buchanan's account again frequently refers to complaints heard by him of the shortage of rain, tanks drying up and so on much as one hears at the present day. We have then only to put down this idea of the good old days that are no more to the more or less universal tendency to look to the past as a golden age of peace and plenty. There is however this much justification for the popular belief in Mysore, at any rate, for the older men recall the memory of a time when articles of food were extraordinarily cheap, ragi selling at 50 seers a Rupee, butter at Rs. 2 a maund, coffee at Re. 1 a maund and so on, with all the nice things of the land. It will take me too far a field to pursue this alluringly interesting subject. I have to leave it at that.

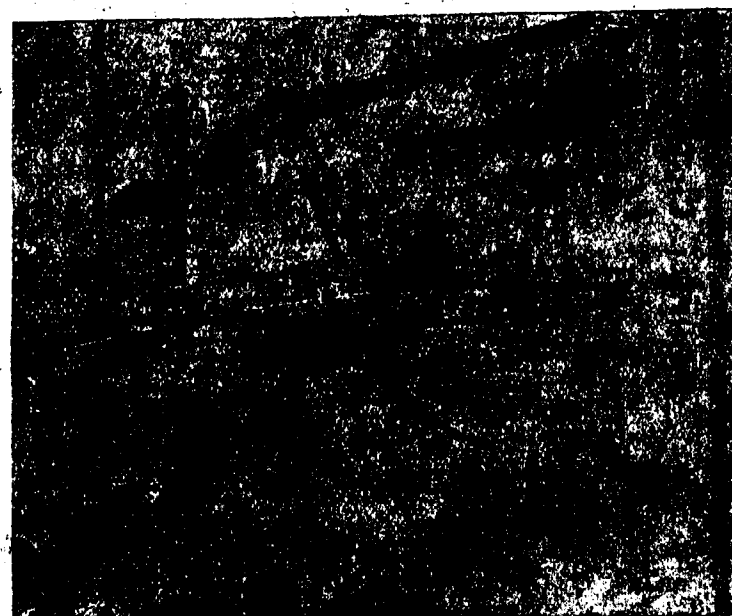
Changes in Agriculture Classified.

Coming now to the agricultural practices and the changes therein, a perusal of the minute and full account given by Buchanan of a hundred years ago will when compared with the practices of to-day lead one to suppose that there has been little or no change during this long series of years. In the main this may be taken as true, but nevertheless changes there have been and of an important character too; many old pattern appliances have given place to new; many a crop has ceased to be cultivated, many new crops and new varieties of crops have come into cultivation; the methods of animal husbandry have undergone noteworthy changes, while in the matters of subsidiary agricultural industries many a change can be chronicled consequent upon changed conditions. In fact the ryot has shown an adaptation to environment all along the line such as he is seldom credited with.

The Old Wooden Sugarcane Mills.

The replacement of the wooden sugarcane mill by the three roller iron mill such as one sees universally used is the most interesting among the changes. The change has indeed been so universal that a large majority may not be aware that there has been a change at all, and few even among those that know about it could have seen an actual mill of the old type. The mills were of two types, one was a two roller type, (Fig ii) this being the parent of the present iron mill. It was a ponderous and clumsy affair, consisting of two wooden crushing rollers each about 4 feet high and 1 foot in diameter and terminating in a perpetual screw arrangement, and worked much like the present iron mill. The other





(Fig iii) was of the present country oil mill type, and was even more elaborate and clumsy and heavy. Both may be said to be quite extinct at the present time and I reproduce therefore here Buchanan's pictures of the two types of mill. I once happened to come across one such mill in a remote village with giant rollers about 5 feet long with their screw arrangement and all intact, but discarded and put away mouldering in the sight of its rival and vanquisher—the compact little iron mill of the present day which its owner had bought. In addition to these two which were turned by bullock power, canes were milled in smaller mills of the first type, which were worked by manual labour. If it were not that Buchanan describes it in use in his time for the milling of cane intended for jaggery, I should not have believed it was anything more than a kitchen appliance for pressing the juice out of a cane or so, somewhat of the lemon squeezer order. The mills as you will see are so cumbersome and required in actual working such a degree of attention that a carpenter formed part of the permanent labour at the jaggery boiling shed. In the roller type the cane was fed whole or cut in long lengths much as is done now; in the oil mill type the cane was cut into small pieces and fed. The improvement effected by the present day iron mill is so obviously great that I refrain from going into it in detail. I have no figures to estimate the extraction from either of these mills; but Buchanan records in more than one place in his book the amount of jaggery made from an acre of cane as below:—58, 67, 76 and 135 maunds per acre and in one place gives the actual quantity of cane and the weight of the jaggery made out of it; on the basis of these figures, namely, 1000 canes giving 2 maunds of jaggery, I compute that a maund of jaggery should have taken from 30 to 40 maunds of cane, the efficiency being about a fourth or at best a third of what it is at the present day; in other words from the same crop of cane the ryot to day gets 3 to 4 times as much jaggery as his venerable great grand father did. The change is really enormous in magnitude, for it amounts to saying that a field of sugarcane yields now three to four times as much jaggery as it did a hundred years ago. The old type mills nevertheless did not perish without a fight, for the new type met with much opposition and many things were said against it; it was hard work for the bullocks, it was impossible of repair locally; the jaggery was said to be unwholesome and was the cause of many bad humours: again the cane begasse came out torn up and in pieces and not in the long ribbonlike shape fancied for the making of ropes, all which sounds so very much like the crying down of innovations in our own day that one is reminded that human nature has not changed much.

The Stone Threshing Roller.

Another change which is very general but not universal in the State though it bids fair to become one very soon, is the use of the

stone roller for threshing grains. The rapidity with which this new appliance is coming into use is wonderful. Probably its introduction does not date back to more than about 30 years and yet there are to day several thousands in use, if fact in about half the State it may be stated that there is hardly a threshing floor on which the threshing roller is not in evidence. In itself it is not an implement of great pretensions, but over the slow and laborious methods it has replaced, it is certainly a very noteworthy improvement. It is quicker, it is cheaper, and above all it dispenses with the need for neighbourly help which now-a-days the ryot is loathe to seek and probably seldom gets. Even about this method of threshing, some of you may have heard the complaint that as a cattle feed the straw is inferior in quality to that got in the old ways of threshing and that such straw also spoils in the stack very soon and so is only fit for sale, that is to say to be fed to the other fellow's cattle. It also makes the ryot ease loving, for the threshing roller makes it possible for him to ride along in ease sitting mounted on the driver's seat and protected from the scorching sun of the threshing season by a hood or awning. But the ryot himself surely appreciates it, and the practice is now spreading fast notwithstanding the inevitable grouser, whom in the rest of this paper I propose to call Jeremiah, following the example of the author of "Rural Denmark."

Ploughs Old and New.

The ryot's chief implement, namely, the plough has come to us unaltered through the 100 years and more and probably has been so for centuries past. Not even the Experimental Farm maintained by the Government in the old days where iron ploughs and spare parts thereto were made and attempted to be popularised was attended with any success. This farm was eventually closed down as an unnecessary luxury. There was a little vogue for Madras made iron ploughs, a few of these have survived to this day for the ploughing of the heavy black cotton soils where it replaces, not altogether, the heavy wooden plough drawn by six or seven pairs of bullocks.

The story of the general purpose improved plough in Mysore of which there are over 10,000 in use today belongs however to very recent days being coincident with the growth of the Agricultural Department. I do not propose to chronicle the work of our department, in this paper and I refer to the popularity of the improved plough as an illustration of my main theme. That the improved plough has become a permanent part of Mysore Agriculture may be judged not only by the large number sold by the department but also by the fact that there are several local smithies where a very good imitation of this plough is made and that the repairs to old and worn out shares is largely done in local smithies also. When I sit watching

ordinary looking ryots coming into our depots to buy ploughs each worth Rs. 25 or more, turning their nose at cheaper local made shares and these insisting on good American made shares costing twice as much as a local share, I wonder at the change that has come over our ryot folk, the change over the days when to spend anything more than a couple of rupees on a plough was thought a chimera and a folly. Jeremiah says it is becoming a pernicious fashion, detractors say it is the lack of good wood in plenty or that the village carpenter has ceased to be part of the village community having migrated into the towns—anything but the real reason. But the sale goes along and increases by long strides every year and will, I have no doubt, go on even though wood gets plentiful and the carpenter returns to his ancestral village and trade.

New Crops Introduced.

(a) *Mulberry and silk worm rearing.* Coming now to crops, there is many a new crop taken up for general cultivation during this period. The most notable is the mulberry. One hundred and odd years ago the mulberry was just being introduced into the country by Tipoo Sultan. In his experimental garden in Bangalore, he had the plants introduced newly and found that they grew well in the climate. Beyond stating that the Sultan was very eager to introduce mulberry growing and silk raising Buchanan does not relate if and what special methods were taken to push the cultivation. The story of the succeeding 100 years is indeed marvellous. The cultivation has been taken up extensively by the ryot and though the industry has passed through many vicissitudes it remains to-day Mysore's unique and most valuable agricultural industry. A hundred-years ago, the mulberry was little more than a curiosity and all the silk required for the Mysore looms had to be imported from the Karnatic, which did a most lucrative trade in the article. Compare this picture with that of the present day, when the production of silk in Mysore is estimated at one crore of rupees a year. The ryot you will admit has not neglected his opportunity.

(b) *The "Pattapatti" Sugarcane.* To the same prince, or to be more correct, to one of his Sirdars, namely, one Mustafa Alli Khan is due the introduction of the "Pattapatti" sugarcane in Mysore. Buchanan notes that the variety had just then come into the State; it was found to be so good that the ryots were planting the variety as fast as they could obtain seed setts. Today it is Mysore's premier sugarcane, a variety which has such manysided excellence that it will be hard to find one superior. A free growing variety liberally responding to good manuring and cultivation; an excellent tiller, a medium soft cane, with a juice of high sugar content, of great purity and yielding upto 400 maunds of jaggery and more per acre, it has spread

throughout the State and is certainly *the* cane of Mysore, *par excellence*. And yet a hundred years ago it had just secured only a foothold.

(c) *The Coffee Industry.* Among the crops other than the ordinary field crops introduced successfully during this period, the coffee ranks foremost. A hundred years ago the Mysore Malnad was the region only of the arecanut, pepper and cardamoms. Coffee was unknown. Through the sea parts of Calicut and Mangalore small quantities intended evidently for the British Officers were imported, from Mocha and Muscat, the yearly import being no more than about 50 maunds through these two ports. But the following 100 and odd years have witnessed a transformation of the Malnad due to the introduction and rapid extension of cultivation of coffee. Popularly believed as it is to have been introduced from Arabia by a Mahomedan saint into what at present is the heart of the coffee region, its phenomenal development was due to British enterprise and capital. The native population has not certainly been slow to copy the example and plantations owned by Indian Landholders form in the aggregate more than 60 per cent of the total area of about one lakh of acres, though individual holdings are small. To the Malnad, the coffee has meant wealth but what is more important, it has meant civilisation, people, homes, roads, the opening of the door in fact to many-sided material development and all this in a region which a hundred years ago was only a jungle far away from human habitation and difficult of access.

(d) *The Groundnut.* To a somewhat recent time belongs the story of the groundnuts and of the potato. The former is mentioned by Buchanan as a very minor crop grown by the kitchen gardeners of Sidlaghatta, probably of the kind called the "local" which at present has all but disappeared. To-day the area is over 100000 acres and is steadily on the increase, much to the dismay of the Jeremiahs who see in it an alarming shrinkage of the food crops. But the ryot is after cash, as all of us are, and in the groundnut he has discovered a ready means of making it. No crop owes its development more to the stimulus of the foreign demand for tropical produce to which I referred, than the groundnut; and its fortunes will be bound up with the steadiness of that demand, waxing or waning according as the latter is fostered or fettered. The cultivation has meant an enormous volume of trade and a rising local manufacturing industry of some importance.

(e) *The Potato and "English" Vegetables and Fruits.* The potato which is one of Mysore's special agricultural produce, is also a newly introduced crop belonging to this period, although when exactly and under what circumstances it was introduced is not possi-

ble to say. The ryot has however seen money in it and to-day it constitutes the most important money crop of a large part of the Bangalore and Kolar Districts. A mild and salubrious climate is one of the special features of the Mysore Plateau and the ryot has not been slow to exploit this advantage he possesses over his neighbours on the plains by resorting to the cultivation not only of the potato but also of the crops collectively named "English" vegetables and fruits for export to the big consuming centres outside the State.

(f) *Coconut Plantations on Dry Land.* The extensive plantations of the coconuts in parts of the Tumkur and Hassan Districts is also a feature to which attention should be drawn as among recent developments. Few of these plantations are more than 50 years old but subsequently and within the last 30 years their extension has been very noteworthy, the planting going on with astonishing rapidity. As a profitable investment and as a convenient substitute in the place of the usual arable crops, it is appreciated by the large landholders, while for the small man it is the nest egg. Here too the ryot is after money, led almost by instinct, regardless of Jeremiah who deplores the blocking of the waterways, the deterioration of tanks and the abandonment of food crops. The development has meant undoubted prosperity to the tract concerned—a fact which unfortunately for the ryot did not escape the notice of the settlement officer who extolled the ryot's enterprise but enhanced the assessment.

(g) *Dharwar—American Cotton.* Another crop to which reference may be made is the cotton known as Dharwar-American cotton. This is all that survives of the well-meant efforts of the old East India Company to introduce American Up-land cotton, under the fostering technical care of Scotch gardeners. In this variety of cotton, the Mysore ryot has found a cotton thriving on his red soil unlike the local cotton. The variety has come to stay. Cultivation has gone on apace, the area now advancing and now receding according to the prospects of the cotton market. Jeremiah deplores the disappearance of the hand-loom and of the home ginning industries that this new variety difficult of ginning in the little hand gin has brought about, for a 100 years ago both ginning and spinning were great home industries in the cotton country: though as regards the Brahmins, Buchanan states that just as the males of this superior order of beings never would stoop to hold the plough, so the females never plied the gin or the spinning wheel.

(h) *The Casuarina.* One more instance in regard to crops; with the advent of the railway in Mysore the question of wood fuel was taken up and the Casuarina was introduced. It was a really a case of "*Veni Vedi Veci*." The Casuarina is everywhere in the districts of

Bangalore and Kolar literally transforming the landscape of the country to the mind of many an English Visitor, these graceful groves of tall pinelike trees studded over on the country, up and down among the rolling plains, have brought a vivid recollection of the home country. To the ryot it has meant money put out on gilt edged security, and as fuel is and will continue to be a burning question with a growing population, the ryot is on the right enough track. He has learnt system in planting and felling and crops are timed to come in successively in 10 to 15 years, with a small income in thinnings and loppings in between. Jeremiah bewails the sucking up of underground moisture, says the casuarina has depleted the ground of moisture to depths of fifty feet and that casuarina in the midst of cultivation is a curse, but the ryot does not heed, he merely takes the beeline to where he thinks money can be made.

Crops that have been given up.

(a) *The Opium Poppy*. Just as the ryot has not been slow to take to the cultivation of new crops, he has likewise not been slow to discard crops and crop industries, where these were found unprofitable or otherwise unsuitable. Buchanan refers to the cultivation of the Opium Poppy as an important crop, in the Kolar District, to Omum Ajwan (*Carum Copticum*) in the Nanjangud Taluk of Mysore District and to Jeerige (*Cuminum Cyminum*) in the Kolar District. These have ceased to be cultivated at present or are cultivated only as insignificant crops.

(b) *Indigo*. But the most noteworthy among the crops that have gone out of cultivation are certainly the dye crops, which no doubt have succumbed to the competition from aniline dyes. Indigo was grown and manufactured in several villages; it is now only a memory. The 'cusumbe' (*Carthamus Tinctorius*) was extensively grown for the sake of the dye and Buchanan notes it throughout his travels; but nowadays it is a very insignificant crop grown for the double purpose of use as oilseed for domestic purposes and as a barrier against stray cattle being grown on margins of fields.

While on the subject of Indigo an excellent illustration of how quick the ryot responds to new conditions may be related. You know during the great war, the supplies of artificial indigo from Germany ceased and indigo soared up in price consequently. The ryots in at least two villages to my knowledge were quick to seize the opportunity and straight away started the cultivation of the crop, built the necessary vats, installed the plant, imported men with the technical knowledge and manufactured dye of good quality. The concerns were, it need hardly be stated, closed down on the return of normal conditions.

(c) *The Cochineal and "Cactus Farming."* The cochineal was reared for the sake of the dye and Buchanan notes it as a good source of income round Belur. It almost looks like "Cactus Farming", because the insect fed on the cactus which was planted and looked after for the sake of the insect. Buchanan relates that the Amildar informed him that in case the supply of cactus gave out, he would compel the ryots to plant more so that a plentiful supply may be assured! With the introduction of cheaper dyes, cochineal rearing evidently disappeared. At present we may remark in passing that it is well worth reviving not for the sake of the dye but as a destructive agent against the prickly pear, which is a serious menace in many parts of the country. To readers of the cactus extermination campaign in Australia, this Mysore practice of a hundred years ago may come as a revelation, because after many unsuccessful attempts at cactus destruction, the Australian Government has at last found in the cochineal of various species the ideal destructive agent. Cactus in Australia was attempted first to be converted into a useful product, it was attempted to bring it into manageable shape by crushing it by mechanical means such as giant "Tanks"; poison sprays were tried; but all in vain; the pest was advancing and covering the country at the rate of a million acres per year; in the cochineal at last the government has found the most promising and effective agent of destruction of the pest and we see it suggested that the insects should be distributed by the train load! In Mysore a like campaign will be only the revival of an old industry and with perhaps the trial at the same time of other than Indian species also.

Industries of the Past.

(a) *Date Palm jaggery*. Among the industries belonging to the past, is that of the making of date palm jaggery. The date palm at the present time forms the principal source of the large excise revenue of the State, but a hundred years ago it seems to have been a goodly source of the jaggery produced in the State. The Maddur and Malur Taluks are mentioned in particular by Buchanan as great centres of the industry. About the middle of the last century it was sufficiently important to be taken up by an English Company for developing. Should Mysore desire to go "dry" its date trees will only be reverting to the function they were discharging a 100 years ago.

(b) *The Sugar Industry*. Speaking of sugar, Buchanan writes that local sugar of good quality was made by certain families who enjoyed royal patronage. The processes were kept by them as a great secret. Imports of white sugar were from China. The sugar factory at Palhalli was a concern of about 75 years ago; it closed down after a few years but its memory survives in the term "Astagaram" as

applied to that particular class of sugar. Another sugar factory which is of more recent date and was started in Goribidnur also shared the same fate. Local sugar making establishments making sugar on the model of "Clayed Muscavado" also kept up a thriving business until in recent times when the flood of cheap foreign sugar put them all out of commission. The Mysore ryot eats more sugar and better and cheaper sugar than his grand parents did a 100 years ago, but it is all imported, little or nothing being made locally.

(c) *Sunn hemp Fibre and Gunny Weaving*.—Another crop which a 100 years ago used to be cultivated extensively was sunnhemp, grown for the sake of the fibre out of which rough bags, awnings and cordage were made which gave employment therefore to a large population of the weavers of this material. The cultivation of the fibre has in recent days all but gone out of existence, probably owing to cheap machine made Bengal gunnies and also to the fact that transport by pack bullocks which used to be very general in those days has become now a thing of the past. The crop has now not gone out of cultivation but continues still to be largely grown; it is however not for the manufacture of the fibre but for use as a green manure.

Manures Old and New.

That brings us to the subject of manures. Great strides evidently have been made in recent times. Throughout Buchanan's account I could detect nowhere reference to manures other than the ordinary cattle and sheep manure and the green manures, used in paddy cultivation. There is no mention anywhere of the use of oilcakes as manures. The methods of oil extraction both from the Hongey (*Pongamia Glabra*) and the Castor are gone into in detail but the cakes are said to have been used only as fuel. At present however the use of these and other oilcakes like groundnut oilcake for manurial purposes is very general. The general use of the castor oilcake, and groundnut oilcake is recent but the use of hongey oilcake as a manure extends far back in time. In any case it is a fact that the use of oilcakes as a manure for sugarcane is universal in the districts of Bangalore and Kolar and has been so far many years. Manures constitute the most important factor in increased crop production and it is no little encouragement to know how the ryot has thus shown his appreciation of new manures. The phenomenal increase in the use of artificial manures like superphosphate of lime and sulphate of ammonia in particular by the Mysore ryot although it is a very recent development, is an additional proof of his responsiveness and readiness to change his methods.

Live Stock—Changes in Status and Methods.

(a) *Oxen*. I now pass on to Live Stock. A hundred years ago Live Stock of all kinds appear to have received much greater attention than at the present time; the reason is indeed obvious. They were almost the sole means of transport for, even cart traffic was at a minimum. On account of the general lack of proper roads, goods were largely transported from place to place on pack bullocks and donkeys. The commissariat of large armies was composed of hordes of Binjaris who moved their grain solely in bullock loads or ass loads. The constant warfare of those days created the need for vast numbers of first class bullocks for driving the gun carriages, and the carts for the baggage and other military stores. The wastage to be replaced was also enormous. Buchanan records that the route taken by the army of Lord Cornwallis to the Mysore country could be traced by the thousands of bleaching skeletons of the draft cattle which perished of hunger and fatigue, the whole route of the march. The grazer's occupation was an important one and Buchanan records and describes the method of cattle keeping by these people. At the hands of the Rajas of Mysore and later under Hyder Ali and Tippoo Sultan and under many a feudal chief, the cattle rearing industry enjoyed great patronage, and the Amrit Mahal or Cattle Department of the Mysore Government survives to the present day, though in a very attenuated form.

Tippoo Sultan's Agricultural Experiments and Improvements.—Here we may refer to the various experiments of Tippoo Sultan whose passion for agricultural improvements of all kinds in the State was indeed remarkable. His memorable introduction of the mulberry and silk rearing has already been referred to; at Malavalli which was his Jahagir he kept up an extensive plantation of fruit trees, where mangoes of all varieties gathered from far and near were planted, some of which survive to this day. He is also reputed with the introduction of the Baje (*Acorus Calamis*) to Seringapatam where it was put out to grow in the margin of the moat as a specific against malaria. In addition to the Malavalli garden, he kept up others at Bangalore, Seringapatam and in the Nagar country. His Sirdars took the cue evidently; we have already referred to Mustapha Ali Khan and the 'pattapatti' sugarcane. We also read that his Sirdar Mir Sadac maintained a garden at Doddaballapur of which the Mir was a native. Live Stock did not fail to claim the attention of the Sultan. He is said to have kept special breeding rams of superior breeds for free service available to all the country ewes which were brought or had to be brought to be served. He tried to improve the breed of the local ass in order to make it more suitable as a pack animal. He

made a beginning in the breeding of mules, and imported for this purpose from Arabia several donkey stallions.

Sir Mark Cubbon's Sheep Farm.—After his time, in the days of the British occupation Sir Mark Cubbon, the Chief Commissioner established and maintained a sheep farm, though this too shared the fate of the Government Experimental Farm in Bangalore already referred to, being wound up because it could not pay. The larger *gowdas* in the cattle breeding tracts kept each one or more breeding bulls which were available *free* to the village cows. Not that everything was as satisfactory as it might be; communal grazing was as much prevalent then as it is to-day, and Buchanan gives a warning that the practice of delaying the castration of young bulls in vogue then, as it is to-day, coupled with this common grazing will lead to a deterioration in the type. Cattle epidemics were frequent and Buchanan notices that in many places he visited a recent epidemic had carried off thousands of cattle and quotes several such disastrous epidemics of previous years of which the people everywhere gave accounts.

The care and anxious solicitude for the welfare of the country's cattle of all kinds have left an indelible mark upon the character of the Mysore cattle. The State is the home of the finest cattle in South India from which probably 23 to 30 lakhs of rupees finds its way annually into the state in return for the bullocks sold. The sheep in the Nagamangala, and surrounding taluks, which were served by the old Government Sheep Farm, to this day retain a superiority in form, colour and quality of wool over the sheep in other parts of the State.

Changed Methods of Cattle-rearing.—It is noteworthy that where the State left off the ryot has taken up. The ryot has not failed to turn the cattle wealth of the State to his advantage. Cattle breeding may be said in one sense to have undergone a revolutionary change during these hundred years. The old system of keeping herds in a state of semi wild character has given place to rearing under domesticated conditions, although in the Amrit Mahal Department itself the old tradition is kept up still. The forest areas and the waste places are fast shrinking before the expansion of cultivation and the days of the grazier and drover gone; but the ryot has shown great adaptation. While in the old days only a few men were cattle breeders, now almost every ryot is one, especially in the breeding tract. Much priced cows are kept chiefly in two's and three's by individual families; they are never allowed to roam at large in the village herd, the best bulls are sought after, high service fees are paid and the pure and high special quality of the Mysore strain

is kept up. Outside the breeding areas are the rearing centres practically all over the State excepting the Malnads, where each farmer buys and rears a head or two of male calves to be eventually sold to the men from below the ghat. Buchanan notes that in the Kolar and Bangalore Districts large numbers of cattle reared from Krishnagiri and Kangundi were being brought into Mysore for sale. The tables have been turned since his time, thanks to the enterprise of the Mysore ryot. Mysore sends out cattle now and does not depend on outside supplies. The epidemics are unfortunately still with us and the periodical fodder famines. Through the Veterinary Department great efforts are being made to combat the one and it is up to the ryot himself to mitigate the severity of the fodder scarcity by realising that his cattle wealth should consist in quality and not in numbers and act accordingly. If we have studied him aright, he probably will do so before long.

(b) *Sheep.*—The Sheep Industry, which is one capable of comparatively rapid improvement as improvement of live stock goes, has received no great impetus, barring the efforts already referred to. Such action as has been taken is too recent to be written about. There has undoubtedly been an increase in numbers, but that is about all that can be said. There has on the other hand been some retrogression because Buchanan records that the fleece of those days weighed upto 1½ lbs; a half yearly clip seldom weighs nowadays more than ½ lb. so that even assuming that Buchanan's figure applies to one year's clipping there is decided deterioration.

(c) *Goats.*—Goats appear to have been very popular indeed and according to Buchanan there must have been an immense number of them; but through this long series of years no steps seem to have been taken either by Government or the ryot to improve them. It strikes me on the other hand that they should have been kept under some kind of check, or else they should have overrun Mysore. They say "The camel killed the lion" in Egypt, it looks as if the goat will kill everything in Mysore. It has become the poor man's wealth, nobody need be a farmer to keep a few goats, they have a free run of the crops and all manner of vegetation, cultivated or jungle, avenue trees and plantation to all which their visitation spells ruin. During the fodder famine of the last two years when the cattle population decreased by 25 to even 75 per cent in certain tracts, the goat increased by nearly 50 per cent and it is this hardness and prolific nature of these animals that makes me think some cause must have kept down the numbers recorded by Buchanan from increasing normally. It however puts an animal in the hands of the ryot which is capable of being turned to much pecuniary advantage by improvement of the breed.

Conclusion

From the foregoing brief account is amply evident then that the ryot in Mysore has shown himself ready to adopt changes in his methods, that he responds to altered conditions; that he is as eager to better himself as the rest of mankind, and that no safe and certain means of enhancing his income is ever neglected by him. I may give numerous instances taken from the experience of recent years but as I stated at the outset I have purposely refrained from going into the work accomplished by the department; and have confined myself in a large measure to what the ryot himself has done of his own accord in response to economic and other stimulus through the long period covered by a century and a quarter; it is not true to say or think that the Indian ryot, for the Mysore ryot is I daresay not so different from his brethren across the frontiers, is too conservative, too indifferent and too slow to adopt improvements. That ought to put hope into all of us; if our recommendations are sound, based upon accurate scientific work and field trials, if they do not mean a sudden dislocation of the rural economy, the ryot is bound to take them up, I think, gentlemen, that it is well at this juncture that we are fortified with this belief and hope. Changes are coming on apace; science and mechanical knowledge have made such rapid strides in recent years, that developments which would have taken 50 years to mature are being crowded into the span of a decade or less. The school master is abroad and is putting into the possession of the ryot new knowledge and the means to attain more. The villages are rapidly losing their isolation, thanks to the motor bus and the motor car. Trade facilities are multiplying rapidly. In the village organisation itself, the error of the past is being sought to be mended and the disruptive forces set free attempted to be checked by the co-operative movement and the village Panchayat system. The departments of Agriculture are well organised and great expansion is in prospect. A vista of useful and beneficent service opens out to us, unparalleled in the annals of this country. That the ryot will respond to and co-operate with these new forces promptly and liberally to his own advantage and that of the country at large has been the theme of this retrospect of a century and quarter of Mysore Agriculture and I trust you will agree that the ryots' record in the past has all been to his credit and is such as to fill us with hopes of a bright and prosperous future.

Paper read at the M. A. S. U. Golden Jubilee Conference July 1926.

Place of Economic Zoology in a Scheme of Agricultural Education

By T. V. RAMAKRISHNA AYYAR, B.A., F.Z.S.

Madrās Agricultural Department.

It has to be acceded that in a country which is anxious to utilise to the best advantage modern improvements in the methods of agriculture, a proper education of the rising generation in the different aspects of the science of agriculture is a *desideratum* and should take precedence of all other preliminary activities. This education is essential not only to prepare the younger generation of the country to bring into practice the already accepted canons of scientific agriculture, but is also necessary to provide them with a sound foundation of up-to-date knowledge in that direction for further investigations on their own initiative. It will be too early and premature to think of research or demonstration before we have the proper agents or media who are sufficiently well equipped with the necessary knowledge and training in the different aspects of agriculture; for, experience must have often taught us how many a laudable attempt at improvements and research has failed for want of the properly trained individuals. Until lately these facts were not properly realised in India in spite of the country being a pre-eminently agricultural one; and consequently agricultural education did not receive its legitimate share of attention. It is a happy sign to find that nowadays the need for the wide dissemination of agricultural knowledge is felt in responsible quarters and attempts are being made in the different provinces to inaugurate suitable schemes of agricultural instruction.

The need for agricultural education having been accepted, the next consideration, naturally is with regard to the different ways and means of imparting such an education which will produce the desired results appreciably for the material prosperity of the country. The writer believes this is not an inopportune time to consider this aspect of the subject and get clarified ideas which may help educationists in drafting the various curricula of courses in the agricultural subjects that may be introduced in the few existing and many future agricultural institutions.

The subject of agriculture, made up as it is of some aspects of many of the other sciences such as Mathematics, Geology, Physics, Chemistry, Botany, Zoology, etc., the difficulty is often felt as to how much of each of these sciences should find a place in a scheme of agricultural education. While stress should certainly be laid on such

subjects which have a direct and more practical and advantageous bearing in the operations of the farmer, a certain amount of unbiassed discretion has always to be exercised by man in authority in judging which and how much of these different subjects will be of real and greater practical value to the future farmer and as such demand better and greater attention. For, it is not uncommon to come across enthusiasts in some subjects often proclaiming that their own subject is far more important than any other, forgetting the stale tale of the "belly and the members." It is not at all the object of this paper to discuss the comparative merits of the different sciences in their relation to agriculture or to allot their proper places in any scheme of education (the author is evidently unfit for any such thing), but this is only a modest attempt to point out the relative importance of one of these subjects in which the writer has dabbled a little viz., *Economic Zoology*, and to suggest a suitable and practicable syllabus for incorporation in a scheme of agricultural education. One important difficulty and disadvantage under which the agricultural Zoologist or Entomologist has to labour, unlike other scientists, is that he has to deal with active living things, their sudden and unexpected freaks and the ravages they cause all unawares! The Chemist or Botanist could solve his problem in his laboratories sufficiently early and there is no need for any hurry or sudden emergent action in such case, and once these problems are solved, there is little difficulty for the farmer on that score. On the other hand, the Entomologist's problems arise all unexpectedly and they have to be solved not merely according to any cut and dried set of rules, but by the exercise of a good deal of proper discretion and quick-wittedness to act in sudden and unexpected emergencies; and this undoubtedly requires a good deal of practical experience, training, and foundation on the subject. In fact our cultivators have nowadays to encounter more of pest problems than any other agricultural questions barring perhaps that of irrigation or proper rain fall; and in the opinion of the writer, there is a good deal more cry for help from the fungus fighter and the insect man than for the Botanist or a Chemist. What the writer wishes to state therefore is, not that other sciences are in any way unimportant, but that the science of agricultural zoology deserves to have a little more attention devoted to it than it gets at present in agricultural institutions.

While it is realised that special courses have to be arranged to suit the needs of particular classes of students specialising in Entomology, the scheme herein submitted is intended for regular undergraduate students pursuing a three or four years' course for the Bachelor's Degree in Agriculture.

As regards the status of this subject in Colleges and Universities in India, until recently it did not receive any recognition, though the

pure science of Zoology was having a place in the University curricula; but even this latter was of a very meagre nature in all the Universities except perhaps in Madras. University graduates in Zoology though they get a foundation in their subject and have been the fittest available to get an Entomological training, were not found quite suitable to handle Entomological problems soon after they come out of the University. The reason evidently is, that entomology as a special branch of Zoology has had no place in any of the University courses till recently, and Universities are only now beginning to realise that they should also afford facilities for the study of biological and other problems on subjects connected with the economic, industrial and material welfare of the people. And it is only nowadays that Governments and responsible public men have begun to feel that the subjects of Zoology, Botany, etc., possess much more than a purely academic importance. In the Saidapet Agricultural College the importance of Entomology was to some extent recognised, but unfortunately, the actual attention paid to it was not only very meagre but even very faulty, so much so that the students had to unlearn a good deal of what was taught there as Entomology!

Since the starting of this college at Coimbatore in 1908, from which date the writer has been in charge of this subject, the syllabus and the time allotted for this subject passed through several changes due to the frequent modifications in the whole scheme of Agricultural education in Madras: from 1901—1922 to suit a three year Diploma course, a three year L. Ag., course, a two year Certificate course, and latterly the three year B. Sc., Degree course. It was only very recently that this subject—Agricultural Zoology—was recognised by the University when the college was affiliated to the University and a University faculty in Agriculture was inaugurated.

Portions: In the present three years' course for the B.Sc. Degree the subject is only taught during the first year. The following is the scheme of work which the writer has been arranging for this course during the past 4 or 5 years to occupy the time allotted by the authorities for this subject. During the first year the course in Agricultural Zoology, for which 2 hours in lectures and two in practical work are allotted every week, includes (1) Lectures in Elementary Zoology as an introduction to Entomology. These deal with the fundamental features of the different animal groups from the lowest forms with special reference to groups having some economic value, and general facts regarding Evolution, Development, classification, and habits of the important forms in the various sub-divisions (2) Practical work includes microscopic observation and dissection of some of the important lower and higher types from Protozoa to Mammals, only to get a general idea of the organisation of these forms and not in

detail. This work in Elementary Zoology has to be finished either by the end of the first term or certainly by the second term. From the third term Elementary Entomology is taken up. This at present includes lectures on the different orders of insects and on the more important families of economic importance, and field observations on and collection of familiar insects during practical classes. This has to be finished by the end of the first year. During the second year, the whole course of Economic Entomology has to be gone through and the time allotted for this work is only one hour of lecture and two hours of practical work every week. The lectures on the important aspects of the subject have therefore to be carried on in a hurry for want of time, and what is more unfortunate is, that during the final year when the student studies crops in detail he has nothing to do with the subject of pests, and naturally forgets the same and very rarely thinks of it afterwards. In the opinion of the writer a course in Entomology is all the more important during the final year, when the student actually deals with the important aspects in the life history of different field crops. In the opinion of the writer the time allotted for this subject is unfortunately not sufficient compared with the practical importance and need for the same as pointed out above. The writer would suggest either of the two following alternatives with regard to the treatment of this subject in an Agricultural course.

(A) Spread out the subject for all the three years more or less as below. First year :—Elementary Zoology, portion which is now done in 1½—2 terms. Second year :—General Entomology—Biology, classification, etc., the portion of Economic Entomology dealing with general principles of Economic Entomology and beneficial and useful insects (Portion which is now done in 2 terms). Third year :—Agricultural Entomology—study and methods of control of important crop pests—Entomological technique, collection, etc. The subject for the B.Sc. Degree—Agricultural or Economic Zoology (1 paper and 1 practical). Each student must be also asked to submit a thesis on some agricultural subject of his own choice, which should be made at the beginning of the final year.

(B) The other alternative is to start the subject during the second year, finish the same as is done at present, but arrange the syllabus for examination as in the Bombay University B. Ag. Degree examination, where, in addition to making the study of plant pests one of the compulsory subjects, there is another subject called the optional, according to which every student, besides attending a general course in all subjects, has to choose an optional, specialise in the same, and pass through an examination in the advanced portion of his choice subject.

Though the Second alternative course does not deal with Agricultural Zoology as much as one would wish, yet the compulsory introduction of an optional subject for advanced study will offer opportunities for at least some of the students who are qualifying for a degree to specialise in the subject. Whichever alternative is preferred it is the opinion of the Writer that by the time a candidate qualifies himself for the Degree he must, not only gain a fairly good knowledge of all subjects, but should receive sufficient training and help to carry on advanced work in some special branch of agriculture. The absence of this latter is evidently the reason why among so many of the Diplomates and Graduates who have gone out of the College there are very few, so far as we know, who have taken to any special line of work on their own inclination and initiative; of course circumstances have driven many of them to do agricultural, chemical, or botanical work, but that is quite a different thing, and this latter contingency often puts square men into round holes. This is certainly to be avoided. It is desirable that the graduate going out of this college should not only be a jack of all trades in Agriculture, but should try to be a master of at least one of them.

Paper read at the M. A. S. U. Golden Jubilee Conference July 1926.

EXTRACTS.

Sugar Outlook.

The present situation in the sugar market is causing great anxiety to sugar producers in all parts of the world. Briefly, the condition of the market is this: production has increased to such an extent that prices have fallen to, or below, the cost of production with the result that producers are faced with the prospect of an indefinite period of unremunerative prices or, in many cases, heavy losses. Perhaps the most distressing features of the situation are the rapid accumulation of heavy stocks, in spite of low prices, coupled with the reports of increasing production from most sugar producing areas. Examining the position in the United Kingdom we find that stocks of refined sugar amount to 168,000 tons compared with 22,000 tons a year ago, and stocks of unrefined amount to 246,000 tons compared with 125,000 tons last year. Reports from other consuming areas indicate similar conditions. The history of the origin of the present depression is a long and complicated one. The main historical factors have been the enormous increase in the output of European bounty-fed beet sugar, and the remarkable rise of the Cuban cane sugar industry stimulated by preferential treatment accorded by the United States of America. In 1913—14 the world production of sugar amounted approximately to 21,000,000 short tons of which cane sugar contributed nearly 53 per cent and beet sugar a little more than 47 per cent. During the war the beet sugar industry of Europe experienced a severe set-back, the total production of beet sugar declining from 10,000,000 short tons in 1913—14 to less than 4 million short tons in 1919—20. This rapid reduction in the output of beet sugar resulted in a rapid rise in prices which, in turn, stimulated the production of cane sugar, the output of which rapidly rose from 10 million short tons to nearly 14 million short tons. Towards this increase Cuba contributed nearly 2 million short tons, the expansion being due almost entirely to the influx of American capital at an unprecedented rate. After the termination of the war, the European beet sugar began to return to its prewar dimensions with the result that the total sugar production is now almost 5 million tons greater than before the war.

The latest development in the situation, and one which has caused quite a flutter in sugar circles, is the proposal of Cuba to reduce its output by 500,000 tons during the next two or three years. The suggested mechanism is this, that no new planting should be permitted, and that the commencement of the crushing sea-

son should be subject to Government legislation. A heavy tax will be levied upon all sugar in excess of 90 per cent of the normal output, thus reducing the total output by about 500,000 tons. If we ignore the suggestion that natural conditions will result in a reduction of that amount of the Cuban crop irrespective of Government action, we arrive at the conclusion that the world output will be reduced by some 2 per cent. It is suggested in certain circles that the scheme will be analogous to the restriction scheme enforced in the production of plantation rubber. The comparison is however hardly justifiable when one bears in mind the fact that British possessions contributed 73 per cent of the total output of rubber when the restriction scheme was introduced, whereas the production of sugar in Cuba is only about 20 per cent. of the world's total. Moreover, the restriction in the case of rubber amounted to the drastic reduction of 40 per cent., subsequently, in accordance with the mechanism of the scheme, increased to 50 per cent. Similar action on the part of Cuba would be not only futile but fatal. The proposed restriction of Cuba amounts only to 10 per cent. of a much smaller proportion of the world's supply. The more one examines the two crops, the conditions under which they are produced and the nature of the commodities themselves, the less become the similarity between the two restriction schemes. The only hope for such a movement would be a concerted action upon the part of all, or the majority, of sugar producing countries and that possibility may shortly be dismissed as being beyond the realms of practical politics. It is suggested in some quarters that the immediate effect of the proposed restriction will be to stimulate the production of beet sugar upon the Continent, but whether that be so or not, it is evident that the action of Cuba will be too limited in scope to have any fundamental reaction upon the market for sugar as a whole.

From the point of view of Cuba the proposal has much more significance. The prosperity of the Cuban sugar industry has rested mainly upon the fact that she has received from the United States of America preferential treatment with regard to sugar imports. The United States of America is the largest consumer of sugar in the world, the total imports in 1924 exceeding 5 million short tons. Of this total the insular possessions of the United States, whose sugar enters duty free, contributed nearly 1½ million tons. The imports of foreign sugar at full duty were negligible, amounting to little more than 100,000 tons. Cuba with a reduction in tariff of 20 per cent supplied the remainder. The net effect has been that Cuba, owing to this fiscal discrimination, has secured the monopoly of the large, lucrative and expanding United States sugar market, apart from the contributions of the insular possessions. Outside the United States, Cuba has been subjected to the same disabilities as other foreign

nations, and it is only on account of the possession of the monopoly of the lucrative United States market that she has consistently been enabled to gain access to such markets as the United Kingdom—whose vacillating policy with regard to Empire sugar was recently described by a prominent member of the present Cabinet, Viscount Peel, as “a black spot in our economic and fiscal history”—at prices with which British producers could compete only with difficulty. Cuba has flooded the United States market, from which foreign producers are shut out, and a reduction of 500,000 tons in the output of Cuban sugar will amount to 10 per cent of the United States consumption and should have an appreciable effect upon the price of Cuban sugar in the States, without, at the same time raising prices to such an extent as to stimulate the importation of foreign sugar. The effect upon foreign producers in general, and British producers in particular, is likely, therefore, to be negligible. One of the main factors in the world's sugar industry, as we have seen, has been the fiscal policy of the main consuming countries. Cuba has a monopoly of the United States market, European countries jealously protect their own beet sugar industries, but the British sugar producer has the monopoly of no large market, even though the United Kingdom is one of the greatest consumers of sugar. It is true that the English beet sugar producer has recently received beautiful assistance from the Government, it is equally true that the British producer of cane sugar has received a moderate preference from the same source, and, more important, that the preference has been established for a period of 10 years. All this is very satisfactory, but the main question is whether the preference is sufficient to guarantee for the British producer a profitable market, consistent with the requirement that this sugar shall be produced upon a sound economic and competitive basis. Prominent politicians and business men closely in touch with this British industry have declared, in unmistakable terms, that the existing preference is completely inadequate, and point with envy at the attitude of the United States towards her insular possessions, and the attitude of European nations towards their own national producing industries. *Tropical Agriculture* has studiously avoided the advocacy of controversial political problems. It is our policy, in this column, merely to record facts and offer non-controversial suggestions. We earnestly suggest that the time is ripe for a thorough investigation into the present condition of the British sugar industry. Whether such an investigation would reveal the necessity for an increased preference, or whether such an increase would be desirable and justifiable, are questions which we prefer to leave undiscussed, but it is evident that the promised help from the action of Cuba will prove illusory.

(“*Tropical Agriculture*” July, 1926.)

Science and the Common Farmer.

BY C. F. BAKER,

Dean, College of Agriculture, Los Banos, Philippine Islands.

We read and we see much, in these times, of the dependence of great industries on science. In fact many great industries have been established on recent scientific discoveries and developments. The relation of common man to science is not so clearly recognised, and in the less progressive countries no such relation may exist. In the Orient for instance, the common farmer may be still getting along after a fashion with the same methods that he has been using for 4000 years and with practically no improvement either in his crops or in his mode of life.

“Science” is merely a seeking of the truth—the complete, unmistakable, indubitable facts—full and clear knowledge of all factors. Through science have come the modern possibilities of better culture, of plant breeding, of fertilization to suit crops and soils—all meaning larger returns for the unit area, and more generous returns, with far greater possibilities for the unit of human labor. From science has come great possibilities in crop insurance against pests and diseases, which up to a few decades ago did not exist in any country and is now developed in but few.

Uncontrolled Nature demands a fearful toll from the ignorant farmer. Here in the Philippines we lose each year some millions of pesos from pests and diseases, yet adequate support for investigation along these lines is unobtainable. By expenditure through the right hand of a few thousands, Hawaii territory is constantly averting losses that might easily, if neglected, run into millions. Japan claims over-population and inability to produce at home adequate food supplies, but at the same time she allows too large a percentage to pests and diseases and does not support adequate investigation, her few over-worked specialists being unable to cope with existing problems for the whole country. Though it must be admitted that, under the highly efficient administration of Dr. Kuwana, Japan maintains the best plant quarantine service in the Orient. China has practically nothing along these lines and suffers tremendous losses accordingly, but the fate of the common man means little in China as yet. Indo-China has but limited service of this sort, and Siam and the British Malayan colonies nothing worthy of the name. In striking contrast, Java maintains a very active Institute for Plant Diseases where the highest class work is constantly in progress. Java also has besides this, numbers of the highest-class specialists obtainable, in the various cognate lines.

We talk of the material development of the Philippines as if it was a matter only of business—of attraction of capital. We should not forget what the years have clearly taught in America and Europe, that there can be in the long run no safety whatever in agricultural investment, without the essential technical—scientific—service that may throw new light on every problem, and may furnish the only reasonable insurance and security that agriculture—"the greatest gamble on earth" may have. *After* needed and adequate knowledge is secured, it must then be taught to the whole population through every educational means available from lowest to highest.

The road is the only "Royal road to wealth and well-being"—a pathway broad, plain, and clearly sign-posted. In the Orient, to a very large extent, we wander in meandering and tortuous by-paths that lead to no positive results. More needed, than all the political arguing and self-seeking, is constructive action that will result in putting us on the right road—in the way of definite material progress for the *common man* and of hope for all ;

(Philippine Agriculturist Vol. XV No. I June, '26.)

Notes.

The Beehive of Asia:—China woke up from her long slumber about 20 years ago, she sent her Manchus rulers away and changed her monarchy for republicanism but the form of administration has persisted. The plodding and fertile Chinaman who is still symbolising in himself the "Yellow peril" is not happy in his own house. He may do good work in cane fields in Honolulu, the orchards in the Pacific States of America, the gold mines of Transval or the tin mines in Malaya but all is not well with him in his native land.

Writing to the "Peking Leader" on his country's immediate needs, Field Marshal Feng Yu Hsiao describes her economic conditions in terms which woke the sympathies of China's wellwishers. Here are his words:—"The vastness of our territory and the richness of her resources are looked upon with eager interest by all other states. However on account of her backwardness in industrial sciences and because of her capitalistic oppression the resources are left undeveloped and the people's power of earning a livelihood is greatly reduced. Our country's natural resources are amongst the richest in the world. Agricultural lands in the provinces are not yet fully cultivated and mines are mostly left untouched. The coalfields

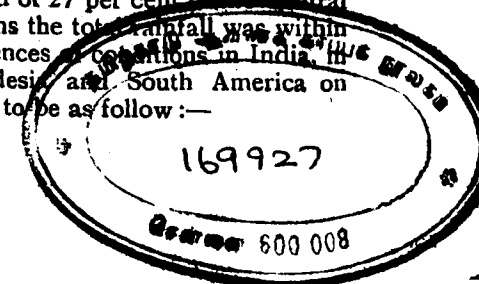
in the province of Jhansi alone are capable of supplying the world for several centuries. The large plains in the north east and north-west abundant in pastures are natural cattle rearing grounds far superior to those of the Argentine. These unpopulated lands if farmed and cultivated will become some of the best places for farm supplies in the world."

Australia:—This huge island-continent is purely agricultural. Farm produce, animals, and animal products are the main concern of the dwellers in the rural parts. A conference of ministers of agriculture representative of the whole common-wealth was held at Brisbane, Queensland, on the 7th June and following days. Matters of vital importance to the farming industry were discussed and decisions reached in many important points, some of which are:—

(1) that a permanent standard for wheat be fixed throughout the year, (2) that an embargo be placed on black-grown maize; (3) that the question of uniform seed legislation be submitted to a body of expert officers to secure legislation to meet the needs of the whole of Australia on a uniform basis; (4) to make for the betterment of the Dairy industry, Butter and Cheese boards be set up in each state; (5) that the Commonwealth Government subsidise the States in respect to the Dairy Industry for purchase of pure-bred dairy bulls, and defray all importation charges of purebred stock; (6) that representations be made to the Commonwealth Government to secure the necessary amendments to the Act so as to secure practical assistance to producers and producers' organisations in the preparation of the produce for market and the marketing thereof, as the Commonwealth Bank Rural Credits branch has failed; (7) that it is desirable that the manufacture of power alcohol be encouraged from agricultural products and (8) that Government make every endeavour towards the removal of the damping duty imposed by the Canadian Government on Australian butter."

The next conference will meet at Adelaide.

Indian Rainfall in June and July:—Over the greater part of the country the monsoon was very weak in June but normally active in July. The combined rainfall of the two months was in defect by 4 per cent. There was an excess of 27 per cent in Assam, a defect of 50 per cent in eastern portion of Central India, Baluchistan and north-West Frontier provinces, of 30 to 50 per cent in South-East Madras, Hyderabad, Sind and Bay-Islands and of 27 per cent in the Central provinces; over the remaining portions the total rainfall was within 20 per cent of the normal. The influences of cyclones in India, in the Indian Ocean, Java, South Rhodesia and South America on August-September rainfall are expected to be as follow:—



3L
J. G. in 21, 113
N 26

- (1) For the Peninsular India, an excess of rainfall and
- (2) For the North-West India, normal.

Madras exported during 1925-26, 43'13 millions of tea valued at 353,38 lakhs of rupees ; of the total shipments, 99 per cent was green tea ; United Kingdom alone taking 90 per cent.

The third annual meeting of the Mysore Economic Conference, in its reconstituted form, was held at Bangalore on the 30th July. In his opening address the Dewan observed that 20 per cent of the rice consumed in the State was imported from outside Mysore and he attributed the shortage in the supply to the deterioration of the tank systems in the State. His suggestions that estimates of the resources and a Survey of production in the State should be undertaken were very sound.

A sudden fall of 60 per cent in the imports of Japanese cloths into Bombay is reported to gather a considerable increase in the business of yarns, of Indian mills with China. This is attributed to the increasing demand of local cloth in Japan and the lower prices at which India is able to put her yarns in the China market than Japan.

A million pounds has been voted this year by the British House of Commons for the development of the Imperial marketing.

The Dewan of Cochin Mr. T. R. Narayana Ayyar referring to the agricultural conditions in the State, in his address to the Legislative Council this month, said that, on account of want of seasonal rains, the conditions of the agriculturist had been rendered unsatisfactory, that even in the Chittur taluk where there was an irrigation system, things were not what they would be, and that in all other taluks there was real trouble. He stated they were very earnest in taking up the question of Kule lands at once.

It is painful to note that the Veterinary Hospital which had been maintained by the Zamindar of Uthumalai, at Mookkeralanpudur, Tinnevely District should have been closed soon after the Zamindar came under the management of a Government appointed Receiver.

The Zamindari of Kaduvur which had been under the management of the Court of Wards for over 15 years was handed over to the proprietor Karma Raghavamuthu Nayakkar, free of all encumbrances and debts.

Departmental Notification July 1926.

Appointments, transfers etc.—

Mr. R. Kochukrishnan Pillai, to officiate as assistant, Vth grade in the G. A. C's section.

Messrs. V. Satagopa Ayyangar, M. Satyanarayana and A. K. Annasami to be on probation in the Upper subordinate service, Vth grade from 1st March 1926. The following are appointed as Upper Subordinates, Agricultural section, Vth grade, on probation and are posted to circles as noted against each :—Mr. A. P. Balakrishnan Nayyar to VII Circle ; Mr. V. Karunakaran Nayar to Chintaldevi Cattle Farm ; Mr. K. Varadachari to IIInd Circle and Messrs. N. Annasami and S. Mahadevan to IIIrd Circle.

Messrs. V. N. Krishna Rao and R. Sankaran to officiate as Scientific Assistants Vth grade and work under Cotton Specialist and Assistant Cotton Specialist respectively.

Millets Specialist's Section :—Mr. V. Gomatinayakam Pillai, Farm Manager to be Assistant Vth grade. Mr. N. S. Rajagopalan to be Farm Manager Vth grade on probation. Messrs. T. R. Narayanan and V. Panduranga Rao to be Assistants Vth grade on probation.

Mr. M. Krishnaswami Ayyangar, Assistant Manager, Live Stock section to report for duty to Deputy Director, 3rd Circle, Bellary and A. Venkobachar, assistant demonstrator transferred to Live Stock section. Mr. K. Ramanatha Ayyar, Demonstrator transferred to Nandyal Agricultural Station on the expiry of his leave.

Mr. K. Raghavachari, Farm Manager Hosur transferred as Demonstrator 8th Circle, Coimbatore.

Mr. C. S. Krishnaswami, to be Assistant, Mycological section, Vth grade on probation. Mr. E. R. Gopala Menon to officiate as Assistant Vth grade, Entomologist's section.

Leave etc:—

1st Circle :—Mr. M. Ramamurthi assistant manager, Anakapalli, leave on average pay for 12 days from 28-6-1926.

2nd Circle :—Mr. V. G. Dhanakoti Raju, Manager, Guntur leave on average pay for one month from 22-7-1926.

3rd Circle:—Mr. K. Hanumantha Rao assistant demonstrator leave on average pay for 15 days from or after 6-7-1926.

Mr. B. S. Suryanarayana, Manaker, leave on average pay for 3 weeks from or after 1926-7-26.

Mr. P. Naghadar Nayadu, assistant demonstrator, leave on average pay for 15 days from 17-7-1926.

4th Circle:—Mr. K. M. Venkatachalam Pillai, assistant demonstrator, extension of leave on average pay for 15 days.

Mr. K. T. Bhandary, Manager extension of leave up to 4-9-1926.

Mr. M. K. Swaminatha Ayyar, Manager, leave on average pay for one month from 3-8-1926.

6th Circle:—Mr. A. Chinnathambi Pillai, Manager, leave on average pay for 2 months and 8 days from 5-8-1926.

Mr. P. Kannappa Pillai, assistant demonstrator, leave on average pay for one month from 16-8-1926.

8th Circle:—Mr. V. S. Ramaswami Ayyar, Demonstrator, furlough on half average pay for 6 months from or after 1-8-1926.

Live Stock section:—Mr. K. Ramanujachari, Manager, leave on medical certificate for 3 weeks.

M. S's Section:—Mr. M. R. Sankara Ayyar, assistant, leave on average pay for 2 weeks from 15-7-1926.

G. E's section Mr. C. K. Subramanya Ayyar, sub-assistant, leave on average pay for 2 months from 1-8-1926.

Report of the Working Committee of the Madras Agricultural Students' Union, Coimbatore for the year ending 30th June, 1926.

Mr. President, Ladies and Gentlemen,

The working Committee begs to submit its report for the year ending 30th June, 1926.

It has been the singular fortune of this Committee to be connected with the celebration of the Golden Jubilee of the Introduction of Agricultural Education in Madras in 1876. An account of the agricultural work during the past 50 years will be separately read.

The College day and Conference were celebrated with great enthusiasm and interest on 14th—17th July last year. For a second time, the Union had the rare fortune of having the Minister for Development to preside over the deliberations of the Conference. A large number of district officers, M. L. C's, ladies and gentlemen attended the function.

The sports commenced with the Cross-Country race just a week in advance of the regular sports' day—the 14th July. The events commenced at 3 P. M. in fine weather, the Freeman Building affording ample facilities for accommodation of seats for witnessing sports from the verandah and in the commodious rooms inside for the Union's "At Home." All the events were keenly contested and the day's proceedings terminated with the distribution of prizes by Mrs. Butcher. A sharp drizzle, however, towards the close caused some slight inconvenience. The Champion of the day was K. Ramaswamy, student of class II, who was first in as many as five events. The Union tenders its grateful thanks to Mrs. Butcher for giving away the prizes and to Messrs. R. V. Norris, C. G. Tottenham, C. R. F. Williams, N. R. Krishnamma, J. A. Wilson, G. R. Hilson, M. R. Ramaswami Sivan, A. C. Edmonds and G. Moritt for their help in judging the events. Our special thanks are due to Mrs. P. V. Ramiah who was largely responsible for the success of the Union's "At Home" and to the Boy-scouts, volunteers and their captain Mr. P. N. Krishnan.

The Conference commenced at noon on the 15th July, Mr. Broadfoot—the President of the Union—welcomed the visitors in a short speech. The Committee's report was then read and the Hon'ble the Minister for Development delivered his presidential address in which he dealt at great length with the situation of the scientific

agriculturist in India and of the ideal which should impel him to advance the cause of science and of the country in which he was born.

The following papers were then read:—

- (1) "The present position of soil microbiology" by Prof. Roland V. Norris.
- (2) "Guntur agriculture" by Mr. K. Sankaran Pillai.
- (3) "The importance of the study of Co-operation to agriculturist" by Mr. J. Gray.
- (4) "Paddy breeding stations and their usefulness" and (5) "Seed and demonstration farms of a new type" by Mr. M. Anandan.
- (6) "Agricultural education among the masses" by Mr. K. Unnikrishna Menon.
- (7) "Labour" by Mr. T. B. Anderson.
- (8) "Interpretation of yields in agricultural experiments—some limitations" by Mr. V. Ramanatha Ayyar.
- (9) "Some useful agricultural practices in Cuddapah" by Mr. R. Swami Rao.

Very interesting discussion followed, the subjects in which a large number took part being 'Labour' and 'Seed and demonstration farms of a new type'. To all gentlemen who contributed papers, the thanks of the Union are due.

The usual bonfire was lit in the maidan on the 14th night.

The entertainment consisted of the enactment by members of staff and students, of "Eye of Love" in Tamil and the "Magic Button" in English; the latter was specially composed by Messrs. P. V. Ramiah and B. V. Nath for the occasion. Both the plays were highly appreciated, the actors 'doing' their parts very well.

With the Business Meeting held on the 17th, the proceedings came to a close. We are, however, glad to note in this connexion that a fairly large number of departmental officers were present.

Thanks of the Union are due to Mr. Hilson, Ag. Director of Agriculture, the Circle officers and Heads of sections and other ladies and gentlemen who in several ways helped the Committee.

The Journal:—The Committee reiterates the difficulties attendant upon running a monthly journal of the kind for which it is responsible, especially as it has to satisfy varied interests. The difficulties of management are further enhanced by the practice hitherto followed of publishing all the papers read at the Conference in one issue which not only delays publication of that issue but makes the issue of succeeding numbers irregular. The Committee begs to suggest that for the future it is desirable to publish abstracts of papers immediately after the Conference and publish them *in extenso* in the succeeding issues of the journal from time to time. All the same the Committee must state that the response for contributions is not as satisfactory as one would wish it to be.

Agricultural Education. The completion of a new building for teaching which was necessitated by the growing demand for agricultural studies and the opening ceremony of which was performed by His Excellency Viscount Goschen only the other day, rendered it possible to admit a large number of students and this year the Government have been pleased to raise the admissions to 40. The Committee feels gratified to note that the Local Government have emphasized the need for continuing the Agricultural Middle Schools at Taliparamba and Anakapalle. The University has recently sanctioned the adoption of agriculture as an optional for the Intermediate examination. It has thus laid the foundation for the spread of agricultural education among a greater number of students in this province.

The Royal Agricultural Commission:—The appointment of a Royal Commission this year has raised great hopes in all well-wishers of the ryot. The personnel of this Commission is strong, the President being a big landowner with experience as Chairman of several Agricultural committees in England. The Madras representative is the Rajah of Parlakimedi who is one of the Patrons of this Union and who has been maintaining a farm on modern lines for several years. The Committee has made representations in responsible quarters for permitting it to submit a memorandum and give evidence.

Ramasasthulu Mungala Prize:—Three papers were received for this prize and were valued by Messrs. D. G. Munro, G. N. Rangaswami Ayyangar and Rao Sahib T. S. Venkataraman to whom the

Union's thanks were due. The Judges have declared that "Research" is fit to be awarded a prize and this goes to Mr. R. Balasubramanyam Cotton Assistant, Guntur.

Finance:—The financial condition of the Union will be found in the Balance sheet which will be presented before the Business Meeting.

Jubilee:—The Committee began their preparations for the celebration in January last and approached the Government in the Development Department, all district boards, taluk boards and unions for help. Government have very graciously sanctioned a munificent grant of Rs. 1500 through the exertions of the Director of Agriculture, Mr. Anstead, whom we take this opportunity of thanking. Communications were also sent to several Planters' Associations, Chambers of Commerce, Heads of religious institutions, several Zamindars, Landholders, Honorary Visitors to this College and Patrons of the Union, from some of whom were received sympathetic replies and contributions, whom also we thank.

Personal. The Union congratulates the Hon'ble Diwan Bahadur Sir T.N. Sivagyanam Pillai, Minister for Development, on the knighthood conferred upon him. Mr. C. S. Ratnasabapathy Mudaliar one of our Patrons on his Rao Bahadurship and Mr. V.P. Subramanya Mudaliar, an old Saidapet student and retired Deputy Superintendent, Civil Veterinary Department on his Raj Bahadurship. Two of our Members, Messrs. H. Shiva Rao and C. S. Duraiswami are still in the United Kingdom undergoing agricultural training and we hope Mr. K. Ramiah who is leaving us shortly on deputation to England will come back with fresh experience gained in the latest developments in plant-breeding. Mr. C. J. George has at his own expense decided to proceed to England for an advanced course of study in Zoology and will be away from us for a couple of years. We wish these young friends success in their undertaking.

Lastly the Committee begs to thank Mr. R. C. Broadfoot, our President, for his sustained interest in the affairs of the Union and his guidance especially in connexion with the Golden Jubilee celebration.

E. P. W. Coimbatore.

ABSTRACT OF PAPERS.

(1) Crop Improvement Popularly Explained.

R. O. ILIFFE, M.A., DIP. AGRIC. (CANTAB).

A field of cholam contains several thousands of plants, no two of which are exactly alike. In harvesting, all are mixed together, good and bad, and the weight of crop gives no idea of how many good plants there are. All that can be said is, that a large number of poor plants decrease the yield, and if the poor plants could be eliminated and good plants substituted the crop would naturally be greater.

It is one duty of the plant-breeder to recognize the merits of individuals in a field of plants. It was said of Luther Burbank that from a field of many thousands of plants he could pick out 20 and say that they possessed certain qualities that the majority did not. There is always variation in a population, but if the best can be chosen, and a new population can be built up from them, an improvement may be expected with reasonable certainty.

There are many ways of choosing, or even building up, the "best" plant and the plant-breeder recognizes four main divisions of selective methods (I) clonal selection depends upon propagation of non-sexual parts of the plant i.e., vegetative organs, such as tubers of potatoes, cuttings of herbaceous shrubs, runners in strawberries, bud selection amongst rubber and fruit trees, etc. The result is a repetition of the parental characters. This method is of particular use to the market gardener, and is now being recognized by the rubber planter to propagate from trees that are established as good yielders. (II) mass selection is commonly practised amongst grain crops. It consists in using only the best plants of a field for seed for the next year's sowing. Each season the selection of good plants must be carried out or the yield at once drops off. It must be continuous to be effective. Carrots, sugarbeets, and cotton, besides the grain crops, have given good results by this method, which never gives the maximum improvement, but certainly gives quick results. The chief disadvantages are the labour involved in selection, and the rapid degeneration that follows even on temporary cessation of selection. (III) line selection (pedigree strains) is a natural sequence to mass selection. Broadly speaking, this method consists in the recognition and isolation of the best plant, or plants, of a population and the seed is used to found a pure family or families, whose characteristics follow very closely the parental type. If necessary precautions against crosspollination and other contaminations are strictly observed, a pure

or pedigree strain results with characteristics that are fixed, within the normal range of fluctuation. This is the method which probably produces most reliable results and is most widely adopted for cereal crops. The advantages are purity, uniformity of the characters for which the parent was selected; crop does not generally degenerate; purity may at any time be renewed from original stock, results are sure. Disadvantages are, training is necessary for original selection; work is intensive and beyond scope of ordinary cultivation; expensive, because seed not guaranteed in quantity for about five years. (IV) Hybridisation aims at constructing a new plant having the desirable qualities of two or more other plants. The method is in general use amongst annual crops such as cereals, cotton, grains, fruits, etc, but is normally applicable only between plants of the same genus, and in many cases the same species. The pollen of one parent having a desirable trait is conveyed to the stigma of the other parent having another good character, with the hope that the off-spring will show both these characters. Commonly the combination does not take place till the second generation, when various other combinations appear. If the desired combination appears it becomes necessary to fix the type and multiply the new strain by pure line selection. The advantages are that several characters of economic importance may be combined in one strain, and that unexpected combinations may prove even better than the object aimed at. The disadvantages are the labour and skill involved, the time taken in producing seed in bulk and the uncertainty that any conceived combination can be procured and fixed. As a new plant is evolved it is never certain that in establishing new traits, the old ones will continue.

The rest of the paper gives practical examples of these methods of crop improvement with particular relation to paddy.

(2) Crop Study.

G. N. RANGASWAMI AIYYANGAR, B. A.

Recent agricultural development has taken the form of an intensive study of each individual crop and of the way the characters in it are inherited. There is plenty of variation in each crop and the degree to which a combination of desirable characters are built together by the breeder, will determine the success of efficient crop study. Illustrations from sorghum are given.

(3) "Some factors affecting Private farming."

C. B. SAMUEL M. A. B. Sc.

Many students who come out of the Colleges and even those who are engaged in actual farming forget certain factors which are essential for successful private farming.

Taking the question of land, the area has to be large enough to maintain a farm house. They forget the main points while choosing the land and err in not properly dividing the land for various purposes. Is land an agent for producing wealth?

Labour in agriculture has been upset by the rise of Industry, and the farmer has to try all means of increasing the efficiency of his workmen by treatment, kindness, inducements. The relation between landlord and permanent workers is mentioned, as well as the proper business-like conduct of labour. The methods of attacking intemperance and the results have been mentioned and how to further a "T. T." policy for villages.

Capital, being the "motive power" on the farm, has to be carefully used—farming is a business bringing in a very small profit. The ways and means of raising capital have been mentioned. The personal ability and capability of the young landlord has to be diverted towards encouraging and patronising cottage industries and at the same time fully engaging himself.

(4) Genetics and Physiological Study of the Cotton Plant; and the Development of the Cultivation.

C. B. SAMUEL M. A. B. Sc.

There can be no question that the market for raw cotton is great. America has lost a good deal of her supremacy owing to various factors. It is time India takes the opportunity and places her cotton in the world's markets. "It can compete in cheapness" and the improvement in quality has to be brought about.

The equipment so far used by the cotton workers (as well as others) are observational and experimental methods, Cytology and Experimental Embryology not being called into, much. The latter have been so far working on unpedigreed material, and are not interested in "post-embryonic" stages. But for the geneticist, the development from the germ cell to the adult form is essential. Cytology has its own limitation and yet, allied with Experimental Embryology, the subject of genetics can be better attacked and recent researches have shown that Biochemistry is a very useful weapon.

Before attempting to improve cotton, we must visualise our ideal cotton plant. Habit, vigour, and length of term determine the individuality, and its capacity to produce well, though there are many

aiding factors which affect the quality and quantity of cotton. The latter demand the geneticist to work 'Size inheritance' into the constitution of the indigenous varieties and the exotics to prevent their degeneration. The ultimate end-lint production—is intimately connected with the physiological activity of the epidermal cells of the ovules, hence physiology has to go hand in hand with genetics.

Under 'quality factors, the "length" is a function of the soil moisture and the improvement depends much on this point. Though fineness, refraction, nep strength and, twist can be fixed, yet they are equally affected by environmental agents especially the sun. It is a battle. The adulteration often complained of can be removed by the farmer and the geneticist.

Notwithstanding the poor technical apparatus, we have the attacks of water, climate, soil, diseases upon the soma and the germ. This requires a further study on the activities and changes wrought on our ideal plant.—especially climate.

The work cannot be perfect unless financial help and the organization is improved. There ought to be Presidency Cotton Trusts for lending money, selling seeds, manures, purchasing cotton, financed from a tax on imports partly and by shares from the public (quasi governmental.) The State in its turn should by a levy of a small fee per acre for cotton grown, raise money to institute a thorough research in this valuable crop and further extend the zone of cultivation by providing facilities in new unopened areas.

(5) Co-operation and Agriculture.

V. KRISHNA MENON B. A., D. A.

(1) The chief object of the formation of co-operative societies in India (2) potentialities of the movement with special reference to the improvement of agriculture (3) Has co-operation held to improve agriculture to any appreciable extent; if not, why not? (4) what are the remedies possible (5) who has to apply them and how?

(6) "The place of economic zoology in a scheme of Agricultural Education."

T. V. RAMAKRISHNA AYYAR, B.A.

It is now admitted on all hands that for a pre-eminent agricultural country like India a proper training of the younger generation through a course of agricultural education is absolutely essential for the material prosperity of the country. It need scarcely

be added that it will be too early and premature to think of agricultural research, propaganda or demonstration until we have the proper agents or media who are sufficiently well equipped with the necessary knowledge and training to carry on the work successfully. The most important consideration in connection with this matter of training the suitable men with the proper agricultural training is the question of what subjects and how much of each subject should form the curricula in a course of agricultural training that will produce the desired results. Agriculture is a subject made up mostly of some of the aspects of other sciences like Mathematics, Physics, Biology etc., and the difficulty is often felt as to how much of each of these should find a place in a scheme of agricultural education. While stress should certainly be laid on such subjects as have a direct and more practical bearing on the operations of the farmer, a certain amount of unbiassed discretion has always to be exercised by men in authority in judging such an important matter; for it is not uncommon to come across enthusiasts in some subjects often proclaiming not only that their own subject is far more important than others, but even decrying others, however ignorant they may be of the merits of the latter and the writer knows of such cases where the importance of some subjects has not been sufficiently realised by the judging authorities for want of sufficient backing up on behalf of such subjects. The object of this paper is not however to discuss the comparative merits of these subjects (the author knows he is absolutely unfit for such a task) but this is only a modest attempt to point out the relative importance of one of these subjects (Economic Zoology) and to suggest what may be in the opinion of the writer a suitable syllabus on the subject for incorporation in a scheme of agricultural education.

With this idea few facts are added on the peculiarities and disadvantages in working on this subject as compared with others with the remarks that this is a subject which should and can be easily taught from the lowermost classes and one on which a student farmer requires considerable amount of training in powers of observation, discretion for emergent action and considerable amount of tact, patience and quickwittedness in emergencies, since the Entomologist has to come in contact with the public more often than other scientists of the Agricultural Department as it is a subject which has to be attended to more in the fields than in the laboratories and wherein one has to deal with active living things and adjust his work to deal successfully with the thousand and one unexpected freaks of these small animals. As such the writer thinks that the subject demands some more attention that it gets at present.

The merits of the present syllabus on this subject for the B. Sc. course in the Madras University are discussed and a conclusion is

arrived at to the effect that the subject should be taught all the three years the main lines of treatment being during the *1st year*-Elementary Zoology as an introduction to Entomology, Practical and Theory, *2nd year*-General Entomology-Morphology, Biology and classification of the main groups and a familiarity with the commoner forms of important families of each order, especially those of economic importance and *Third year*-Economic Entomology-Treatment of beneficial and injurious insects including Silk, Lac, Honey, friendly insects and crop pests and the various methods and technique connected with applied entomology. With this idea a new syllabus is submitted. The writer is also of opinion that during the final year every student for the degree must be asked at the end of the year to select some aspect, however small and narrow of any one of the agricultural subjects and specialise to some extent in that and submit a thesis, the choice being left to the student himself. This will give an agricultural graduate not only a general training in all allied subjects but will afford him facilities to get some preliminary training in specialising and in research methods sufficiently early.

(7) A Note on some phases of flowering in rice in Tanjore Dt.

T. K. BALAJI RAO, L. Ag.

Observations were made at the Paddy Breeding Station, Aduthurai to get information about (i) the time and order of the opening of rice spikelets, (ii) the effect of the prevailing weather conditions on the opening and (iii) the period required for the complete blooming of one head and for the whole plant. The materials used in the study were four of the strains evolved. The results obtained may be summarised as below:—(1) One of the factors responsible for the glume opening is expected to be the rapid elongation of the anther filaments and the pressure brought on the glumes by such elongation. The time taken for the actual opening is $1\frac{1}{2}$ to $3\frac{1}{2}$ minutes depending on the prevailing weather conditions. The time taken for the close of the open glumes depends on the weather again, being 24 minutes on a bright day and 37 minutes on a cloudy day. It took as much as 57 minutes when it rained.

(2) The time of flower opening appears to depend on the weather conditions, stray cases were noted when it commenced as early as 5-30 A. M. and got delayed as late as 4-30 p. m. the normal time of opening being 9-45 A. M. to 12 noon. Only stray spikelets are found to open in the beginning.

(3) The dehiscence of anthers is brought about simultaneously with the opening of the glumes or immediately after one sunny day but on cloudy and rainy days the anthers do not dehisce.

(4) In every plant the first few heads take about 5 to 6 days to complete full blooming but this period gets extended in the later heads. A plant with a very large number of heads does not necessarily take a longer period to finish blooming than one with a fewer tillers.

(5) There is no apparent order in the opening of spikelets in a panicle though the different zones in which the maximum number of spikelets open each day can roughly be made out.

(8) Rice Improvement Work in Burma.

K. VENKATRAMAN B.A. (Hons.)

Burma is pre-eminently a rice producing country, nearly 73 per cent of the total cultivated area being cropped with rice. In the export trade of rice, Burma easily holds an undisputed first place, shipping $2\frac{1}{2}$ million tons rice out of a total production of $4\frac{1}{2}$ million tons of cleaned rice per annum.

The conditions of cultivation vary in different parts of the province. Upper Burma is hot and dry, with a limited rainfall and the paddy crop is grown under irrigation. Lower Burma is humid, the rainfall is heavy and the tract is fertile and rainfed. There are two long established paddy breeding stations, one at Hmawbi for evolving improved strains suitable for Lower Burma and the other at Mandalay to serve the needs of Upper Burma tracts.

The chief paddy crops grown in Burma are:—(i) a short-duration variety called 'Kaukyin' in Burmese, (ii) a long duration variety called 'Kaukyi' and (iii) a hot weather crop called 'Mayin.' A flood resisting variety of paddy 'Tadungbo' is cultivated in some low-lying tracts subject to periodical inundations.

The agricultural prosperity of the country is clearly dependant on the magnitude of her export trade. Conformity with trade requirements and increased outturn form, therefore, the guiding principles of all work on rice improvement.

The main requisites of good paddy from the commercial point of view are (1) a bold grain of regular size, (2) uniformity of colour and absence of red grains, (3) minimum breakage in milling and (4) absence of awns in grains. With due attention to all these good points, the Burma agricultural department has evolved, multiplied and distributed improved strains which have found favour with the ryots and millers.

(9) Agricultural Propaganda work in Burma.

K. VENKATRAMAN, B.A., (HONS.)

Agricultural propaganda work may be divided into 5 important heads, namely (i) agricultural education, (ii) demonstration of improved agricultural methods and implements, (iii) the supply of pure seed, (iv) publication and supply of information and (v) the formation of "Agricultural Improvement Committees." Details of organization and methods of work pursued by the Burma agricultural department are described under the different heads.

Some noteworthy features are the farm-schools attached to important farms, where a practical training is given in cultivation and seed-selection to adult cultivators as well as the private seed farms where seed supplied by the department is grown under official supervision by private farmers, and the produce sold back to the department for purposes of distribution. The co-operative seed-unions arrange for the growing of pure seed purchased from the Government central farm and the subsequent distribution of the produce among its members on a co-operative basis. The agricultural improvement committees are semi-official organizations consisting of both official and non-official members in some important districts, the function of the committees being to act in an advisory capacity on all matters connected with agricultural expansion, including the grant of Government loans under the Land Improvement Loans Act.

(10) Growth Studies in rice varieties.

K. RAMIAH, L. AG.

An attempt has been made in this short note to compare the phases of growth in rice varieties. Detailed observations were taken for two seasons on 14 short duration types with durations ranging from 90 to 130 days and 15 long duration types with duration ranging from 150 to 182 days. A dozen seedlings from each of these lots were marked out from the commencement of sprouting and periodical measurements were taken. This identity of the plants was maintained in transplanting by suitable labelling and the measurements were continued till there was no increase in size. Notes were also taken on the number of leaves functioning at a time, the number of tillers produced, the flowering and the ripening periods.

Differences are found to exist in the formative, growing and reproductive phases of the varieties according to their duration. Measurements in the seedling stage reveal no striking differences between an early and a late variety, although the former exhibit a

tendency for a greater leaf formation. The number of leaves formed in the seed-beds is greater in the early variety than in the late, and the rate at which fresh leaves are formed is more sustained in the late one.

After transplanting, the early varieties establish quicker and the increase in size between definite periods is more marked than in late varieties. The rate of growth in the late variety is in its ascendancy when the early one has finished its maximum growth. The rate of growth in both early and late varieties is at its maximum when they start their reproductive phases. While the growth is fairly continuous generally, in the case of a few very late varieties the increase in size is marked till they finish their lateral growth i.e., branching, after which time there is cessation of growth for a period and it commences again when the plants enter their reproductive phase.

Varietal differences have been noted in the time taken to finish their lateral branching. The following period though fairly constant among the individuals of a variety, varies slightly with different varieties. There is no apparent difference in the maturation periods of the late and the early varieties.

(11) Some observations of ratooning in Paddy.

C. M. JOHN, B.A.

Paddy ratoons were studied in the case of 7 pure varieties at the Paddy Breeding Station, Coimbatore, during the years 1924-25 and 1925-26. The observations show the following points of difference between the first and ratoon crops.

(1) The ratoon tillers come to maturity in a shorter time than it takes to mature normal ears, (2) The ratoon plants and ear-heads are very much shorter, (3) There is a marked increase in the number of unset grains in the ratoon ear-heads, (4) The grains of the ratoon crop are markedly smaller in size, (5) The grains of the ratoon crop weigh less, (6) The ratoon grains have a prolonged and uneven germination and are thus unfit for seed purposes.

The behaviour of these ratoon grains in further generations will be studied in the coming season.

(12) Aspects of the Cotton Plant.

P. NARAYANA NAYAR, B. SC. AG.

Introduction; varieties; area; method of branching; duration; flower; factors that increase the yield; certain hereditary characters; and conclusion.

(13) Court of Wards and Agriculture with special reference to Zamin in Ramnad District.

M. A. BALAKRISHNA AYYAR, L. AG.

Zamin areas are a little over 50 per cent of the total of the district. This fact is sufficient to impress on us the importance of the subject. The system of land tenure is described as affecting Dhanasasanam, Pannai and Inam lands. An extract of the Sannad given to Sivaganga—one of the two big zamins by the East India Company—is quoted and limitations to any activity on the part of the Court of Wards are pointed out. An analysis of the different sources of income for the zamin is made. Total income varies from 20 to 26 lakhs annually. The difference between these limits—viz-6 lakhs is nearly one-third of the total annual income and is the income from the 'Pannai' lands which is the main source of revenue to the Zamin-dar. This fluctuation therefore gives us an insight into the possibilities of not only keeping income up to the maximum but even increasing it considerably.

This is where the Agricultural department should come in. Government as trustees of the Court of Wards States should put forward a workable scheme and adhere to it sufficiently long. A few particulars suggested are:—(1) preparation of a statistical analysis of crops, cultivation, yield etc. of the Zamins; (2) opening of farms in every Zamin tract with an annual collection of 20 lakhs. (3) The area should be 30 to 50 acres of land. (4) The farm should be under the guidance and immediate control of an experienced agricultural officer who should act on the advice of the Deputy Director of Agriculture of the circle. These farms would serve as convenient units for the several specialists of the department to try their methods under varying local conditions and demonstrate to the ryots in the immediate neighbourhood.

This without materially increasing the cost of administration would cover a greater area more efficiently and carry improvement to the very hearths and homes of the ryots.

(14) Fodder Problem in the Dry Tracts of South India.

S. V. DORAISAMI B. A., B. SC. (AG.)

The adoption of improved methods of cultivation will be greatly facilitated by the existence of strong and well-built cattle. The development of live-stock should take place side by side with improvement in the fodder supply of dry tracts. The area under fodder crops is actually little compared to the total cattle population and the available cultivable area. The dry tracts of the central districts, and the Ceded districts and those of the Southern districts of Madras, Ramnad and Tinnevely are the areas, the fodder requirements of which we have to consider. Some suggestions for solving this problem are.—(1) to include a fodder crop in the rotation; (2) to put down a larger area under fodder crops; (3) starting of 'fodder farms' in suitable places; (4) to afford facilities for cheap transport of fodder; (5) to investigate into the suitability of some drought-resisting plants as fodder; (6) to re-introduce the levy of concessional rates of assessments to areas under fodder crops or grass in Coimbatore and to extend the concession to all parts of the Presidency.

(15) 'Coconadas' with special reference to Palnad.

R. BALASUBRAMANYA AYYAR, B. A., B. SC. (AG.)

The paper records the observations and enquiries in Palnad and Satenapalle taluks and embraces agricultural statistical, and botanical studies as well as those of trade.

The cotton of this tract is designated "Coconadas" in trade, monopolises the Indian mills, spins to less than 20's and is suitable for coarse khaki. An area of 260,000 acres is sown every year and Guntur accounts for one-third to half the area. The soil is topical black cotton mostly. In this tract monsoon sets in July and the following 4 months are rainy. Average rainfall is 32." Extremes of climate prevail. Due to the present condition of the ryots' population, chiefly their extreme poverty and small holdings, the cultivation is neglected. Little or no manuring is given, nor any judicious rotation followed.

There are two seasons, early and late. In the former cotton is always a mixture while in the latter it is sown pure. In the early season crop are found *G. Obtusifolium* (Coconada) and *G. Indicum* (Yerapathi) The crop is a heterogeneous mixture from the botanical

point of view. The colour, length and fineness of lint are variable. Similarly the seed exhibits marked differences of character. Branching in Cotton is of utmost importance and 'Coconadas' is of the type abounding in vegetative branches unlike many other indigenous cottons. The superiority of this type lies in increased yield, and completion of picking in a short spell. The need and possibility of such a type will be viewed by any one with optimism. The ryot's crop is very poor with no branching and low yields. Picking is done in an unsatisfactory manner. This is due to exigencies of existing rural conditions, time and method of picking and heaping in the field and want of inducement to bestow more care. The remedies sought for are suggested. Different market rates are quoted and the percentage of leafiness and loss or gain in premium are given. The ryot is very often a loser due to his indebtedness, the system of making forward contracts and lack of easy means of transport. Adulteration of inferior 'Coconadas' is carried on round Narasarowpet and Palnad suffers. The result is deterioration and low price. Cooperative sales are not organised though plenty of scope lies in this direction.

The valuation of the stuff is done by the purchasing firm for each year and the market rate is fixed according to the colour and leafiness. A good deal of extra premium is offered for colour and the magnitude of difference between 'Berar' and 'Coconada's is as great as Rs. 90 and this is due only to the white colour of Berar. The common pests are pink and spotted boll-worms and aphids and a fungus disease very often prevails doing much damage.

There is a rapid fall in price this year and inducement is lacking. The cotton area is likely to go down next year, as other crops like chillies and tobacco are on the increase.

(16) "Mosaic" Disease of Sugarcane.

D. MARUDARAJAN, B.A.

Mosaic was first noticed in India in 1921 by Dastur in Pusa and in 1925 in Samalkot, Palur and Coimbatore.

Mosaic is characterised by blotches of chlorotic areas distributed all over the surface of the leaf. Each variety has its own characteristic symptoms and those of some local varieties are described. Such symptoms are also found in cane stalks.

The disease is transmissible to other plants through the agency of *Aphis maidis*. Artificial inoculations are also reported to have given positive results. The disease is generally transmitted by planting diseased setts.

The disease has been noted in Coimbatore, Salem, Tricinopoly, North Arcot, South Arcot, and Samalkota.

Intracellular bodies are said to be present in the diseased tissues. The host nuclei are reported to be much enlarged and irregular in form in the diseased tissues of the leaves. The chloroplasts are smaller and fewer in number in the mosaic tissues.

(17) Some Aspects of the Control of Paddy Blast.

K. M. THOMAS, B.A.

(1) The Blast disease of paddy (*Piricularia oryzae*) being not amenable to direct treatment, an attempt was made at Coimbatore to study the degree of resistance in several varieties of paddy.

(2) The plan of experiment and the method of recording results are mentioned.

(3) The varieties exhibited different degrees of resistance.

(4) In one and the same variety, difference in environment produced remarkable difference in the incidence of the disease. Greater vegetative growth indicate greater susceptibility to disease.

(5) The chief avenue of fighting the disease appear to be the selection of resistant varieties.

(6) Recommendations are made to eliminate very susceptible varieties, and to test new strains for *Piricularia*-resistance, before they are distributed to the cultivators.

(18) The Role of Plant Pathology in Modern Agriculture.

K. M. THOMAS, B.A.

The importance of the study of plant pathology, the limitations of the pathologist, the methods practised in fighting plant diseases and the achievements in the field of phytopathology are discussed.

(2) Recent developments in tackling plant diseases are described and the importance of the need for close co-operation and united action among the plant pathologists and specialists in several sister sciences is discussed.

(19) Farming invites the educated man for profit.

K. UNNIKRISHNA MENON, DIP. AGRI.

The largest rush of educated gentlemen for private or public service and the apparent condition of several men remaining unsuccessful creates the unemployment question. The present unpopularity of farming as a profession fallen into poor hands explained. How educated men (the School—Final men especially) can find a more profitable business in farming than in service leading a town life. A monthly budget of a family depending upon a pay of Rs. 70/- a month is compared to another annual budget of a similar family getting (Rs. 35 a month) or Rs. 420 or 420 paras of paddy a year. The former showing a profit of Rs. 12 a year as against Rs. 50 a year in the latter.

(20) A Century and a Quarter of Mysore Agriculture.

A. K. YEGNA NARAYANA IYER, M.A.

Subject of historical survey of changes in Mysore during a period of 125 years taken up as appropriate to an agricultural Jubilee address. Data regarding state of agriculture in the past taken mostly from Dr. Buchanan's account of his travels in Mysore in 1800 and 1881. Changes described refer firstly to general conditions of life such as peace, trade facilities, improvement in transport methods, opening of world markets etc.,—Ninety years rainfall record reviewed and question of alleged progressive diminution examined—Changes in agricultural technique described under 1. implements, 2. crops, 3. manures, 4. preparation of produce, those that have gone out and those that have been newly introduced—Among implements the old wooden sugarcane mills, threshing appliances and ploughs described with the later new appliances and nature of the improvement implied—Among new crops and methods of the period are described the mulberry and the whole art of silk production; the whole of the coffee industry; of groundnuts, of the Dharwar American cotton, the potato and "English" vegetables and fruits; the Pattapati sugarcane; the exten-

sion of coconut cultivation on dry lands—The changes in sugar and jaggery making methods and the vicissitudes in the sugar industry are referred to.—Among crops that have disappeared from cultivation altogether or in part are described indigo, the safflower, the opium, poppy and sunhemp as a fibre crop—Special mention made of the rearing of the cochineal insect on prickly pear.—The cattle industry then and now and rearing methods with reference to oxen, sheep and goats described—The Farms maintained by Tippoo Sultan, by the Maharaja and later by the British Commission which have all disappeared are described with the mark left by them on the industry—Theme concluded by drawing attention to the large and important changes that have come over Mysore agriculture contrary to belief that the ryot seldom alters his methods and is too conservative.

(21) Cotton Work in Madras.

S. N. VENKATARAMAN, B. A., B. SC., (AG.)

The paper begins with a historical account of the work done in earlier years, describes improvements made in the last quarter of the 19th century in commercial, agricultural and botanical aspects; makes reference to improvements made in other countries at the same time and lays emphasis on the attention paid in this province to the study of cottons both indigenous and exotic. The different cotton tracts have been severally dealt with in respect of suitability acclimatisation of varieties and trade facilities. The paper closes with the recent scientific work on cotton.

(22) Joint Purchase and Sale of Agricultural Commodities.

V. N. SUBBANNACHAR, L. AG.

The paper describes the general condition of the Indian ryot, his conservatism and indebtedness to moneylenders and middlemen, compares his practices to the more organised methods of the European farmer, and emphasises the need for cooperative efforts in the disposal of agricultural produce. It gives an account of such combined work on the part of the ryots in the purchase of cotton seed and disposal of lint in the Bellary district and shows how it has helped in preserving the purity of strains, while bringing increased profits to the ryot.

(23) The Rise and Progress of Entomology in India.

T. V. RAMAKRISHNA AYYAR B.A., F.E.S., F.Z.S.

A modest attempt is made in this paper to give an account of the information that we possess with regard to knowledge of insects in ancient India and the progress made in Entomology.

Early period:—Much information is not available on the subject of lower animals as on other scientific subjects. But there are evidences to point out that people in the early days were familiar with some of the commoner forms of insect life. Such terms as *Pathanga*, *Bhramara*, *Pipilika*, *Makshika* etc., in some of the ancient books are evidences to prove that the Hindus in the early days possessed some knowledge of insects. The physician *Susrutha* had a fair knowledge of animals and has even classified *Pipilikas* (ants) into 6 subdivisions and the nature of the names of some these subdivisions shows that the author possessed considerable powers of observation. There is also considerable evidence to prove that people in ancient India had a knowledge of the *Lac* insect (*Laksha*). From time immemorial people all over India were familiar with honey bees (*Madhumakshika*). The writer does not know of any records to show that any regular work on Entomology on modern lines was carried on in the early days in India. Reference may, however, be made to the strange story in the Mahabharata of the boy-sage *Mandavya* who had the habit of collecting and pinning insects and for which he had to pay a heavy penalty.

The Middle or Premodern Period:—The first work published in Entomology on modern lines was from south India by Dr. Koenig, a Danish naturalist and a pupil of the great Linnaeus. This author was first attached as a medical officer to the Tranquebar mission and occupied the post of naturalist to the Nawab of Arcot. One wonders whether any of the present Nawabs or members of the landed aristocracy in India employs a naturalist. Dr. Koenig's paper appeared in 1779, the subject being 'Study of the white ants near Tanjore'. The next production on Entomology appeared in 1781—a paper on the "Lac Insect" by Dr. Kerr. A detailed account on the same appeared in the "Asiatic Researches" in 1790 by Dr. Roxburgh. In 1791, Dr. J. Anderson, Physician-general to the East India Company issued a monograph on the Cochineal insects. In 1800, the famous traveller Buchanan published an account of the cultivation of Lac in different parts of India and notes on the cultivation of the silk worm in some localities. In 1840, the Rev. F. W. Pope published a paper on the "Entomology of the Himalayas and India" in the Madras Journal

of literature and science. It was, however, only in the year 1842 that a regular book by E. Donovan on the "Natural History of Insects in India" appeared. In 1848 appeared Westwood's monumental work—"The Cabinet of Oriental Entomology" and this publication only attracted a good deal of attention. In addition to papers that appeared in the Asiatic Society's Journal and the Bombay Journal which had been started in 1788 and 1886 respectively, during those years numerous papers on Indian insects by well known authors appeared in British journals especially in the Transactions of the Entomological Society of London. In one of these papers there is the interesting record worth mentioning. Mr. J. A. Rothney in his paper on his observations on "Indian Ants" made while touring in South India in 1893 records how he found to his great surprise reams of paper in the Stationery godowns of V. Perumalehetty and Sons in Madras quite free from white ant attack and how the proprietor proudly pointed out a kind of small red ant which appeared to keep off the white ant pest from the ream of paper! In 1888 interest in agricultural entomology began to be evinced by the Government of India and the Trustees of the Indian Museum issued the well known periodical on insects "Indian Museum Notes" from 1889 to 1902 and these contain a fund of information on Indian entomology especially on the economic aspect of the subject.

Modern Period:—This begins from the year 1903, when the first official Entomologist was appointed by the Indian Government. This was held for over a decade by the late Prof. Maxwell Lefroy whose death under very tragic circumstances was reported recently and under whom the author of this paper was working for over 2 years. The work of Prof. Lefroy during his tenure is all an open book and requires little commendation. Meanwhile interest in entomological work was also created in the provinces and Madras was the first to secure an Entomologist in the person of Mr. Fletcher whose work is well known.

Some brief remarks are added with regard to the rise and progress of Entomology in other countries as compared with India. The paper concludes by making some observations on the nature of the work done so far, showing how the great bulk of it has been necessarily of a general and systematic nature and how important systematic work is, forming as it does the substantial foundation on which all economic work has to be built.

(24) The Leather Trade and the Agriculturist

CAPTAIN A. GUTHRIE.

The principal raw materials of the leather trade are the hides and skins of domestic animals bred by the agriculturist.

Their economic value is considerable compared with such staple crop as wheat or ground-nut.

To the agriculturist there is one great difference between skins and hides on one hand and wheat, groundnut or cotton on the other hand.

The latter are primary products to him while the former are only by-products. This accounts for the present necessarily earlier attention paid by the agricultural department to the improvements of staple crops and development of animals for dairy, work or draught purposes.

During recent years owing to the notable developments in well organised industries through the introduction of labour-saving appliances and methods, it has been found possible to lower the prices of main products as byproducts pay for the material used in their manufacture.

Cases in which the ryot obtains anything directly or indirectly for hides and skins are considered.

Difference between "Hides and skins" is noted and the reasons for the poor quality of the Indian hides given and their validity examined.

The importance of leather to the agriculturist in South India is emphasised and the paper concludes with a statement of trials with chrome-tanned leather and suggestions for prolonging the life of a leather bucket.

(25) The Rice Swarming Caterpillar as an Instance of the Difficulties of Insect Control.

RAO SAHIB Y. RAMACHANDRA RAO, M. A.

In calling for remedies for insect pests the layman has usually no idea of the difficulties which beset the Economic Entomologist in devising measures. Remedies are not always simple and straightforward. The stereotyped remedies usually suggested are often impracticable owing to economic considerations. One has to study the pest in all its aspects and find out the weakest link in the chain where-at the pest could be easily tackled. The above difficulties are illustrated

by reference to actual experience gained in remedial measures tried against the Rice Army worm—*Spodoptera mauritia*—during the last 2 or 3 years.

(26) The feeding value of Spear Grass Hay and Silage.

DR. F. J. WARTH.

An experiment to compare the feeding effects of spear grass hay and silage made from the same grass cut at the same time was carried out recently at Hosur. It was found that spear grass hay produced no increase in weight during a test of 13 weeks. Silage feeding produced an average increase of $\frac{1}{8}$ of a pound a day during the same time. It was observed further that the nutritive values of the two fodders were nearly identical. The better result obtained with silage was accounted for mainly by the larger amount consumed. The practical significance of the results is discussed under three heads.

(27) On some Indian Agricultural Problems.

S. RAMACHANDRA AYYAR.

The paper opens with a classification of agricultural problems under the heads Land, Labour and Capital, discusses under the head State Aid, such questions as tariff, consolidation of holdings and tenure, agricultural banks, co-operation and co-operative farming, transport facilities, pests and diseases on crops and cattle. Agricultural education is then touched upon. Research is thereafter dealt with and the paper concludes with a statement of agricultural statistics.

(28) Effect of Manuring on the Vegetative and Reproductive Capacity of the Seed.

MRS. B. VISWANATH AND M. SURYANARAYANA.

The paper deals with the influence of manuring a crop on the resulting seed in regard to its value in the nutrition of plants and animals. Experiments have been described to show that the seed obtained from a manured crop has a better nutritive and cropping value than the seed from an unmanured crop and that the seed from a crop manured with cattle manure is superior in these respects to a crop receiving commercial manures. The possible reasons for this are considered and the scientific and practical significance of the results discussed. Especially light has been thrown on the hitherto neglected question of Auxinones and accessory food factors—for plants.

(29) Money in Coconut.

M. GOVIDA KIDAVU.

In South Kanara the area under coconut is 0.47 lakhs and in Malabar 3.29 lakhs of acres. The trade in coconut and its by-product in the West Coast is enormous. 4 coconut stations—one an old garden and three on representative waste lands were started in 1916 for the study of the crop from its various aspects.

2. It has been studied that Coconut can be grown in the West Coast without a drop of irrigation water if adequate attention is paid for proper manuring and intercultivation. To demonstrate this fact, 140 demonstration plots (miniature farms) have been started throughout the West Coast from Palghat to Balindur. The actual experience shows that a grown up garden gives an acreage net profit of Rs. 94—the gross income and the expenditure being Rs. 148-12-0 and Rs. 53-15-0 respectively. It takes 10 years for a coconut tree to bear in red loam and laterite soils and 12 years in sandy soils with a total expenditure of Rs. 550 including the value of the land. A coconut tree continues to bear for 60 years and the average net income per acre for that period comes to Rs. 5,640.

3. Out of a total waste of 16.72 lakhs of acres in both the districts at least a lakh of acres in each are suited for coconut cultivation.

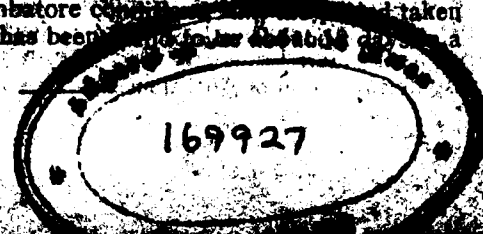
4. The partial solution of unemployment problem can be found in the starting of more and more agricultural middle schools and in the granting of liberal grants of money to the passed out men by the co-operative societies and by the Government on long term loans and affording facilities to get lands on dharkast and from private land owners at the same time.

(30) Blooming of Rice and the Development of Rice Grain.

N. PARTHASARATHI AYYANGAR, B.A. : B. Sc., (Ag.).

The mechanism and the process of flower opening for the pollination of rice are briefly described in this paper and the experience is recorded for Coimbatore. The experiments taken from fertilization to ripening has been done for a short duration variety.

JL
J, 9, m 211, N13
N26



(v)

The Coimbatore Manure Works & Standard Saltpetre Refinery.

Under European Supervision.

EXCELLENT COMPLETE MANURES

For Paddy, Ragi, Cholan, Sugarcane, Coconut,
Tobacco, Fruit Trees, etc. etc.

WE HOLD LARGE STOCKS OF

Imported Chemical Manures, Bonemeal, Poonacmeal,
Bloodmeal, Milled Fish etc., etc.,

**SOLE AGENTS IN SOUTH INDIA,
FOR the Excellent New NITROGENOUS FERTILIZER.**

Our SPECIALITIES,

"NITRATE OF LIME"—13 per cent Nitrogen, 25-30 per cent Lime, in a readily available form, well suited for South Indian soils which are generally deficient in Lime. This new Fertilizer has invariably given excellent results on COFFEE, TEA, RUBBER and CEREALS, and has obtained unsolicited testimonials.

Refined Saltpetre, Dried Blood, Basic Bonesuperphosphate,
Flour, Phosphate etc., etc.

ANALYSES OF ALL MANURES GUARANTEED.

The various Fertilisers are ground as fine as possible and mixed to order, or sold separately as required on the most favourable terms. Special quotations for large orders.

Our manure pamphlet giving useful information, and price list will be posted on application.

Messrs. T. STANES & Co., Ltd.,

Coimbatore Manurial Works,

and Standard Saltpetre Refinery,

COIMBATORE

(vi)

When you think of buying

FARM IMPLEMENTS

Remember ::

KIRLOSKAR

Largest Farm Machinery Manufacturers

IN INDIA

**We can supply you
IRON PLOUGHS,
CANE MILLS,
FODDER CUTTERS,
MHOTE WHEELS,
MAIZE SHELLERS**

&c., &c.,



Bulk production enables us to offer these implements of proved quality at prices within easy reach of all farmers. Ask for complete catalogue.

KIRLOSKAR BROTHERS, LTD.,

Manufacturers of Farm Machinery,

KIRLOSKARVADI, Bombay Presidency.

(vii)

JUST PUBLISHED.

“ Manual of Dairy Farming ”

BY

K. K. GHARE, L. AG. (BOMBAY).

Lecturer, Agricultural College, CAWNPORE.

An invaluable book to all students of Agriculture and Dairying containing UP-TO-DATE and full information on the subject, with illustrations.

(Cloth Bound) Price Rs. Three only.

Apply early to:—

**B. C. GHARE, L. AG.,
P. O. BARAMATI,
District POONA.**

OPINIONS

President, World's Dairy Congress, U. S. A.

The Secretary to the President writes :—

Mr. Van Norman wishes me to express to you his thanks for your kindness in sending him a copy of your book, “ Manual of Dairy Farming.” He has found this an interesting account, and congratulates you on its thoroughness and appearance. It should be very helpful.

Imperial Dairy Expert, Simla.

Within the limits which you have set yourself I consider the book gives sound and valuable information.

Dr. Mann, Director of Agriculture, Bombay Presidency.

You seem to have made it exceedingly complete and it will be of great value as a book of reference.

Journal of Agriculture (Pusa).

The writer shows a genuine appreciation of dairy conditions in India and the book is certainly a valuable addition to the scanty literature available concerning the Dairy Industry in this country. The general principles applicable to Indian Dairying laid down in the book are sound and well and clearly stated The book can be recommended as a suitable text-book for agricultural students and for all interested in the dairy industry in India.

(viii)
The Journal of
THE
Mysore Agricultural & Experimental Union
BANGALORE.

**A Quarterly Journal published for the Union by
an Expert Board of Editors.**

Chief Editor—Dr. B. Narasimha Iyengar, B.A., Ph. D.,
Agricultural Chemist in Mysore.

Subscription Rs. 3 per annum.

Florists and Fruitists.

Genuine Seeds !!! SHOW GARDEN !!! Reliable Plants !!!

Salem Mango Grafted Plants three years old	As. 8 to Re. 1
Wholesale rates all sorts	Rs. 50 per 100
Fruit Grafts Guava, Pomegranates Different sorts of	
coloured crotons and Roses	Rs. 6 per doz. each
Orange Grafts, Lime Grafts, &c.	Rs. 9 do.

FRUIT TREE SEEDS ALL VARIETIES

English Vegetable and Flower seeds 20 sample pkts. Rs. 2 each
do do per 10 sample pkts. Rs. 1 4 0 each.

Indian Vegetable Seeds all varieties supplied at CHEAP RATES.

1492 Catalogue with Calendar supplied Free on Application.

SALEM MANGO FRUITS SUPPLIED FROM APRIL TO JUNE.

S. K. I. ABDUL RAHIMAN SAHIB, Proprietor,

"SALEM NURSERY GARDENS,"

Tel. Address:—"Nursery Salem."

SALEM

OFFICE-BEARERS FOR 1926 -27.

The Council (25 Members.)

PRESIDENT.

(Ex-officio) Principal.—R. C. Broadfoot.

VICE-PRESIDENTS (4)

Resident:—C. Tadulinga Mudaliar.

Mofussil: J. Chelvaranga Raju, Guindy, Saidapet.

" P. H. Rama Reddi, Bellary.

" K. T. Alwa, St. Thomas' Mount.

MEMBERS (20)

Resident: U. Vittal Rao, *Secretary*.

" D. Srinivasa Rao, *Treasurer*.

" V. Muthusami Ayyar, *Editor*.

" K. M. Thomas, *Sub-Editor*.

" S. Narayaniah, *Manager*.

" M. C. Cherian, *Member, Editorial Board*.

" T. V. Rajagopalacharya, "

" P. N. Krishnan "

" S. Muthusami, "

" V. K. Subramania Mudaliar.

Mofussil: M. U. Vellodi, Nileshtar.

" N. S. Kulandaswami Pillai, Trichinopoly.

" A. V. Tirumuruganatham Pillai, Madura.

" T. Budhavideya Rao, Hosur.

" R. Swami Rao, Saidapet.

" K. Raghavacharya, Coimbatore.

" K. T. Bbandary, Madanapalle.

" K. Avadainayagam Pillai, Coimbatore.

" C. S. Namasivayam Pillai, Madura.

" D. Balakrishnamurthi, Madura.

Working Committee (14 Members).

The resident Vice-President and the ten resident members with the following student members form the Working Committee.

Student-Members (3)

K. Ramaswami, B. Sc. III.

K. S. Ranganathan, B. Sc. II.

R. Chandramowli, B. Sc. I.

Editorial Board (7), as indicated above.

AUDITORS: K. Krishnamurthi Rao,
T. S. Ramasubrahmanyam.

THE JOURNAL
OF THE
Madras Agricultural Students' Union
PUBLISHED MONTHLY.

A Journal in English devoted to the study of improved agriculture. Contains articles of scientific as well as of general interest. Extracts and reviews from various Journals both Indian and Foreign a special feature.

Widely circulated and therefore an excellent medium for advertisement.

RATES.

Subscription :—

ANNUAL.

For members, new associates and Patrons of the Union.

For others— (India) ... Rs. 4-0-0

Do. (Foreign) ... Rs. 4-8-0

Advertisement :—

Single insertion.

Per annum.

	Rs.	Rs.
For full page ...	5	20
For half page ...	3	12
For quarter page ...	2	8

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

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

All business communications should be addressed to :—

**THE MANAGER, M. A. S. U. JOURNAL,
 AGRICULTURAL COLLEGE, LAWLEY ROAD P. O. COIMBATORE.**

Printed at the Electric Printing Works, Tower Building, Coimbatore.