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

The Madras Agricultural Journal.

(ORGAN OF THE M. A. S. UNION).

Vol. XVII] JUNE 1929. [No. 6

EDITORIAL.

Ascendancy of Economics :—During the past half-a century, much progress has been made in all concrete sciences and wonderful improvements have certainly occurred, the latest, for instance, being air navigation. Intellectual workers have not deigned to prostitute their intellect for nefarious purposes and no better example can be given than the deadly war in which chemistry and gas were ruthlessly husbanded for killing thousands of souls Millions were crippled and no better happiness accrued to the belligerents or even to the neutrals than broken homes and devastations of property or depression of industries. The aftereffects of war have been equally disastrous and all nations are returning to their senses and the revengeful attitude which characterised the winners in their first outburst of victory has with the efflux of time almost died down and reason and prudence have assumed sovereignty once again. The laws of human nature have gained supremacy and mere reason or theory has been given the go-bye; Inventors, magnates and warlords have given place to economists who have rightly

assumed the role of valuers of past wrongs, present conditions and future tendencies to evolve a balanced state of society whether in the vanquished countries or others. It is therefore imperative that each country should in this generation produce an abundant crop of economists to adjust the balance of super-fecundity of intellect in other branches. It is not enough that a J. M. Keynes or General Dawes prepares a scheme but every national in his own way should try to help in the economic regeneration of the whole race by a careful study of economic conditions throughout the world. In this connexion we would invite careful attention of our readers to the series of articles appearing in the Review of Agricultural Economics and Sociology issued by the International Institute of Agriculture, Rome. We commend these contributions for their completeness, breadth of outlook and freedom from the taint of too narrow patriotism.

Colonies For Trained Agriculturists :—In this issue we publish a paper entitled as above which Mr. Rao Bahadur M. R. Ramaswami Sivan, Retired Principal, Agricultural College, Coimbatore, read before the Madras Agricultural Students' Union Conference last July. The paper enters a vigorous plea not for any charity doles from Government but facilities for agricultural men to show the worth of their training, by increased production and intensification of farming. It is a notorious cry at present that agriculture is in a backward state and methods followed are crude and uneconomical. The Rao Bahadur states that improvements are not possible by assigment of waste lands or barren soils but a minimum set of conditions of fertility are necessary, unoccupied lands of such a nature are available all over the Presidency and that a move in this direction by Government will help in the settlement of agriculturally trained men in backward tracts to the betterment of themselves and the cultivators amongst whom they will live.

Annamalai University Chidambaram :—We welcome the addition of another University in our own province. This is entirely due to the large-hearted and discriminative philanthropist, Rajah Sir Annamalai Chettiar-the prince

amongst bankers and public men in Chettinadu. The creation of this University will, we anticipate, add an increasing number of graduates in this Presidency. We understand that this University provides scope for specialisation in oriental literature, history, music, and a number of other subjects not now much in favour in other universities. This is certainly a step in the right direction but that no provision exists in this university for encouragement of mechanical arts and industries especially agriculture, will in the present state of the country cause some concern We hope however that this defect will be rectified when the university authorities have settled down for strenous work. We are confident that the Rajah of Chettinad whom we congratulate on the hereditary title of Rajah conferred on him will be an example to other wealthy members of the Nagarathar community and that they will provide large endowments to supplement work in this University.

Farming Colonies For Agricultural Students.

By Rao Bahadur M. R Ramaswami Sivan,
Retired Principal, Agricultural College, Coimbatore.

It is a longstanding complaint, ever since Agricultural Colleges were started and Agricultural Departments began to work in India, that very few of the passed students of these Colleges have taken to private farming, and along with the complaint the usual explanation has also been adduced that the main reason for the disinclination on the part of students to take to farming was due to the fact that the students did not really belong to what is popularly known as the Agricultural classes. The Term "Agricultural classes" covers a wide range It may mean those who own large estates and extensive lands or those who own small holdings or it may mean tenants or agricultural labourers. The last class is generally the illiterate class and the first class consists of Zamindars and rich men, some of them not educated enough, and some of them inclining to an easy life, or with other avocations to engage their attention. The men with small holdings and the tenant farmers are generally able to make some thing out of their lands, as they live on the spot and attend to all the worries and troubles of a cultivator as they arise from day to day.

2. If one looks into the applications for admission to the Agricultural colleges, it will be found that the column "Area of land held in the family" is generally well-filled. It is only rarely that Principals of Agricultural Colleges, and recently the Selection Committees select students who have not agricultural interests or who come only from urban areas. Such being the case, it is a matter for serious consideration why these agricultural students who, in their first interviews before admission, said they sought admission with the object of taking to private farming, did not take to it when they passed out of the College. The reasons may be summarised as follows:—

(i) They have found berths ready for them so far in the Agricultural Departments; but it has to be pointed out that a limit to such recruitment will soon be reached.

(ii) Most students have not sufficient landed property when the property held in the family is divided and subdivided by the joint family system to bring them such profit as a result of the agricultural improvements they may effect on their lands, as will be equal to the present income from those lands *plus* the salaries of their appointments.

(iii) Some of them at any rate are not sufficiently confident of their own capacity to make farming profitable in the face of the uncertain nature of the Indian monsoons In my opinion, the practical training in Agriculture, which students at present receive in the different Agricultural colleges, has achieved two important results; (a) The students have been taught the dignity of manual labour, some of them becoming quite expert at it, and they are not likely to fight shy of such manual labour in after-life and (b) they have been well trained in powers of observation. In these two respects, agricultural students are quite ahead of students of Arts Colleges. But something more than these is required to make a business farmer. The commercial aspect of farming is quite different. No agricultural department can be said to have started and worked a farm on commercial lines. It is no wonder I am not complaining or finding fault with Government Agricultural Departments, but I am only making a statement of fact therefore that students do not feel confident of success, if they wish to take to farming, nor are the parents willing to entrust their lands to these lads whom they consider to be mere theorists.

(iv) To such of the students as have confidence in themselves and as may be prepared to brave the vicissitudes of South Indian Agriculture, there is an absence of facilities and resources.

Those of you who were present at the opening Jubilee Session of the Conference 2 years ago will remember, that no less a person than His Excellency Lord Goschen said that in his case, he did not get much profit from landed property. Income from land is verily uncertain. But intensive farming conducted on business lines will certainly pay, provided the land holder is not an absentee landlord but remains on the spot and attends to the innumerable details of a business as they arise.

3. Before proceeding further, I would like to point out, that this problem of making agricultural students turn to private farming, has been felt as keenly in other Provinces and in Native States, as we feel it here in Madras. A number of proposals has been formulated but the latest is a system of agricultural colonies for agricultural students. The Durbars of Travancore and Mysore have, I understand, sanctioned schemes for colonising students, who pass out from the Vernacular Agricultural Schools in the former and from the Hebbal School of Agriculture in the latter, by the assignment of definite areas of land and the advancement of a certain sum of money for initial outlay. I have not got the details of working of these colonies and I will leave it to the visitors from these States to explain their working. You might have heard of Captain Petavel's scheme of Rural Reconstruction in Bengal, but that has reference to the relief of middle class unemployed youths, not necessarily lads trained in an Agricultural college. It was the late Sir Ganga Ram who brought to my notice the evolution of a definite scheme for the establishment of colonies for the agricultural students of the Lyallpur Agricultural College in Punjab. During my visits to the Punjab in 1927 and 1928, I had occasion to discuss this scheme with the Director of Agriculture and the Principal and staff of that College. The scheme has been sanctioned, and the land meant for colonisation has been handed over to the Principal more than two years ago, but it has not been given effect to pending the decision of a number of details which, I understood, were engaging the attention of Government and of the agricultural officers. It appeared to me that this scheme might be worthy of application in the Madras Presidency, with such modifications as may be deemed necessary, to fit in with our local conditions and with the systems of land tenure prevalent here. The Punjab scheme is a follows :—

4. The scheme first emanated from Mr. Johnstone, Dy. Director of Agriculture and was blessed by the Provincial Board of Agriculture, Punjab, of which the Director of Agriculture was a member and was subjected to careful scrutiny by different officers of Government, including the Minister, the Financial Commissioner, the

Chief Engineer for Irrigation, the Director and the Deputy Directors of Agriculture, the Principal and staff of the Agricultural College and the Old Boys' Association of the Lyallpur College; and the Principle was finally accepted by the Government of Punjab, of the idea of the grant of land being made to agricultural students. After considerable discussion, an assignment of 75 acres of land in the Canal Colony was considered an Economic Unit which would give a student a net income of Rs. 2,000, per annum which was slightly in excess of the starting income of an Agricultural graduate entering Government service. The principle was also accepted that the students to whom lands are assigned should form themselves into a Co-operative Society for their mutual advantage. 3,500 acres of land near Shergarh were ear-marked for the purpose and handed over to the Agricultural Department. The lands are not to be assigned permanently, but usually on a five years' lease, the object in the Punjab being to train the students in practical farming, in order to induce a feeling of confidence and self-reliance in agricultural students, and at the same time, to produce men who will be, eagerly and without hesitation, employed by rich Zamindars as Estate Agents on suitable remuneration. The lands should be cultivated according to the advice of the officers of the Agricultural Department, as far as possible and regular records and account books maintained, which would be subject to inspection by the Agricultural officers. The students are to reside on the lands in quarters provided by Government for which a nominal rent will be charged. The lands are not to be sublet, but students can get the work done with the help of labourers, and there is provision in the scheme for special work being executed on the contract system An advance up to Rs 2,000 may be given to each student in the first year, for initial outlay, the amount being repaid by him during the next five years. All the land should be brought under cultivation within a definite period, and the tenant will be liable to pay the usual land-tax and, in case of failure of monsoons, will be entitled to the usual remission. as well. The produce will be sold, according to the market rate, to the Agricultural Department by preference for seed purposes, if they should require it. The student should provide kucha buildings for cattle sheds and for his servants

When the land has to be assigned to a new batch of students at the end of five years, payment will be made to the outgoing tenant, according to a proper valuation, in which the officers of the Agricultural Department will have the deciding voice, for permanent improvements on the land and for cattle, implements stores etc., with the proviso that the outgoing tenant may, for some reasons, be allowed to remove his moveable property.

According to the scheme, at the rate of ten students per year, 50 colonies will be established within the course of 5 years. The idea in the Punjab is this:—It is not that the students settle down once for all as farmers on the other hand it is considered to be a continuation of their practical training, especially farming on commercial lines. It is presumed that they would have acquired *sufficient mastery of the business of farming* during these five years that they would be able to lease out or purchase lands on their own account without the help of departmental officers, apart from the opportunities afforded to them of being employed as estate agents in large Zamindaris.

5. Such in brief is the scheme of Agricultural colonies for agricultural students of the Lyallpur College. The scheme has been made possible, first on account of the enthusiasm displayed by the Director and Deputy Directors of Agriculture, by the Registrar of Cooperative Societies and by enthusiastic successful farmers like the late Sir Ganga Ram. Secondly, such an extensive area as 3,500 acres in one block was easily available in the Punjab Canal Colony. If a scheme similar to this has to be evolved for the Madras Presidency, it will not be so easy to find such a large area but I believe none will gainsay the enthusiasm and the genuine interest in the welfare of agricultural students, which our popular Director, Mr. Anstead and his able and sympathetic Deputy Directors will evince in such a scheme.

6. His Excellency Lord Goschen has been the greatest friend of the agricultural classes in Madras. The Registrar of Cooperative Societies in our Presidency is not likely to show less interest in the matter, and we have also our present Minister of Agriculture who is a practical business farmer himself. Under such auspices, it should not be very difficult to evolve a scheme suitable to our condition

in Madras, whereby at least a small percentage of our agricultural graduates may be trained as practical farmers. As stated above, we may not have available in Madras such a large block of land as is available for the Punjab students It is no good assigning to agricultural graduates who are starting life as probationary farmers, waste lands which have been already declared unfit for cultivation : nor is it expected that existing ryots should be turned out from rich lands for the benefit of the agricultural students. I have heard it said by experienced Collectors including a member of the Board of Revenue that there are suitable lands still available for cultivation in different parts of the Presidency which could be converted into colonies for agricultural students. What I would like to press on this Conference is this :—We have met today under the best of auspices. His Excellency the Governor himself was pleased to open the Conference yesterday, and the Honorable the Minister for Development, himself an agriculturist, will be here in a day or two. The Head of the Department of Agriculture presides over this session of the Conference. All the senior officers of the Department and a considerable number of the junior officers are here to-day. The Registrar of Co-operative Societies whose good offices we solicit in this venture has a reputation for working in intimate touch with the officers of the Agricultural Department . The old boys of the Saidapet College and the old and the present boys of the Coimbatore College are also assembled under the welcoming Aegis of the Alma mater. Now under these good auspices I beg to suggest that this Conference organised by the Madras Agricultural Students' Union should accept in principle the idea of the grant of land to Agricultural students with a view to encourage them to take to farming as a profession, a principle which, as I said above, has been accepted and acted upon, as far as I know, by the Punjab Government, and the Durbars of Mysore and Travancore. I may be permitted at this stage to say that this will be a characteristic feature of the Agricultural college to be opend under the Benares Hindu University, and His Highness the Maharaja of Benares has already consented to place an area of 1,200 acres at the disposal of the University, to be parcelled out into Economic Units

for starting students' colonies. Once the principle is accepted and I find from the Annual Report read by the Secretary that the Madras Agricultural Students' Union has accepted it the next step will be the appointment of a Committee by Government to obtain detailed information regarding the availability of suitable blocks of land in different districts and formulate detailed proposals for the starting, development and successful working of students' agricultural colonies.

7. With the limited time of ten minutes allotted to me, it has not been possible for me, nor would it serve any useful purpose, to go into details in the absence of detailed information about available land which is the basis on which one could work out an Economic Unit per student. At the same time, of the many obvious advantages of this colonisation scheme, one that is worth examining is that it may, to a certain extent, provide chances and facilities for the regular students of the Agricultural College to learn practical field work; somewhat on the line in which students of Agricultural Colleges in Great Britain take their training under a British farmer, whose certificate is officially accepted; and, supervised, as these colonies are suggested to be, by the officers of the Department, the practical training given herein to the students will be a real asset to them.

8. I have one word more. My object in bringing this subject before the conference is this. I have been speaking on this subject at so many of our Conferences in previous years, as most of you know. They were probably speculative proposals then, but when I have actually seen something like this scheme having been evolved, and I believe successfully being worked in other provinces, I am quite certain that such a scheme has become an immediate necessity in Madras, and I am also optimistic that it will lead to successful results.

After all there is so much talk in the country of rural re-construction. Most of us, agricultural students of the past, have led a rural life in the service of his Majesty's Government, and I believe, we have on the whole given a fair account of ourselves so far. What is asked for is that those of us who have not the necessary facilities and resources may be given a chance to turn to practical farming as a profession.

Experiments at the Betel Vine Station, Vellalur.

By V. Satagopan L. Ag.

Betel vine is an important money crop in some localities and it occupies an area of about 23,800 acres in this Presidency. About 8 % of this area is accounted for by Coimbatore District. It is a very delicate crop and requires an enormous amount of care and tending. This is possibly the reason for the comparatively :small percentage of the area under the crop. Without being one of the necessities of life betel leaf is all the same an essential and inevitable factor in the social and religious fabric of Indian life.

Since 1911 complaints were received now and then about some diseases on betel vine in the Noyyal valley which were said to affect the produce of the crop very seriously. The nature of the disease as complained of is neither very definite nor confined to any one particular aspect. The diseased vines have generally stunted growth, put forth only a limited number of branches and leaves and such leaves are very much undersized and poor in quality. This, in common, is the main complaint, and the cause is attributed locally to earthworms. Occasionally instances are also brought forward where failures of vines occur due to one or more specific reasons. These are chiefly in the nature of diseases which would appear to be either fungoid or bacterial. Three such diseases are known here and go by local names as follows :—

(i) *Vellainerkkai* :—a disease which affects young vines where the plants assume a pale and unhealthy appearance and have a lengthy and struggling existence. Here the growth gets permanently arrested and the leaves have an insipid taste—quite unlike the aromatic pungent one one is familiar with. The plants when touched break off very easily at the nodes.

(ii) *Karunthal* :—So named on account of a black collar developed round the stem of plants. This appears on the vines below ground or on the parts above near to the surface. The result is that the plant at first

assumes a drooping appearance and later dries up comple tely above the seat of attack. Even in the early period of attack the underground portions of the vines are rotten and very often shredded; and the aerial stem when split longitudinally reveals black streaks. The damages on account of this disease are sometimes very heavy.

(iii) *Kollikattainovu* :—This is a disease which is neither so largely harmful nor as widely distributed as either of the other two diseases. Something like a scorched up appearance from the tip to about the middle of the leaves would go to indicate this disease.

In earlier years some investigations were carried on in the fields of ryots themselves to study this problem, and as all of them were not quite as successful as could be desired a betel vine station was started in 1925 at Vellalur one of the several villages wherein the diseases were noticed. The previous investigations were largely helpful in directing the course of investigation at the Betel Vine Station and based on the observations thereof the problem is thought to rest on two broad factors viz., physical and biological.

Physical Betel gardens here have a tendency to get water logged and conditions are such that proper aeration is wanting in most cases with the result that the roots and rootlets have little chance to develop sufficiently. As an instance the sketch shown here (omitted) may be studied. It represents diagramatically the relative levels of the tank, the channels and the betel plots at the Vellalur Station. It may be observed that the bed level of the tank itself is about a foot higher than the plots and when the tank is full there is a head of seven feet and over of water above the level of the plots. In addition the level of water in the channels is also higher than the field levels. Naturally there is a considerable amount of water getting into the plots by seepage, and its effective drainage is indeed a problem. It has further been noticed that the crop suffers most in wet weather. It would therefore be obvious that by improving such conditions it should be possible to get over the diseases, which may after all be only after-effects. In the experiments at the Betel Vine Station this is sought to be achieved in two ways.

(i) Improvement of drainage by artificial means.

(ii) Improvement of the soil by application of lime.

Drainage Experiments :—So far the method adopted to provide better drainage has ben to grow betel on beds raised ½ to 1 foot higher than the local beds. Such an experiment was started in plot V during 1925 and was repeated again in plot I the next year. The first experiment has run its course and full figures are now available. The second one continues still and will be completed in the coming year.

In each of the above two experiments comparison was made between 5 raised series and 5 local series each consisting of two rows of arches and the series alternating with each other.

In plot V the value of uneven conditions was brought about by a large number of failures of vines due toKarunthal. In the other plot 11 harvests have thus far been made and the results there are more trustworthy as the crop has been fairly uniform. The yelds from the two plots are shown in the graph (omitted) here. In plot V. with the exception of the few yields at the fag end of the crop, the raised beds have, in all instances, given appreciably higher yields than the locals The same could be said of the yields in plot I also. In both the cases the differences between the locals and the raised are less during the dry months, and more during wet weather. On the whole there has been an increased yield of 28% in the case of plot V and 22% in plot I.

Apart from a mere increased quantity the raised beds have also given a superior quality of leaves as judged by the local standard. where large thick and heavy leaves are always priced more than small thin and slender ones. In plot V out of 500 there has been an increased length of 26.4 "and a like width of 26.3 " in favour of the raised beds. Similar increases for the raised beds in plot I for 1, 100 leaves have 131 " and 84 " respectively,

This superiority of the raised beds in producing larger quantity and better quality of leaves has been proved beyond any possible doubt by a very thorough scrutiny of

the figure and allowing for probable error in the experiments, the results are also quite significant.

Soil improvement by application of lime is dealt with elsewhere in this paper.

Biological factors:—Here the problem centres chiefly round the effects of earthworms and fungi on betelvine. Incidentally some observations are also made of other organisms like eelworms and insects which may be affecting the crop.

Earthworms:—It is common knowledge that moist soils with a plentiful supply of organic matter afford easy breeding ground for earthworms. This is the case in almost all betel gardens in tne Noyyal valley. Possibly the cool shady condition and the frequent irrigations and manurings done to the betel crop are just about the conditions necessary for the worms to thrive. During wet weather the soil is completely covered by earthworm castings and when it is dug into there is a net work of earthworm burrows presenting a characteristically-reticulated appearance. Earthworms in large numbers are also found wriggling into their holes. Such large numbers of these worms are not generally met with in fields uuder other crops; nor are they so largely found in the very same betel gardens. It is mostly in the wet months that severe damages on vines are noticed and at that time large numbers of earthworms are also to be found very near to the surface. Ryots naturally associate the two together and attribute the damages to earthworms. What harm the earthworms do exactly no one is able to say very definitely but suggestions are made that they directly rob the crop of its plant food by eating away the organic matter viz., cattle dung and green leaves applied as manures, cut off roots and root-lets of the vine while burrowing in the soil and affording places for stagnation of water in their burrow holes during the wet months These causes, it is said, affect, either individually or severally, the general growth of the vines and thereby make them susceptible to very many diseases. We cannot pass our verdict on the role of the earthworms in the vine gardens without first making a detailed study of the problem in all its aspects.

Since the time of starting the Station at Vellalur a study is being made into the life history of the earthworms by the Government Entomologist, at the College Insectary. Side by side with such a study certain field trials are also being conducted to see how far the earthworms are responsible for any damage observed on the vine.

These trials include a direct counting of the population of earthworms in the several experimental bits at the Betel Vine Station and another experiment which is in the nature of being manurial.

The manurial experiment is an indirect method of judging the damage, if any, caused by earthworms. Plot II goes under this experiment and the crop there was started in 1926. The plot has been divided into two halves with 30 rows in each. One half has been limed at 1000 lbs. per acre. The 30 rows in each of the two halves have been grouped into 10 units of 3 rows each. Every alternate unit receives a complete mineral manure and the others remain as control receiving the usual organic manures as applied in the locality. Till March last the mineral manures applied consisted of a mixture of 9 cwts. of super phosphate and 6 cwts. of Nitrate of Potash per acre. Subsequently they have been changed to two separate mixtures Nitro-chalk Basic Super and Nitrate of Potash constituting a basic mixture and Sulphate of Ammonia, Super and Sulphate of Potash forming an acid mixture. These two mixtures are to be applied alternately once in 3 months. 195 lbs. of mixtures of Super and Nitrate of Potash and 68 lbs. of the basic mixture have thus far been applied to the crop in 8 doses.

The object of this experiment is to find out whether, by cutting off food supply to earthworms and substituting manures in the shape of minerals to meet the needs of the crop, it would not be possible to reduce the earthworm population of the soil and thereby increase the production.

So far only 11 harvests have been made from the crop and the yields are as shown-below :—

The limed half has given distinctly better yields than the unlimed one and in each of the two halves the organic manure portions have almost always given slightly increased yields over the mineral manure beds. At this stage it would be desirable to consider the earthworms population of the different treatments so that they could be correlated with the harvest figures.

Counts were taken of earthworms in 1 cubic foot of soil in 24 places in each of plots I and II in places as follows :–

Plot I	Raised beds	12	@	4 per series in i, iii & v.			
	Local	12	@	,,	,,	,,	
Plot II	Lime Organic manure.	6	,,	2	,,	,,	,,
,,	,, Mineral Manure	6	,,	,,	,,	,,	,,
,,	Organic Manure only	6	,,	,,	,,	,,	,,
,,	Mineral manures only	6	,,	,,	,,	,,	,,
	Total	48	Counts.				

Starting in December 1927 these countings were repeated once in every month, and from the figures so far available the following conclusions are apparent:—

(i) Raised beds in Plot I have more earthworms in them than the corresponding locals.

(ii) Organic Manure beds also have a considerably greater number of earthworms in them than the corresponding Mineral manure beds.

(iii) The efiect of liming has been to reduce the earthworm population in the soil.

If now, side by side with the above we consider the leaf yields we could come at the following conclusions:—

(i) The raised beds which have a greater earthworm population have also given increased yields over the locals.

(ii) The organic manure beds, which also have quite a larger number of earthworms than the mineral manure beds, have at the same time given slightly better yields.

(iii) Liming has tended to reduce the earthworm population and increase production.

Thus it would appear that a phenomenally large earthworm population in the soil does not in any way affect yields. But before adopting such a conclusion in its entirety it would also seem desirable to account for

(i) the lower population in plot I as against Plot II with the corresponding high yield of Plot 1 against the lower production in Plot II.

(ii) The greater preponderance of earthworms in the last of the three series examined in plot II and their strikingly low yields as against either of the two other series higher above. It is here that the difficulty comes in. For one thing the set of observations now before us require to be amplified still further which is possible only at the end of the experiment; and another thing would be that some further experimenting may be necessary before a definite judgment is pronounced. Such experiments are now in contemplation.

Fungi:—In all the diseases noticed on betel vine there is the possibility that fungi play a great part. The probabilities are that these are externally parasitic attacking the plants either above the ground level or below in the soil. If these were true it should be possible to get over the diseases by one or more spraying with Bordeaux mixture externally on the plants, and disinfecting the soil by fungicides. In 1926 when a large number of vines began to fail on account of Karunthal and Vellainerakkai at the Betel Vine Station sprayings were started on the diseased plants and healthy plants near by: In all, three sprayings were done with a period of 2 months, and these were noticed to have no effect, either good or bad, on the plants. Obviously there are no external parasitic fungi, attacking plants from outside. This has also been tried by application of lime about which mention has already been made.

The Government Mycologist has also been examining periodically, a number of specimens collected from the Vellalur station. So far it has not been possible to stamp out the disease or diseases. At first two fungi viz., Gleosporium sp and Diplodia sp were detected and isolated from diseased vines. But these failed to produce infection when inoculated into healthy plants. Possibly they were more saprophytic than parasitic. Recently another fungus belonging to a species of Phytophthora has also been detected and this one is now under culture and its parasitism or otherwise remains to be proved by further inoculation experiments which are to be carried at the College pot culture house It would perhaps be interesting here to note that a similar fungus has been found to be the cause of an enormous amount of damage to betelvine in Bengal, Central Provinces, Poonamalle near Madras, and Malaya Peninsula.

Eelworms:—In some of the previous investigations carried on before the starting of the Betel Vine Station at Vellalur the roots of vines in some gardens were found to be attacked with eelworms, which when mature produce characteristic swellings on the roots. The roots of a large number of plants—both healthy and diseased ones—were examined, and curiously enough the attack was distributed as much in the healthy vines as in the diseased ones.

Summary.—The results of the experiments at the Betel Vine Station at they now stand could be summarised as follows:—

Investigations were made into the physical and biological factors contributing to promote disease and diminish production in betelvine and experiments designed for the purpose show that

(i) The improvement of drainage alone will result in at least 25% increase of production
and (ii) The application of lime to betel soil is attended with benefits which are both physical and biological in effects.

It is not possible to say at this stage as to what the earthworms do in betelvine gardens and how for and to what extent the diseases are due to fungi or other organisms.

EXTRACTS.

World Production and Trade in Rice.

In the general report on cereal cultivation presented by Prof. Brizi to the XIIIth International Congress of Agriculture held at Rome in 1927 it is stated that the world production of rice *possibly* amounts to 1,300,000,000 quintals. The aggregate figure cannot be stated precisely as there is no registration of statistics in the case of several countries including China. One authority calculates the world production at 1,600,000,000 quintals.

The following figures may be given of the area cultivated in rice and of the production for the year 1926–27, the data being however incomplete in respect of the Asiatic countries : area 54 million hectares, production, 846 million quintals.

These figures may be compared with those of the production of wheat, which in 1925-26 was 1,059,200,000 quintals.

The technicians and econonists who have made a special study of the subject of rice from the world economic point of view state that this question, in common with the general question of cereals, forms part of the whole problem of foodstuffs and scarcity, and therefore is to be included in the examination of the means of meeting the world food crisis.

It should be noted that the importance of rice in Europe does not consist solely in its direct consumption as food. A considerable part of the production is employed as raw material in certain industries; but in whatever way this cereal is prepared or transformed whether for human food or for industrial purposes, there are always residues which are of value for feeding or fattening stock. Hence those countries which import and use in industry large quantities of rice tend to accumulate large quantities of stock feeds which become transformed into meat, milk, or fertilising material. For example,

Germany, a non rice producing country, was before the war much ahead of other European nations where rice is grown, and imported and exported this cereal on a large scale using it as an element in a large number of industries

Generally speaking the technicians and students of public health questions recognise in the first instance that the preparation of foreign rice is an important source of wealth for Europe, and that on this account the importation of Indian and Asiatic rice would promote the solution of the food crisis, besides stimulating labour and trade, but they maintain further that it would be of great advantage to extend rice-growing in Europe. The arguments are: that rice forms in Asia the staple food of the whole population; that its world production is already by far the most widely diffused of all the cereals, and could moreover be considerably further extended by making use of marsh lands or lands capable of a high degree of irrigation; that contrary to the opinion formerly held the rice crop, if carried on by improved methods far from encouraging malaria is a crop that tends to improve swampy and unhealthy lands which have been on this account left waste and uninhabited; that rice, even where as a branch of farming the production is in excess of the demand, is always a safe and remunerative export commodity Certain legal authorities add that the legislation restricting rice growing in certain countries is no longer in harmony with the progress of scientific knowledge about malaria, nor with the principles of political economy, and that unwise restrictions due to antiquated beliefs and long standing opinions must give way to measures calculated to promote the cultivation of rice and to encourage trade in rice, if this crop can really make fertile lands either lying waste or only partly cultivated, and this can promote the development of home colonisation.

It may be remarked. moreover, that agricultural civilisation in S. E. Asia is based primarily on this cultivation, and in comparison with wheat growing the following characteristics are to be observed. Where rice is grown, the crop rotations are more rapid and more intensive. As rice growing develops, it absorbs a larger quantity of labour. The labour in fact accounts for half the cost of cultivation, but the economic advantage of this inevitably diminishes,

since the cost of irrigation and fertilising increases, and thus arises the necessity of introducing into the rotation, or subtituting, other more remunerative crops, so as to keep the worker employed, and to attach him to the farm and the land. Thus as a result of the formation of rice fields in swampy and deserted localities, in the long run there is effected coordination of productive farming, more scientific distribution of the land among the various types of cultivation, the most appropriate crop rotation, and the satisfactory iine of progress for the rural population and for the rise of rura industries. On the other hand it is to be also noted: that varieties of rice grown intensively tend to deteriorate, and it is important to introduce exotic varieties and at the same time so to direct the selection as to restore or improve the original characteristics. Research workers on the spot direct the choice of varieties suitable for export and acclimatisation, and it is essential to maintain for the purpose permanent mutual understandings between the producing countries so as to facilitate periodical and systematic importation and acclimatisation of approved varieties as opportunities offer for the development of trade between distant countries and for the formation of links of interdependence and solidarity between rice growing countries, while it becomes possible to check unfair competition.

As a rule in proportion as the area devoted to wheat cultivation is extended in a given geographical region, statistic show that there is a reduction in unit yield per hectare. Speaking generally, that is to say, a country with a fairly considerable population has a small percentage of lands so fertile and so particularly adapted to wheat as to give the maximum yields.

In Japan the general position of the problem of rice cultivation is in fact the problem of associating another food crop with rice.

During the war it was recognised in Japan that it was essential to secure independence as to the food supply and attempts were made to induce the population to adopt some substitute for rice It was realised that to maintain the feeding of the nation on the rice basis, it would be neceessary, as the population increased, to extend

the crop to arable land already used for other crops and less suitable for rice, a policy neither advantageous, nor practicable. If on the other hand it were possible to reduce the national consumption of rice and to combine it with that of another cereal, the problem of supplies and of the national independent food supply of Japan would be capable of solution even in view of an increase in the population and the increase in rice consumption.

It may be noted that the value of the rice production alone in Japan is equal to 60 per cent. of the total value of the agricultural production of foodstuffs, and that while there is a small export of rice there is a considerable importation on the part of the Japanese colonies. The food situation of the country thus essentially depends on the rice supply. The deficiency in the Japanese production of rice as compared with the total consumption, has gone on increasing from 1893 onwards, in spite of the extension of rice growing on improvod lands and the augmentation of the average yield of the rice fields. The difference is met by imports.

It may be added that in Japan the consumption of rice has always been higher than the production; hence the position is the exact opposite of that of Italy and other European countries which are producers and exporters of rice, Japanese consumption is increasing by two-thirds in proportion to the increase in the population and by one-third in respect of the average consumption per inhabitant. The index of the consumption per inhabitant has risen from 100 in 1888-92 to 149 in 1913-17, while in the same period the index number of the population has risen from 100 to 135.

Correspondingly the price of rice has risen from 12.54 *yen* per *koku* in 1909 to 57 *yen* in 1919, and in consequence the Government since 1920 has made proposals for meeting the future deficit, by crop improvement, by increasing the importation from Corea and Formosa, by giving up to rice cultivation waste lands which are wet or irrigable, or by encouraging the adoption of some food substitute.

The Japanese Government, in order to control the price, exempts the rice import from payment of duties

when the national crop is below a certain level and encourages importation, itself leading the way, whereas in the event of a good crop the duty is raised and right of private importation restricted, in spite of the protest naturally made by the consumers.

It is the opinion of agricultural experts that the best method of bringing waste land under cultivation, provided it is irrigable, is to place it under rice, as no other crop gives from the first year onwards such a yield as rice. Accordingly the experts are asking that special statistical economic world enquiries may be made into the whole subject They demand also the passing of legislation in favour of this branch of production and trade, and of land reclamation, as well as the adoption of general measures for adjusting the equilibrium of world food production. A programme relating to the collection and elaboration of the Far East data is also confidently looked for, as facilitating systematic and sustained enquiry into distribution of rice crops, cultivation costs, return from capital and course of prices. In this way the bodies directing the agricultural policy of the different States will be in a position to follow the world economy of the production of this most widely diffused of the cereals.

Such a development of international research and enquiries on rice is a subject of special interest at the present time, since the European rice-growing countries are undergoing a crisis of prices in this branch of their national production.

The crisis depends on the fact that the production cost increases and that the home consumption in these countries is less than the production : accordingly the home price is closely connected with that of the world market, and in regard to this product the effect of the protective duty is small. The consequence is that some of these European countries, as for example Italy which leads in Europe with a production of rice of 6,900,000 quintals, Spain with a production of 3,200,000 quintals, Bulgaria with 170,000 quintals, Portugal with 175,000 quintals, and other European countries with a lower production, are obliged to make

immense competitive efforts among themselves so as to meet, though not very effectively, the Asiatic, African, and American competition.

The world situation may be regarded as follows :—

Europe produces in the aggregate about 10,500,000 quintals: accordingly thie European production, as compared with the world production, does not reach 0.8 per cent. On the other hand, Asia which is the great continent of production yields 95 2 per cent. of the world production. Africa contributes 2.4 per cent, America 1.6 per cent. Europe is thus the continent with the smallest production.

As is shown by graph No. 1 (omitted) the world production from 1909-1913 to 1926 has undergone a certain variation. Up to 1924 it steadily increased from year to year reaching in that year the figure of 856,636,000 quintals, it then fell in 1925 to 853,647,000 quintals in 1926 to 845,587,000 quintals Asia forms the great centre of production, with more than 95,2 per cent., of the world production and a maximum in 1924 of 805,541,000 quintals.

(I) Taking into account that these figures do not include data for China and for other countries where it is impossible to obtain statistics, it may be estimated that the world production of rice varies round about 1,200 to 1,300 million quintals: a figure nearly equal to that representing the production of wheat.

It is well known that rice is the food basis of the whole Asiatic world. Seven hundred million persons living between Tokio and Colombo, taking Shangai, Canton, Saigon, Batavia, Bangkok and Calcutta on the way, make their daily meal of rice almost exclusively.

The increase of the production in 1924 may be due to the fact that the year was favourable to rice cultivation in all rice growing countries, to reasons of economic supply policy of the Oriental countries and their inter-Asiatic trade in rice, and to increases in the production of food stuffs.

As shown above the area cultivated in rice in Asia reaches very high figures, in comparison with the other countries as is seen in the graph No. 2 (omitted). The maximum area was reached in 1909-13 when the percentage was 96·4, while in 1925 it was as high as 94·6 on the total.

Comparison between the World Production of Rice and the Asiatic Production.

PRODUCTION OF RICE.

Years.	General Total. 1000 quintals.	Asiatic production. 1000 quintals.	%	Other countries. 1000 quintals.	%
1909—13	774,543	743,094	95·9	31,440	4·1
1923 ...	798,763	752,078	94·1	46,685	5·9
1924	856,636	805,541	94 4	51,095	5·6
1925	853,641	803,916	94·2	49,731	5·8
1926	845,581	796,150	94·1	49,437	5·9

Comparison between the total area and the Asiatic Area under rice cultivation.

AREA CULTIVATED IN RICE.

Years.	Total Area. 1000 hect.	Area in Asia 1000 hect.	%	Other Countries 1000 hect	%
1909–13 (1909–10, 1913–14)	48,171	46,445	96 4	1,726	3·6
1923 (1923–24)	52,679	50,174	95·2	2,505	4·8
1924 (1924–25)	54,317	51,401	94·6	2,916	5·4
1925 (1925–26)	55,090	52,164	94 6	2,926	5·4
1926 (1926–27)	54,255	51,194	94·4	3,060	5·6

In 1925 the total area under rice cultivation showed small increases as compared with 1924; but the climatic conditions were not wholly favourable in certain Asiatic producing countries, *e. g.*, India, Indo-China, the Philippines. These slight declines in yield, observed in these countries, have occasioned a reduction in the average yield in the whole of the Asiatic production, in spite of the satisfactory results of the crops of other producing countries.

The following figures show the world trade in rice. While the excess of imports of the other continents amounts in 1909-13 to the figure of 18,563,000 quintals and in 1923

to 12,676,000 in 1924 to 13,797,000 in 1925 to 18,061,000 and in 1926 to 14,085,000 quintals, the excess of exports from Asia amounts in 1909-13 to 20,898,000 quintals, in 1923 to 11,109,000, in 1924 to 13,299,000 in 1925 to 16,814,000 and in 1926 to 14,769,000 quintals.

It must be remembered that China with its enormous production has a closed market: that Japan imports from its own possession Corea over 5,000,000 quintals of rice: that Siam alone exports about 12,000,000, and Indo-China about 10,000,000 quintals, that Madagascar with a production of 10,000,000 quintals exported 417,000 quintals in 1925 and 219,000 in 1926; while on the other hand the Dutch Indies import from 5 to 6 million quintals, although the island of Java has a production of 52,000,000 quintals of rice.

This world situation does not easily admit of modification, simply because the European peoples who are meat and wheat eaters cannot adapt themselves to a combination of rice with their daily food. Consequently although it forms the basic food of more than half the earth's population, rice cannot easily command wider markets. While in Japan the annual consumption per inhabitant is over 150 kilogrammes, and in Siam and the island of Formosa it exceeds 120 kilogrammes, in Italy which leads in this respect among the producing countries of Europe, the consumption does not exceed 7 kilogrammes per inhabitant, as compared with 180 of wheat.

The question of the tastes of the consumers is however balanced by that of prices which also calls for serious consideration.

From 1900 to 1926 the price of cleaned rice in Italy was much higher than that of wheat. The 1900 to 1914 averages exceed those of wheat by 22 per cent. (31.37 liras as compared with 25.75); the war period price averages are 23 per cent. higher than those of wheat (63.70 liras as compared with 51 86); those of the period 1920-25 are 48 per cent. higher (183.21 liras as compared with 123,31) In 1926 the ratio of the higher price fell to 9 per cent ; and in 1927 it fell lower, almost to par; the consequence is that the rice growers are now afraid of the situ-

ation becoming reversed ; a contingency against which they cannot safeguard themselves as it is extremely difficult to ensure an increase in the home consumption of rice and equally difficult to reduce the production costs of rice which are considerably higher than those of wheat.

The problem thus is for the European rice growers to find an export market; rice may become a partial substitute for imported wheat, but it cannot hold its own against the competition of wheat which is a product greatly preferred by the consumer.

The following point is also worth noting. On the London market the price of cleaned rice in 1926 was 9.4 per cent. lower than in 1925 and in 1927 it was 22.7 per cent. lower. On the Italian market it was 20 per cent. lower in 1926 than in 1925, and in 1927 it was 37 per cent. lower. The decline on the European growers' market is thus much more pronounced than that on the British markets which are merely import markets. Hence we are led to the conclusion that extra-European types of rice have undergone less decline in value than has been the case with the European growths.

As regards cost of production the following facts should be noted.

In Italy precise calculations on the unit production costs have been made by two eminent students of the subject, Dr. Salvatore Pugliese and Ing. Andriano Tournon. The result may be stated thus; on a cultivation unit of 230 hectares of rice land the average yield was 57 73 quintals per hectare, the cost of each quintal of the reaped rice was 103.63 liras. And as the best Italian rice sells today at 78 liras per quintal at highest, for the agricultural year 1926-27 the Italian loss varies from 25 to 30 liras the quintal. Special monetary causes may however be responsible.

Spain is suffering from a similar situation ; and in order to protect its rice production it has been arranged to grant a premium of 3 pesetas per quintal to be applied when the price of rice is lower than 48 pesetas per quintal.

Accordingly the European countries not prepared to adopt a system of export premiums must try to increase

consumption by means of special measures, *e. g.*, using rice in bread-making, difficult because consumers object; or must reduce the area under cultivation, equally difficult as causing agricultural unemployment. It is enough to consider, in regard to this second point, the case of Italy where the cost of cultivating meadowland is reckoned at 726 liras per hectare including 316 liras for labour, while the cultivation costs of rice are 3,991 liras of which nearly 1,920 represents labour whereas in the cultivation of wheat the labour is represented by 1,040 liras. The meaning of this is that the cultivation of rice absorbs 93 percent. more labour than that of wheat and nearly 500 per cent. more than meadowland cultivation. In other words: the question because a social question with a view to the prevention of unemployment of a specialised form of labour and resolves itself into a question of food and supply policy.

Further comment is not out of place as regards Italy, since conditions there are typical and may represent in general the European position.

The Italian rice crisis is undoubtedly in connection with the marked and rapid decline in the prices of the chief agricultural products; but the fall in the price of rice which for certain regions of Northern Italy constitute the most important present day agricultural problem, has been enormous: since the price of cleaned rice fell from 213 12, liras the average quotation of the first half of 1926, to 152. 85 liras in the first half of 1927 and to 118.49 liras in the third quarter; and rough rice fell correspondingly from 145.04 liras 106.06 liras and to 78.97 liras and finally at the end of 1927 to 70 83 liras per quintal.

In Italy the principal problem is the maintenance of the level reached by Italian production which was 6,800,000 quintals of rough rice in 1926; taking into account the average of cleaned rice calculated at 4,200,000 quintals; of the home consumption calculated at 2,800,000 quintals; and of the remaining 1,400,000 quintals of cleaned rice available for export. Italian rice must maintain on the world markets the competition with the Asiatic kinds, which are of lower intrinsic value but of considerably lower price owing to

low cost of labour or to fortunate climatic conditions; with the Spanish rices, which are of similar quality and are similar in price; with the American rices which cost less than the European, because in both North and South Ameria the price of land is lower, as well as taxes and irrigation costs; and moreover the cultivation costs are lower, in so far as rice cultivation can frequently be carried out by intensive methods making use of the reserves of fertility stored in the soil.

To pass from the European crisis in rice-growing to the consideration of the world situation, nearly 52,000,000 hectares are under rice and in the agricultural year 1925–26 the production has exceeded 800,000,000 quintals of rough rice. Africa comes next with 1,632,000 hectares under rice cultivation and a production of more than 23,400,000 quintals; then America with about 1,040,000 hectares and production in excess of 16,000,000 quintals. In Europe only 204,000 hectares were under rice in 1927 and the production was about 10,000,000 quintals. Australia comes last, and has recently begun to cultivate about 4000 hectares, with a production of 58,000 quintals. Among the great continents Europe has the smallest figures of area and production, but it stands first in yield per hectare.

The maximum European yield 47·2 quintals perhectare, was reached in 1925-26, while the American rice lands hardly reached 15·7 quintals, the African 15·6 the Asiatic 15 and the Australian 15·5 per hectare.

(Int. Rev. of Agri. Eco. & Socio. Feby. 1929).

COLLEGE DAY AND CONFERENCE.

The Working Committee of the Union have decided to celebrate this year's College Day and Conference on July 9th—14th. Dr. G. Fowler of the Technological Institute, Cawnpore has kindly consented to preside. Advantage will also be taken of this opportunity by the Union to present to the College a portrait of Mr. R. D. Anstead, our Director who goes on leave preparatory to retirement, in September next. A tentative programme has been fixed and is as follows .—

9th July	12 to 4 p. m.	... Conference opens, group photo.
10th July	Forenoon	.... Visit to Cotton and Millets stations.
„	Afternoon	... Conference 2nd Session.
„	9 p. m.	... Entertainment.
11th	Forenoon	... Visit to Imperial Cane breeding station and Paddy breeding station.
„	Afternoon	.... Conference 3rd Session.
„	6 p m. to 7 p.m.	.... Popular lecture.
12th	Forenoon	.... Union Business Meeting.
„	Afternoon.	.... Visit to Entomological, Mycological and Chemical laboratories & Herbarium
„	9. p. m.	.... Entertainment.
13th	3 p. m.	.... College Sports.
14th.		... Cricket match, visitors *vs* residents.

APPENDIX I.

UNIVERSITY OF MADRAS.

B. Sc. Degree Examination in Agriculture, 1929.

PART I.

AGRICULTURAL ENGINEERING.

WEDNESDAY, 3RD APRIL, 7 A. M. to 10 A. M.

Only SIX *questions are to be answered. Questions 1, 2, and 3 are compulsory.*

1. Reduce the levels in the accompanying extract from a field book and draw the cross-sections to a scale of 10′ to 1″. Calculate the earthwork in the embankment from 300′ to 500′ on the longitudinal section. (9 marks.)

2. Draw the cross-section of a road culvert with a vent way of 3′ × 3′. The side walls are 2′ thick and rest on a concrete slab 2′ thick. The top covering is a reinforced concrete slab 6″ thick over which there is a layer of 1′ of earth and 3″ of gravel. The width of the roadway is 14′ and the parapets 2′ high above the road level. The road level is 1′ above ground level. Scale 2′ to 1″. (12 marks)

3. A motor driving a centrifugal pump develops 6 h.p. What will be the discharge of the pump when the lift is 22′ and the efficiency of the combination is 50 per cent.?

4. Explain fully the mechanism and action of the governor of an oil engine.

5. What is concrete? Specify the quantity of lime, sand, and broken stone in 150 cubic feet of ordinary concrete.

6. The surface velocity of water in a channel whose section is a semi-hexagon with a bottom-width of 6′ is observed to be 2′ per second. Calculate the discharge of the channel.

7. A stone weighing ½ ton has to be lifted to the top of a wall with the help of a derrick and a pair of 3 sheaved pulley blocks. What pull will bé required at the free end of the rope, assuming an efficiency of 75 per cent. for the arrangement?

Back Sight.	Inter-mediate.	Fore-sight.	Rise.	Fall.	Height above base.	Dis-tance.	Total distance.	Remarks.
	4.50				50.00		300	centre of top of bank in long section
	9.00					0		on ground
	9.00					10		toe of bank
	4.50					9	CS. No. 3	edge of top of bank
	4.50					15		edge of top of bank
	9.00					6		toe of bank
	9.00					10		on ground
	5.00						400	on longitudinal section-top of bank
	10.50					0		on ground
	10.50					10		toe of bank
	5.00					10	CS. No. 4	edge of top of bank
	5.00					14		edge of top of bank
	10.00					7		toe of bank and ground level
	5.50						500	on longitudinal section-top of bank
	10.50					0		ground level and toe of bank
	5.50					10		edge of top of bank
	5.50					14	CS. No. 5	edge of top of bank
	10.50					8		toe of bank
	11.00					10		ground level

AGRICULTURAL CHEMISTRY.

THURSDAY, 4TH APRIL. 7 A.M. to 10 A.M.

Only SIX *questions are to be answered. Question 4 is compulsory.*

1. State what you know about orthophosphoric acid and its calcium salts.

2. What is soil acidity due to? How is it measured? Is there any relation between such measurements and the lime requirements of a soil?

3. Write short notes on—minimum cropping value of a soil, available plant—foods in a soil, and movements of soil water.

4. A primary alcohol with a vapour density of 29 contained C=62·1 and H=10·3 per cent.. and reacted with bromine to yield a derivative containing C=16·5, H=2·7, and Br.=73·4 per cent. Determine the structural formula of the alcohol and its derivative.

5. What are monosaccharides, and polysaccharides? Give examples of each class and indicate which of them are sugars. How would you discriminate in the carbohydrate group between a sugar and a non-sugar?

6. What do you know about the nature of ordinary red soils, lateritic red soils, and black cotton soils?

7. Define the term alkaloid, and mention some of the general physical, chemical, and physiological characteristics of compounds of this type.

AGRICULTURAL ZOOLOGY.

THURSDAY, 4TH APRIL. 1 P.M. to 4 PM.

Only SIX *questions are to be answered. Questions* 1 *and* 2 *are compulsory.*

1. Give an account of the Indian Bee. What proposals would you make for the improvement of the industry?

2. A moth is reported as spoiling fruits by sucking their juice while on the tree. Indicate clearly the lines of investigation which you would follow to control the pest.

3. Classify the Phylum Arthropoda. Give in respect of each of the groups you mention the name of a representative which is of importance from the standpoint of agricultural zoology.

4. Describe the tracheal system of any insect. What bearing has this method of respiration on insect circulation?

5. Write an eassy on the salivary secretions of insects.

6. Describe in detail the life history and methods of control of of Nephantis serinopa. What are the principles on which control measures in South India are based?

7. How would you control the following :—(*a*) dog flea, (*b*) the Avare pod-borer (*adisura atkinsoni*), (*c*) pulse beetles, (*d*) epilachna?

8. What is a combined spray? Cite example. What are the conditions in which its use is indicated?

AGRICULTURAL BOTANY.

WEDNESDAY, 3RD APRIL. 1 P.M. to 4 P.M.

Only SIX *questions are to be answered. Question 7 is compulsory.*

1. Describe briefly the various modifications of stems, giving an example of each.

2. Explain with a diagram the structure of a young dicotyledonous stem. Show how this structure is changed as the plant grows.

3. Describe briefly the manner in which the transpiration in a plant is influenced by external conditions.

4. Give an account of double fertilization, and explain its significance.

5. State the important characters of the family Scitamineæ and name the economic plants belonging to this family in Madras.

6. What are the special characteristics which will help you to identify the plants belonging to Cruciferae. Malvaceæ, Umbelliferæ. Asclepiadaceæ, and Cyperaceæ ?

7. Show how far the vegetation of a locality is governed by the soil conditions.

AGRICULTURE I.

FRIDAY, 5TH APRIL. 7 A.M. to 10 A.M.

Only SIX *questions are to be answered. Questions 2 and 4, are compulsory.*

1. What are the essentials of (*a*) rotation of crops, (*b*) mixture of crops as practices designed to maintain soil fertility? Compare their advantages and disadvantages briefly from the cultural and economic points of view.

2. (*a*) State briefly in tabulated form the points you would look for in—

(i) a working Kangayam bullock,

(ii) a working Ongole bullock.

(*b*) You are engaged in cattle breeding on dryland, rainfall 40″, near a populous city where there is a demand for work bullocks and milk. Which breed would you keep, Kangayam or Ongole? Give figures to support your selection.

3. (*a*) What is the difference between drainge water and subsoil water ?

(*b*) State briefly the operations you would perform on dryland so as to make the fullest use of the rainfall in growing a crop of cholam.

4. Describe the treatment, actual rations and method of housing of a calf from birth to 18 months old. Mention the breed of the calf, and calculate the costs.

5. (*a*) Briefly describe the following implements and their uses:— (i) cultivator, (ii) scythe, (iii) blade harrow, (iv) roller.

(*b*) Give an account of any *four* methods known to you of threshing grain.

6. Classify briefly the main soil types found in the Madras Presidency, and describe in detail the charactaristics of any *one* of them.

7. Write notes on—(*a*) landside, (*b*) drum and concave, (*c*) pedigree stock, (*d*) line breeding, (*e*) duty of water, (*f*) roughage, (*g*) mulch, and (*h*) throw-back.

AGRICULTURE II. ANIMAL HYGINE.

FRIDAY, 5TH APRIL. 1 P.M. to 4 P.M.

Only SIX *questions are to be answered. Questions* 1 *and* 2 *are compulsory.*

1. Explain the process of digestion in cattle.

2. Describe any acute contagious disease occurring amongst cattle, and write notes in detail on the symptoms and treatment, both curative and preventive, of the same.

3. Mention the three classes of bones found in the skeleton of an ox, and describe their uses in the living animal.

4. Give the actions and uses of the following drugs in cattle :— (*a*) carbonate of ammonia, (*b*) common salt.

5. How would you treat a case of—(*a*) yoke-gall, (*b*) any clean-cut wound ?

6. What is the average period of gestation in a cow, and from what symptoms would you understand that a cow is pregnant ?

7. What is husk or hoose in sheep ? Give the preventive treatment of the same.

8. In the construction of a temporary shed for 40 Kangayam cows and a breeding bull, what considerations would you have with regard to points such as the following, viz., locality, prevailing winds, space for each animal, drainage, disinfection, suckling calves, pregnant cows, cows nearing parturition, &c. ?

APPENDIX II.

PART II.

AGRICULTURAL BOTANY. I.

MONDAY, 8TH APRIL. 7 A.M. to 10 A.M.

Only FIVE *questions are to be answered.*

1. Compare the *sporophyte* of a *moss* with that of a *fern.*

2. Point out the distinguishing features of the different varieties of the *cotton plant* grown in the Madras Presidency. Explain the nature and extent of the damage caused to this crop by insect and and fungal pests.

3. Describe the path in the plant-body taken by the nutrient water, and state what happens to this nutrient water.

4. Draw a map of the Madras Presidency, and indicate therein, the places where the following crops are largely cultivated:—sugar-cane, ground-nut, pepper, chilli, cotton, and cholam.

5. 'A better supply of fodder is the foundation of the cattle problem.' Explain the importance of the problem referred to in this statement. Classify the fodder plants (indigenous as well as introduced) grown in this Presidency according to the families to which they belong, and write a short note on the suitability or otherwise of the introduced fodder crops.

6. What are the methods adopted for the improvement of a crop-plant ? Mention the special features of the new strains produced at Coimbatore with regard to *either* paddy *or* sugar-cane.

7. Write short notes on—discontinuous variation, bracket-fungus, geotropism, and law of filial regression.

AGRICULTURAL BOTANY. II.

MONDAY, 8TH APRIL. 1 P.M. to 4 P.M.

Only FIVE *questions are to be answered.*

1. Explain with sketches, the structure and life-history of any *fungus* belonging to the Peronosporaceæ.

2. Give a brief account of the different parts of the plant-body that act as storehouses of reserve materials. When are these materials utilized ? Explain what happens to these materials utilized ? Explain what happens to these materials when they are about to be utilized.

3. Describe fully in technical terms *Eleusine Coracana.*

4. Write an eassy on the different kinds of *Fungicides.* and on the mode of application of the same,

5. Write notes on—dichogamy, spirogyra, bud-grafting, sclerotium, and nyctitropic or sleep movements.

6. Describe the present state and the scope for improvement in respect of the following fruit industries :—(*a*) orange, (*b*) grapes, and (*c*) pine-apple.

AGRICULTURAL CHEMISTRY I.

TUESDAY, 9TH APRIL. 7 A.M. to 10 A.M.

Only FIVE *questions are to be answered. Question* 1 *is compulsory.*

1. Explain the principles involved in any method of mechanical analysis of soils you know, and state for what reasons more importance should be attached to the mechanical than to the chemical composition.

2. Explain what you understand by the term 'retention' by a soil, and state briefly the mechanism of the process.

3. State briefly your views on the formation and amelioration of alkaline soil.

4. How is calcium cyanamide manufactured? What is the nature of its decomposition in the soil?

5. What is supposed to be the composition of the phosphate in basic slag? How is its composition likely to be modified by differences in the methods of production?

6. If two samples of cakes are offered as manures, what constituents would you estimate to determine which is more profitable for the price asked? Illustrate your answer.

7. Give a brief account of the most important microorganisms concerned in the nitrogen economy of the soil.

AGRICULTURAL CHEMISTRY II.

TUESDAY, 9TH APRIL. 1 P.M. TO P.M.

Only FIVE *questions are to be answered. Question 7 is compulsory.*

1. Mention any nitrogenous compounds other than proteins that may be found in plants, stating, as far as you can, the parts of the plants in which they are found, and their functions in the life of the plant.

2. Trace briefly the changes taking place in the sugar contents of sugar-cane during ripening and afterwards.

In the absence of any knowledge as to the variety, age and the behaviour of a sugar-cane crop in a locality, how would you determine the ripeness of a crop?

3. What do you understand by the term' limiting factor' in plant nutrition ? Mention any exampls of which you are aware.

4. If two oil cakes are offered for feeding purposes. what steps would you take to advise which of the two is of better value ?

5. What is meant by the terms—digestive coefficients, nutritive ratio, starch equivalent and therm ? State their practical use in feeding.

6. What is your opinion on the utility of a lactometer for detecting the adulteration of milk with water ?

7. What do you understand by the terms—standard deviation and probable error ? Of what use are they to the agricultural chemist ?

AGRICULTURE I.

THURDAY, 11TH APRIL. 7 A.M. to 10 A.M.

Only FIVE *questions are to be answered. Questions* 1 *or* 4 & 6 *are compulsory.*

1. A newly-opened farm consisting of 60 (sixty) acres of wet land has to be equipped. Give a list of the different items of equipment, including live-stock, which would be necessary, together with an estimate of the cost of each item.

2. State, giving reasons for your answer, what points you would pay attention to in the purchasing and using of artificial fertilizers.

3. In the case of the following crops give (*a*) the seed rate per acre, (*b*) the season for planting or sowing, (*c*) yield per acre :— (i) Cambodia cotton, (ii) turmeric, (iii) potato. In the case of (ii) describe the method of curing, and state the proportion of cured to fresh produce.

4. You own a city dairy stocked with six Delhi buffaloes and twelve local (Kangayam) cows, Give a detailed estimate of the probable income and expenditure for one year at average Coimbatore prices.

5. Describe, with suitable sketches, the various tillage implements peculiar to the Ceded District tract, and explain their special merits.

In the case of a plough drawn by two pairs of bullocks, describe a suitable method of hitching.

6. Taking cotton as an example, discuss the scope, methods of organization, and conditions of success, for a produce-selling Co-operative Society.

7. What is meant by 'correlation of characters' ? Illustrate by examples how this is made use of in breeding work. Explain the terms—segregation, reciprocal cross, and recessive.

AGRICULTURE. II.

THURSDAY, 11TH APRIL. 1 P.M. to 4 P.M.

Only FIVE *questions are to be answered Questions 1 and 4 are compulsory.*

1. In the case of a five-acre farm near Coimbatore commanded by a good well, describe any suitable cropping scheme you would adopt, and give a profit and loss statement for one year's operations according to your scheme.

What is meant by the term 'labour income of the farmer'? Work out this amount in the above case.

2. Give an account of the methods by which soil erosion can be prevented.

Comment on the statement that the opening up of our hills for tea plantations is not an unmixed advantage to the country.

3. Describe the varieties of ground-nuts now being grown in the Presidency. Describe briefly the method of cultivation, giving an estimate of the expenses and receipts per acre. What improvements can you suggest in these methods ?

4. Explain to what points you would pay attention in respect of (*a*) size and shape of plots, (*b*) lay-out of plots, and (*c*) sowing or planting, in order to minimize experimental error in field experiments.

5. (*a*) Explain, with suitable sketches, the 'Sindewahi' jaggery boiling furnace. What special advantages are claimed for this type of furnace ?

(*b*) Describe the different methods in which sugar-cane is commonly planted, giving the seed rate per acre, and the average cost of the setts in each case.

6. Give an account of the results of cross-breeding with foreign (non-Indian) bulls in the improvement of the milk cattle of this Presidency.

7. Discuss briefly the different methods in which fodder crops may be utilized, explaining the merits of each of the methods.

AGRICULTURE ESSAY.

FRIDAY, 12TH APRIL. 7 A.M. to 10 A.M.

Either, Contrast the economic possibilities of the utilization of flow irrigation for the growth of garden crops as against wet cultivation.

Or, Discuss the feasibility and the economic possibilities of the introduction on a large scale of suitable labour-saving machinery into South Indian agriculture.

APPENDIX III.

The following condidates have passed Part II of the B. Sc. Ag. Examination in the order of rank noted, all being placed in the Second Class :—1. Seshadri Sarma, P. 2. Kunhikannan Nambiyar, K. 3. Rangaswami, T. V. 4. Ranganathgswami, G. 5. Subramanya Sarma, A. H. 6. Govindakuttikurup, P. 7. Subbayya, M. S. 8. Narayanan, V. 9. Sundaram S. 10. Krishnamurthi, P. S. 11. Narasimha Rao, M. P 12 Gopalan, K. 13. Ramayya Shetti, M and Sanjiva Shetti, K. 14. Subramanyam, K. H. 15. Suryanarayana, J. 16 Venkatasubramanyam, P. S. 17. Raman, K. 18. Narayanaswami Ayyar, P. S. 19. Balasubramanyam, T. N. 20. Jivan Rao, M and Kalimuthu, M. 21. Ramadas, A. 22. Annamalai, C. 23. Mukundan, T. K. 24. Natesan, K. V. 25. Saldanha, R. J. 26. Ramaswami, S. 27. Sundaram, T. S. 28. Venkatesan, K R. 29. Muttunayagam, A. P. 30. Raghunathan, A. K. and Thomas, N. K. 31. Shanmukasundaram, D and Krishnaswami, P.N. 32. Natarajan V. 33. Anantapadmanabhan, R and Somayya, M.

NOTE :—Those holding the same rank are brought under one number.

APPENDIX IV.

Departmental notifcations for June 1929.

Gazetted:—Mr. K. Ramaiah, Assistant Paddy Specialist, leave on average pay from 3-4-29 to 6-5-29 and leave on half average pay from 7-5-29 to 20-5-29. Mr Venkataraman, Paddy Assistant to act as Assistant Paddy Specialist vice Mr. K. Ramaiah on special duty for 6 months from 23-5-29. Mr. P. H. Ramareddi, Vice Principal, Agricultural College, leave on average pay for one month from 23-5-29. Mr. C. Narayana Ayyar, Assistant Director, extension of leave on average pay for one month.

Non-Gazetted, Transfers, Confirmation, etc:—The subordinates named below are confirmed in their appointments:—

Agricultural Section:—Messers S. Ramachandran, K. B. Vadiswaran, C. S. Sankaranarayana Ayyar, T. Gopalan Nayar, A. Kunhikoran Nambiyar, K. Parameswara Menon and P. A. Narayanan Nambiyar.

Science Section:—Messers G. K, Chidambaram K. P, Anantha-narayanan, U. Achyutha Wariar and K. Ramaswami

Mr. D. V. Subramania Ayyar appointed as Assistant Lecturer in Engineering on probation for one year with effect from 1-4-29 Mr. P. A. Narayanan Nambiyar, Assistant Manager, is transferred to the Agricultural College Dairy, Coimbatore; Mr. F. L. J. Lobo, Assistant Manager, to Chindaldevi Farm on expiry of leave. Manager T. Seshachalam Nayadu will join duty as Hosur Farm Manager, Mr. M. P. Kunhikutti, on relief is posted to Coimbatore as Live-Stock Demonstrator for West Coast, Coimbatore and Southern districts; Mr. A. S. Nityakalyanareddi Assistant Demonstrator is transferred to Madanapalli.

Leave etc:—First Circle:—Mr. P. Lakshminarayana, Assistant demostrator, Bhimavaram leave on average pay for 15 days. Mr. P. S. H. Narayanaswami, Manager Anakapalli, leave on average pay for one month.

Second Circle:—Mr. K. Gurumurthi, Demostrator, Gannavaram leave on average pay for 11 days from 22-5-29. Mr. L. Narasimha-chari, Manager Guntur, leave on average pay for one month from 13-6-29. Mr. V. Ratnaji Rao Demonstrator, Nayadupet leave on average pay for 20 days from 26-6-29.

Third Circle:—Mr. K. Ambikacharan Manager, Nandayal, leave, on average pay for 15 days from 10-6-29; Mr. G. L. Narasimha Rao, Assistant Demonstrator, leave on average pay for 2 months from 3-4-29. Mr. P. Nagadhar Nayadu, Demonstrator, Kudligi, extension of leave on average pay on medical certificate for one month. Mr K. T. Bhandary, demonstrator, Hospet, extension of leave on average pay for 11 days. Mr. P. V. Subbarao, assistant manager, extension of leave on average pay on medical certificate for 2 months. Mr. K. Raghavachari, manager, leave on average pay for one month from 10-6-29. Mr. P. Abraham, Cotton assistant, leave on average pay for 12 days from 4-6-29.

Fourth Circle:—Mr. Bhairy Siva Rao, demonstrator, Madanapalle, leave on average pay for 20 days from 25-6-29. Mr. V. Kumaraswami, assistant demonstrator, Palmaner, leave on average pay on medical certificate for one month from date of relief.

Fifth Circle :—Mr. K. Krishnan, demonstrator, Trichi, leave on average pay for one month from 2-7-28.

Sixth Circle:—Mr. K. K. Subramanya Ayyar, demonstrator, Rajapalayam, extension of leave on average pay on medical certificate for 2 months Mr. T. V. Ayyaswami Ayyar, assistant demonstrator, Srivaikuntam, leave on average pay on medical certificate for 2 months from 28-5 29. Mr T. S. Venkatarama Ayyar, demonstrator Palni, extension of leave on average pay on medical certificate for 3 weeks.

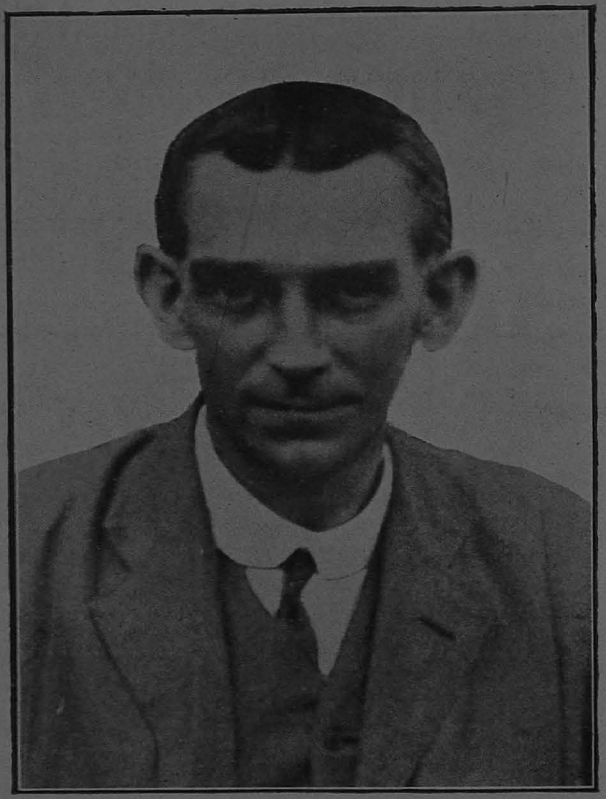
Seventh Circle:—Mr. M. K. Nambiyar demonstrator, extension of leave for 2 weeks. Mr. E. K. Govindan Nambiyar, demonstrator, leave on average pay for two weeks from 3-6-29.

Curator's section:—Mr. K. G. S. Bhandary, demonstrator, Ooty, leave on average pay for 24 days from 12-6-29.

Live Stock section:—Mr. F. J. Lobo, Assistant Manager, leave on average pay for 2 months from or after 10-6-29. T. V. Krishnaswami Rao Manager, Chintaldevi, leave on average pay for one month.

P. S's Section:- Mr. S. Ramaunjam, Assistant. Aduthurai, leave on average pay for 10 days from 25-6-29. Mr. C. V. Saravayva, Assistant, Maruter, leave on average pay for one month from 5-7-29.

Chemistry Section:—Mr. S. Kasinatha Ayyar, Assistant, leave on average pay for 26 days from 5-6-29. K. Govindan Nayar, Assistant, leave on average pay for 12 days from 4-6-29. Mr. C. Raghavandrachar, Assistant, leave on average pay for 20 days from 19-6-29.



H. C. SAMPSON, C. I. E.

[See Page 202-d.