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The Present Position of Soil Microbiology

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Soil microbiology may be said to owe its origin to the discovery by Pasteur of the role played by micro-organisms in the decomposition of organic matter—a discovery made more than fifty years ago. Another twentyfive years elapsed, however, before the epoch-making work of *Winogradsky* and *Beyerinck* in regard to the processes of nitrification and nitrogen fixation, stimulated the scientific world into real activity in investigating the processes taking place in the soil.

By 1903-4 many of these fundamental processes were known and the organisms responsible for them isolated. These discoveries included the oxidation of sulphur and, to a much less extent, the decomposition of organic matter. These important and far-reaching discoveries naturally raised great expectations and it was confidently anticipated that their further development would lead to a profound advance in agricultural practice. These anticipations were but too well founded. Remember the striking advances made in medicine and in other industries as the result of the bacteriology made at this period.

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It must be said at once that these high expectations have not been realised and perhaps as a natural reaction against the exaggerated optimism of the earlier days we seem at the present day to be passing through a period of profound pessimism in regard to soil microbiology. So much is this the case that large numbers of investigations have lately forsaken this line of work for other fields of activity. The situation may perhaps be summed up in the words of a prominent American worker. "*I am sick of pothering about with a lot of dirt and making only ammonia and nitrate determinations, that is not going to lead us any where.*"

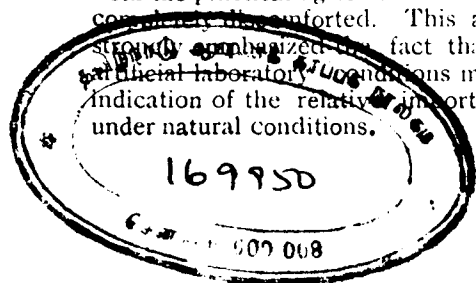
Such pessimism is greatly to be deplored and it is, therefore, worth while to see what is the peculiar difficulty which confronts the worker in the field and which has caused so many men to lose heart.

In the first place far too little consideration has been given to the nature of the soil itself. Soil is a highly complex aggregate of matter, largely colloidal in character, containing a great mass of various forms of life and exceedingly sensitive to external conditions, physical or chemical. It can, therefore, readily be understood that any particular result obtained under natural conditions is not the product of a single clean cut reaction but a resultant of a large number of independent and possibly naturally conflicting processes and that the balance of these various processes may readily be disturbed and profoundly modified by changes in the conditions. Obvious as this may appear it is a fact which the majority of workers have failed to keep sufficiently in mind with disastrous results. It is of course well known to soil biologists that many organisms which appear highly active in the soil can be cultivated only with difficulty under laboratory conditions. The converse is equally true, other soil organisms which seem to be of little importance in their natural habitat being capable of carrying out striking chemical changes in the laboratory. To put matters shortly, in the majority of cases the soil organisms that have been most studied have in general been studied under totally artificial conditions, conditions which resemble in no respect their normal habitat in the soil. From such artificial experiments investigations have again and again made the most sweeping generalisations assuming that the results obtained in the laboratory could be applied without modification to field conditions. The result can readily be imagined; under field conditions the organism has behaved in a totally different way perhaps and it is not unnatural that in many cases both the practical agriculturist and the laboratory worker have been completely misinformed. This aspect of the case cannot be too strongly emphasized the fact that pure culture experiments under artificial laboratory conditions may be completely misleading as an indication of the relative importance of the organism in the soil under natural conditions.

In saying this I do not however, wish to undervalue the work that has been done in the isolation and study of soil organisms. From the point of view of science the results have frequently been of the greatest interest and the methods employed of the highest ingenuity. Moreover an examination of this type must necessarily precede or accompany the much more difficult and complicated study of the organisms under soil conditions. I only wish to deprecate unduly wide generalisations being based on such experiments since disillusionment must in the majority of cases be the result.

It is a matter of reproach to the younger generation, so many of whom have abandoned this line of work, that the task of indicating the correct line of attack and indeed of leading this attack should have been left to the veteran of the old guard—to Winogradsky. Over 70 years of age, driven from his own country, Russia, by the troubles of the revolution, Winogradsky is now working at that Mecca of Microbiologists, the Pasteur Institute, with undiminished vigour and brilliance. "We have"—says Winogradsky however—"as yet no science of soil microbiology although we possess a great deal of information on various groups of soil micro-organisms and what they can do in artificial culture media". The whole problem is to ascertain what micro-organisms live *normally* in the soil and which develop there as the result of special treatment. It is to this problem that Winogradsky has addressed himself and in which he has already attained striking successes. Special methods for the direct examination of the soil itself, instead of the older method of using soil extracts, have indicated, for example, that in a normal untreated soil the population consists almost entirely of cocci and non-sporing bacteria with some actinomyces and some fungus spores. Protozoa are almost entirely absent. The addition of nitrogenous material leads to an almost explosive development of sporing forms and the fungi also become active. Starchy material on the other hand leads to the development of practically one type of bacillus and of Actinomyces. Sugar brings about an enormous increase in Azotobacter or, if the moisture supply be excessive, of clostridium, both these forms being nitrogen fixers.

The soil must therefore be regarded as a medium harbouring an enormous number of different types of micro-organisms, the great majority of which, however, are latent in a normal soil, becoming active only under specified treatment. It is evident, therefore, that, we have to direct our attention not to what I may call the *biological state* of the soil, i. e. the quantity and quality of the organism present at any moment, but to the *biological reaction*, i. e. the changes which occur when particular conditions are created.



Work on such lines, apart from that of Winogradsky himself, has been chiefly confined to the Rothamsted laboratory where particular attention has for example been devoted to studying the balance that exists between the protozoa and the bacteria in the soil. It is clearly established that the protozoa form a limiting factor in bacterial growth, the bacterial numbers diminishing as the protozoa increase. The factors determining the protozoal number, however, have not yet been ascertained. Curiously in contrast to earlier opinions, the recent work of Nazir seems to indicate that the destruction of bacteria by protozoa may not be detrimental to biological processes but the reverse. For though this destruction is continually taking place this only brings about a further development of the organism in question and it is the course of its development that the cell exhibits its chief activity—nitrogen fixation or whatever it may be. Hence though the number of bacteria present at any one time may be diminished, the biochemical processes which the cell carries out may be stimulated and fertility increased.

Time, however, will not permit me to detail the various investigations at present in progress nor is this necessary, my object being simply to indicate the direction in which modern thought is tending and to emphasize that future investigations must take into account the dynamic nature of the problem in contrast to the static methods previously employed.

If I have, Sir, so far emphasized the difficulties of the subject and the somewhat meagre practical results that have up to the present been attained, it is only to emphasize in an equally definite manner (1) the immense amount of work which remains to be done and (2) the necessity for that work being undertaken by men specially trained for the purpose.

The importance and far-reaching nature of the biological processes taking place in the soil must be patent to the most casual observer. In this country, in particular, climatic conditions are such as to accelerate such changes to a pitch quite unattainable in the colder countries of the west. The clearest evidence already exists of the importance of biological nitrogen fixation in maintaining the fertility of Indian Soils. But why in one year this process should take place with astonishing vigour and in another, with apparently almost similar conditions be scarcely perceptible is a phenomenon which at present we are totally unable to explain.

The processes underlying the decomposition of organic matter and the formation of humus are still very imperfectly understood. Nothing could be of greater importance to this country than a solution of this question which would go far to solve the manurial problem by rendering possible the utilisation of the immense amount of waste organic matter in an economical manner.

I have, Sir, on numerous occasions emphasized the importance of Agriculture as India's greatest industry and in a gathering of this kind it is unnecessary to press this point. If, however, progress is to be rapid we must utilise all the resources which science can place at our disposal and I think it must be admitted that in this country far too little attention has, up to the present, been paid to the study of the microbiology of the soil. I admit freely that this has, in part, been due to financial stringency, but now that there seems a reasonable chance of easier conditions, I do urge that this question may be given the consideration it deserves but which it has, in general, failed to receive. The difficulties of the work necessitate the services of the most highly trained specialists, and such men must receive sympathetic and patient encouragement, for, results of importance are not to be expected in a day.

The prizes to be gained are, however, immense and the economic value of such work must ultimately repay a hundred fold the capital it may be necessary to employ.

Discussion.

In the course of the discussion, Mr. Ramaswami Sivan said that in his opinion the question of filling up the post of Soil Bacteriologist should be taken up first by Government in any consideration of the Development schemes now before them, as it was a mistake to have let Mrs. Norris go and that though Dr. Norris was near at hand in Bangalore, Bacteriological study at the College was very much handicapped, as he a Chemist himself was in the absence of any Bacteriologist asked to deliver lectures on Bacteriology, a subject of which he was in absolute ignorance. He further suggested that the best students be selected and sent to foreign countries for training if necessary. The President intervening observed that it might be possible to get their object realised as the remission of Provincial contributions gave them now a chance of setting finances in a more satisfactory order.

* Paper read at the M. A. S. U. Conference on 15th July 1925.

The Importance of Guntur Agriculture.

K. SANKARAN PILLAI,

Tobacco Specialist, Guntur

When the Secretary of the Madras Agricultural Students' Union asked me to read a paper before this body, I felt I was most illfitted for the task. I was however emboldened to write one in hopes that my experience as an agriculturist will be of some use to those students of this College who intend taking up private farming. It is a matter well within our knowledge that there are many students of this College still unemployed. I have also heard it said that the students of this College will not be a success if they were to go back to the land. But my experiences have been entirely different and I may say that success is assured if one selects a suitable tract, studies all details of agricultural conditions and proceeds with due caution.

2. The agricultural and trade possibilities of Guntur District where I settled down 6 years ago, are quite hopeful and there is still scope for further development. As the time allotted to me is limited I shall in this paper merely refer to some of the salient points in the agriculture of this district.

3. Guntur comprises of 3 main agricultural divisions 1. The Eastern Delta Tract. 2. The Western Upland Tract and 3. The Central Black Soil Tract. Each consists of three taluks.

4. *The Eastern Delta Tract.* Water is available in the Kistna from June to December and here is grown only a single crop of paddy every year. Among the paddy fields in elevated belts the ryots grow turmeric with the help of light lifts under semi dry-conditions. Now that the Bezwada Anicut is being strengthened, water may be available for 2 more months and then a trial to grow 2 crops as in the adjoining Godaveri delta or Thambiraparany Valley in Tinnevely Dist. can be made. The Department can very well undertake some experiments in this direction. Apart from this, the question of manuring is another important problem and very little is being done in this line. Phosphatic manure is the chief thing required and *bone is easily obtained in Guntur and from the adjoining western districts at moderate rates.* Till now it is only the Planters in Ceylon that are making use of this form of manure. Either the Government must make arrangements to put up bone Disintegrators and sell bone meal to the ryots of the delta tracts at cost price or help substantially private firms to take up this work by giving them financial help for starting the Mill etc. The unemployment question among

trained agriculturists can be solved in a small degree if such enterprises are taken up by them. Bone mills can also be started in other wetland tracts where there is demand for the same. The cry everywhere in the deltaic tract of this district is for suitable manure for wetland, and though the Department was able to sell Rs. 20,000 worth of manure without any difficulty whatsoever, this is nothing compared with the total demand. In my opinion this has reached a stage when the Department can no longer continue to control the supply of manure. It would therefore be well to advise enterprising agriculturists and Agricultural Societies to take up the supply the Department confining itself to finding out more economical and efficient manures than are available at present.

5. *The Western Upland Tract.* A major portion of this tract is hilly and rocky and hence fit for pasture. The remaining portion is mostly black soil. This tract receives nearly 16 to 20 inches of rainfall which is far below the district average. They grow good cotton and breed cattle and sheep and meet the need of manuring and cattle supply of the Central Black Soil area and the Eastern Delta Tracts.

6. *The Central Black Soil Tract.* This is the important agricultural tract of the District. The soil is of deep Black cotton type. This belt receives nearly 35 inches of rainfall distributed mainly during June to November. The ryots are intelligent. In the first and second ploughing the land is opened into deep furrows and ridges with heavy ploughs and this makes the soil absorb as much rain water as possible. In the subsequent ploughings they plough closely and work Gorru and Guntaka and thus give a good mulch, prevent evaporation and conserve soil moisture completely. The most successful dry gardening can only be seen in Guntur. The beautiful situation of the tract, the soil condition, the method of ploughing with the heaviest type of country ploughs, the timely intercultivation, the presence of sea breeze known as *Piara Gali* which forces the plant to grow vigorously, the complete absence of rain during curing season all these are helpful in producing garden crops like Chilly and Tobacco under dry conditions on an extensive scale. Strangers to this tract during October and February will be surprised to see Chilly and Tobacco growing nicely under dry conditions on a very large scale. The total area under Chilly in normal years in the whole presidency is 334,750 acres of which 116,400 acres are in Guntur District alone. Chilly seedlings are planted in rows about a foot and half either way and pot watered from rain water ponds made in the field itself or on the road-side. The plants establish very well and hoeing with bullock a month after, completes the operations. There is nothing to be done until harvest time. The total area under

Tobacco in the Presidency is 219,841 acres of which 64,481 acres are in Guntur District alone. Same as for Chillies the land is prepared and the seedlings planted 2½ feet apart either way in rows, pot watered until plants establish. A month after planting hoeing is given twice or thrice at intervals and the crop grows well. By the time the Piara Gali also commences which stimulates the growth of the plants and the crop grows a height of 3 to 3½ feet when topped with 18 to 20 leaves. In the case of some of the American varieties the plants grow a height of 7 feet with 28 to 32 leaves and from a distance such fields will have the appearance of plantain gardens. Tobacco grown under dry conditions is mild in flavour and is admirably suitable for cigarette manufacture.

7. I was one of the first to try Virginian and other American varieties in Guntur. Some were trying Turkish and other varieties which ended in a failure. American varieties more specially the less woody ones have since been grown successfully during the past 4 or 5 years and their cultivation is extended on a grand scale by exporting firms. Another important factor that helps the cultivation of such large areas under tobacco in Guntur is, the complete absence of rain in the months of February and March the curing season. This facilitates curing in the open fields with all its advantages. The slightest contact of rain water while curing in open fields will damage the crop completely. If the season is to be unsteady curing in open fields is impracticable and will necessitate the curing under sheds and under such a system only a small area can be grown.

8. Generally the idea is that farming run on modern lines will not pay. It is not a correct statement at least so far as Guntur district and myself are concerned. We shall take the case of an average middle class cultivator in the Guntur Central Dry Garden Belt and another farming 6 acres of wetland in the delta tract in Guntur or any where in the Presidency. The value of 30 Acres of dry land ryot comes to nearly Rs. 12,000 and he gets an annual net income of Rs. 3,000 at the rate of Rs. 100 net income per acre. This pays him at the rate of 25 per cent on the capital outlay; whereas the Delta ryot has to invest Rs. 12,000 for his 6 acres of wetland and gets a net income of only Rs. 600 a year or 5 per cent on his capital outlay. This shows that the black soil ryot of this tract is much better off than his brethren in the delta lands.

9. The Tinnevely Black Cotton Tract presents more or less the same features as the Guntur tract except for its slightly less rainfall. There also we have the same sea breeze which stimulates the growth of crops. The system of cultivation as in Guntur may in

my opinion prove successful in the black soil tract of Tinnevely District. Even in Guntur such a large area of garden crops like chilly and tobacco was not grown some 30 years back. It is all by perseverance and constant trials and study of demand and supply they developed gradually and increased the area. In 1922 a trial was made at Koilpatti Farm at the instance of a private agency to try Virginia tobacco under dry conditions in black cotton soil. Unfortunately there were heavy rains and washes in the plot but all the same the crop grew successfully. To cite another instance in the same farm, henbane was grown on a very small scale with the help of pot watering in a small area of the black soil block and the plants that had a good fitting grew very well. As black soils are generally retentive. There is no reason, why the crop should fail if proper care is taken to set the plants well during the rainy season and if timely intercultivation is given thereafter. I wish the Department takes up the trial of both chilly and tobacco as dry crops in the black soil of Koilpatty Farm adopting the same methods as practised in Guntur. I think this will be a success and may gradually spread in the District and one day we may see beautiful dry gardens of chillies and tobacco in the Tinnevely black soil tract, as in Guntur.

10. Guntur is destined to become an important centre for groundnuts as well. Some years back groundnut was grown on small sandy belts of Guntur District on a limited scale on nearly 1,300 acres. Two years ago this was introduced in the black soil tract on a fairly large scale. No one thought this would be a success but to the surprise of many it gave such a splendid result that last year the area under this crop rose to nearly 13,187 acres and it gave a net income of over Rs. 123 an acre. This year the area will certainly be doubled.

11. Guntur town is the central market for the sale of the produce of the district. Ryots from all over the district bring their produce such as chilly, tobacco, coriander, redgram, ghee etc. to merchants in town or commission agents. The buying firms send their representatives to Guntur for their purchases. The bargain is settled in the presence of buyer and seller by the commission agents who get a small commission on the transaction known to both the seller and the buyer. If any merchant wants to trade in ghee on a large scale he can easily buy 500 to 600 tins every week remaining at Guntur only. Ghee is brought to Guntur mostly from Upland and Central tracts and not from Delta. For four months commencing from February onwards not less than a lakh of rupees worth of chilly and tobacco are sold daily in the market. Thus Guntur affords scope for those agriculturists who are inclined to do a

bit of trading also. There is ample scope in the district to improve the marketing of the produce of the district by formation of Joint Stock Companies and Co-operative Associations.

12. The question of unemployed of trained agriculturists who have passed out of this College can be solved to a great extent by the grant of lands lying uncultivated in Guntur and so many other districts. The land may be taken back if no improvement is made within the stipulated period. Whenever necessary the initial capital may also be advanced by the Government to be recouped in yearly instalments in the harvest season. The students of this College should also be given all facilities for the supply of good seeds, manure etc., to the ryots. All possible help should also be given to those who intend taking up any sideline of farming. Banks and capitalists can also render financial help in this direction. If such help is forthcoming I have no doubt that in course of time one will find in almost all the districts agricultural students of this college running model farms to the advantage of themselves as well as of the poor ryots in their neighbourhood.

13. Gentlemen, I thank you all for the patient hearing you have given me and I should consider myself amply rewarded if by this paper I have been able to induce at least a few of the students of my *Alma Mater* to take up private farming and allied industries instead of sitting with folded hands anxiously waiting for the Government to sanction some more posts in the lower ranks of the Department.²

Discussion.

Mr. Ramaswami Sivan enquired of the author if any previous equipment he had, did not stand him in good stead in helping on the progress he had made and of which he now gave an account. Mr. Pillai said it was not very much though he had a start by his association with Messrs. N. S. T. Chari & Co., for 3 years.

Mr. Tirumuruganatham Pillai criticised Mr. Sankaram Pillai's paper, doubted if the conditions in Guntur were the same as at Tinnevely to which Mr. K. Sankaram Pillai referred as a possible field for extension of the Guntur methods of cultivation. His own experience was that even in Guntur very favourable conditions obtained only in a small tract and did not extend beyond it.

Mr. Alwa analysed and enumerated the factors which brought success to Mr. Sankaram Pillai and wished many more students might have similar luck.

²Paper read at the M.A.S.U. Conference on 15th July 1925.

Dr. Naganna Gowd of Hospet who has had considerable experience of agricultural methods in India and America related his own experience on his return in Bellary and exhorted both the staff and the students to realise that go headedness in the art will go a long way to better farming.

Messrs. R. Swami Rao and G. R. Hilson followed with a further enumeration of factors 'contentment' and 'possession of backbone.'

The importance of the study of co-operation.

J. GRAY, F. C. S.

Registrar of Co-operative Societies, Madras.

When you invited me to attend your College Day and read a paper at your annual conference I accepted with pleasure, believing that I would be able to find time to prepare an essay dealing in detail with some aspect of agricultural co-operation which might be of special interest to you. But during the last few weeks there have been unusually pressing demands upon my time—demands connected with the introduction of the scheme for the reorganization of the co-operative department which was recently sanctioned by Government. That scheme, I may mention in passing, is, as you have already realized, of special interest to you as the direct recruitment to the grade of Assistant Registrar, on the conditions which have recently been notified, affords special opportunities to men who, besides possessing the general educational qualifications prescribed, have also specialised in agriculture.

2 As a result of the preoccupations which I have just mentioned I have not been able to find time to do more than jot down a few thoughts of a somewhat disjointed character, on the importance of the correct understanding of what co-operation is, on the part of everyone who, like yourselves, is interested in the agricultural development of India. It is now, I think, generally admitted that the co-operative movement, properly guided and assisted, is the most potent machinery for the economic betterment of the poorer classes in this country, and for the development of agriculture on which that economic betterment is, and must always be, very largely dependent.

3. It is a commonplace remark that it is extraordinarily difficult to persuade even educated men that co-operation is worthy of serious study. I do not mean that they fail to appreciate the achievements and the enormous potentialities of the movement but too often they fail to realise how much there is to learn about co-operative principles

and practice, and about the history of the movement, with its successes and its failures and the lessons to be derived therefrom, not only in our own province but elsewhere in India and throughout the world. In other words they are sometimes too prone to offer criticisms and to make suggestions, without taking the very considerable trouble necessary to equip themselves with that knowledge which is essential for the formation of constructive ideas and helpful suggestions. I am not suggesting that when you leave this College and take up your vocation in life, whether it be Government service in the Agricultural Department or some other sphere of activity, you are likely to fall into this mistake. I merely wish to warn you against a tendency which it seems to me is too prevalent, namely the tendency to assume that there is little or nothing for an educated man to learn about co-operation.

4. In this Presidency as in other parts of India the co-operative movement was formally started in 1904 although some tentative experiments on co-operative lines had been made in various Provinces even prior to the passing of the Co-operative Societies Act of 1904. Progress was at first necessarily somewhat slow but the rate of development has been greatly accelerated in recent years. I have not yet got statistics for the year ended 30th June last, but if I quote a few figures showing the position on 30-6-24, it will give you some idea of the extent to which the movement has spread in this Presidency. On the date mentioned there were 6,16,628 members in 9,505 co-operative societies. The total working capital of all these societies put together amounted to Rs. 839.27 lakhs. The members' paid up share capital amounted to Rs. 114.50 lakhs and deposits from individuals to Rs. 290.05 lakhs. I do not propose to weary you with further figures to illustrate the position which the movement has attained but shall content myself with mentioning that the number of societies at the present moment must be about 11,000 and the total working capital about 10 crores. The bulk of the membership and of the working capital relates to societies which are classed as agricultural. You will realise therefore what an important factor co-operation now is in the economic life of the agricultural population of our Province.

5. To those of you who hope to enter the Agricultural Department I would point out that the co-operative organization, forming as it does, a net work of societies throughout every district in the Presidency, and consisting very largely of agriculturists affords a most excellent vehicle for the dissemination of knowledge regarding improved agricultural methods, seeds, manures and implements, the value of which has been scientifically tested and proved by the Agricultural Department. These societies also afford a very useful machinery, ready at hand, for the widespread distribution of improved

seeds, manures and implements. In this connection I would plead with you, if and when you enter the Agricultural Department, to regard the co-operative societies and their Unions and Federations, with which your work will bring you in contact, with a large measure of sympathetic consideration. Do not assume that, because one or two societies turn out to be unbusiness-like or indifferent to sound advice, all societies or the majority of them are like that. Remember also that the co-operative movement in India is only 21 years old, and that is too short a period, even in areas where circumstances are most favourable, for the vast work of rural reconstruction to which co-operators have set their hands. The movement grows and develops more quickly in some areas than in others and it does not follow, because co-operative societies in one part of a district have not yet advanced sufficiently to take up and popularize the improvements suggested by the Agricultural Department, that societies in other parts of the district are unable to do so.

6. One of the first questions which the student who turns his attention to the co-operative movement naturally asks is what is co-operation (in the technical sense) and what constitute the essential features of a co-operative society. It is easier perhaps to explain co-operation by showing how it differs from other forms of organization. A fairly comprehensive definition of a co-operative society will be found in Mr. Fay's standard work entitled "Co-operation at Home and Abroad" 1920 edition. His definition is as follows:—

A co-operative society is "an association for the purpose of joint trading originating among the weak and conducted always in an unselfish spirit, on such terms that all who are prepared to assume the duties of membership share in its reward in proportion to the degree in which they make use of their association." This definition is of course very wide but as Mr. Fay points out "any narrow definition runs the risk of excluding much that claims, and is recognized, to be co-operative."

7. Now the first point to note in this definition is that co-operation is business and not charity. This distinction may seem to be obvious enough but nevertheless I occasionally have to deal with proposals for the formation of co-operative societies or for the initiation of co-operative activities which indicate that the originators of the proposals have not grasped the difference. The distinction is sometimes illustrated by means of a medical analogy, the co-operative society being compared to preventive and the charity organization to curative medicine. One of the objects of every co-operative society is to encourage self help among the members, and the introduction of charity into the co-operative organization tends to

retard if it does not altogether stifle the spirit of self help. The next point to note is that the members of a co-operative society join together under the pressure of some common need, for the attainment in common of some business purpose. As Mr. Calvert puts it, one essential requisite in a co-operative society "is the marked consciousness of a common interest in the accomplishment of some definite purpose. The purpose may be improved credit, cheaper supplies or better prices for produce or any other common economic need". And it is this which distinguishes the co-operative society from the joint stock company. In the former the stress is laid on the combination of persons, in the latter the important point is the combination of capital. The grand rule of co-operation is "each for all and all for each". The principle of equality as between members of a co-operative society irrespective of the amount contributed by each towards the share capital is universally accepted by co-operators and hence the provision "one man one vote" which finds place in the by-laws of all true co-operative societies. The next point which calls for remark is that a co-operative society must admit all who are prepared to assume the duties of membership. The membership of a co-operative society cannot be arbitrarily limited and no society is really co-operative which allows itself to become a closed corporation. Theoretically every member should have the right to express an opinion as to the fitness of another to assume or to continue to perform, the duties of membership. The admission to and expulsion from a co-operative society are therefore decided by popular vote. For practical convenience however the power of admission is generally vested in the Board of Directors.

8. That last principle of importance which is brought out in Mr. Fay's definition is the principle underlying what is known as the rule of patronage. That rule is that the members of a co-operative society should share in its rewards in proportion to the degree to which they make use of their society. In a co-operative society the money invested as share capital is regarded as entitled only to a reasonable return in the shape of interest. For this reason, the dividend on share capital in co-operative societies is always strictly limited, the limits fixed in this Presidency under the statutory rules being 9 per cent. per annum in the case of societies on the unlimited liability basis and 6½ per cent. in the case of societies on the limited liability basis. There are of course no profits in the commercial sense in a co-operative society. A co-operative society is composed of the members, to whom alone it restricts its services and it cannot therefore make a profit out of its members in their individual capacity. Any divisible surplus which results from its transactions with its members after providing for a contribution to Reserve and for the limited return allowed as interest or dividend on share capital, is

regarded as an overcharge for services rendered to members. It belongs to the members from whom it has been derived and is therefore returned to them in proportion to their transactions with the society, as a bonus on custom.

9. I have now dealt with the main principles underlying the form of organization known as co-operation. From these main principles there follow several subsidiary principles which find expression in the by-laws of co-operative societies but I have already taken up too much of your time and I shall therefore not attempt to deal with these subsidiary principles now. I trust that I have said enough to convince you that there is something to learn about co-operation and that the subject is worthy of serious study.*

Discussion.

Mr. C. V. Venkataramana Ayyangar, M.L.C., in the course of his remarks said, "I would suggest that the better thing would be to enlighten ignorant people and find ways of showing to them that they are wrong in thinking about the imperfections of this college and that the students trained here are not doing as much good work as they are expected to do. But that is only by the way. So far as I have been able to attend this conference and study this question I should like that a large number of *outsiders should have been asked to attend this conference* and to show them what we have been doing and what can be fairly expected in the short period of the existence of this college and this can be done only by having conferences which means a little expenditure. I also wish the items of progress be published.

It has been said by more than one great man that Co-operation and Agriculture so far as the two departments are concerned might be amalgamated. It may not be of much use to amalgamate them completely but certainly I would expect a little more Co-operation and united action by the two departments together. There is no doubt whatever that the Co-operative Department has to help the Agricultural Department if it is really to do good to the vast masses of agricultural people living outside the towns. It is therefore I say that agriculture and co-operation have to work together. It is a very nice idea, if I am permitted to say so, which the Minister gave expression to, that at least in the appointment of the higher posts in the Co-operative Department those graduates who have some study in agriculture will have preference. I hope that instead of being preferred 8 agricultural graduates may directly be appointed to these posts, because my own idea is that Co-operation in many places is becoming more or less a fad and instead of the idea of this department being given effect to we must take Co-operation to

*Paper read at the M. A. S. U. Conference on the 15th July.

help the people on a large scale. It is unfortunately becoming limited to a small cost, the number of members may increase and the number of societies may be doubling, the capital invested may grow but yet it is a well known fact the proportion of the people who are directly coming into contact with the co-operative department is practically nothing when compared with the vast 40 millions of this Presidency. Last year we had 8 crores invested and it may be that next year it may go up to 18 crores. But what is it after all when compared with the vast indebtedness of the agriculturist? It is unfortunate as many of us know and so far as the ryots of this district are concerned we can safely say they are whether rich or poor, high or low, vastly indebted and it is not in the hands of the co-operative department but in the hands of the sowcars. So far as this district is concerned every pie that the landlord gets from the land is going into the hands of the creditors. Therefore if the Agricultural Department is to think of helping these ryots by way of their capital being invested in the land they should advance money to them. For this the Co-operative Department must have crores and crores of money, to help these people out of the hands of the pressing sowcars. But a knowledge of co-operation will prevent them from getting indebted hereafter. Therefore it is a timely idea that the Registrar of Co-operative Societies thought it necessary, thought it advisable, in the midst of pressure of work to come here and read a paper to combine the working of that department with agriculture. It will be a very good thing for students both present and past if they devote all their time to this question. It would be very desirable that the two departments be linked together and that appointments be made from Agricultural graduates."

Paddy breeding stations and their usefulness.

BY M. ANANDAN,

Assistant in Economic Botany.

In view of the fact that the Government are opening paddy breeding stations in important paddy tracts of the Presidency, people are beginning to be naturally curious to know what these stations are going to do with the paddy crop for its improvement. It is to satisfy, at least partially, that curiosity, the following paragraphs are written.

The total area under paddy in this Presidency is in the neighbourhood of 11 million acres and from this it would at once become clear that, if it is possible to effect improvement, say, in yield, by one per cent, the total increase in output as well as monetary return to the cultivators will be enormous. But experience has shown that a ten

per cent increase in the yield of the varieties already in cultivation is easily possible and has been more than attained wherever paddy breeding stations have begun to operate. It is because of this certainty of good results that the Government are encouraged, and have been pleased, to sanction the opening of some more stations during the current year.

Let us now see how these improvements are brought about. Broadly speaking, they are brought about in two ways. One is by the selection of single plants of promise from the already existing varieties. In this connection it is to be noted that most of the varieties now under cultivation are not pure for various economic characters, such as length of ear-heads, number and size of grain, height of plants, period of flowering and so forth, just as children of the same parents in the human family are not all alike in their physical and mental peculiarities. This the plant or animal breeder attributes to what is known in scientific language as gametic impurity or heterozygosity of the parents concerned. So the first thing the paddy breeder does is to gather all the important varieties grown in the tract which has ultimately to benefit from his work and grow them separately in small plots on the breeding station. He makes careful note of the behaviour and specific peculiarities of these varieties as a whole. Then he commences a search in each of these varieties for plants that are outstanding in certain economic characters such as tillering capacity, height of plants, length of earhead, earliness, resistance to drought, alkalinity or fungus diseases, and various other important points. Anything from a dozen to a hundred plants may be so marked out and grown as separate units so that each plant and its progeny always go by a definite number or symbol of recognition. It may be that a larger or a smaller number among these selections breed true to the valuable characters for which their parents have been selected. Those that are not true breeding are summarily rejected. The true-breeding plants are retained and their produce is accurately weighed and other characters measured with great precision. Even among the true breeding lots, those that are found poor in their performance in the preliminary examination are rejected. The remaining lots that are considered to be of promise are put to a further test the next season by comparing them against the variety from which these strains have been originally selected for merit. All possible precautions are taken to keep down as low as possible, the experimental error involved in such tests so that the results obtained may be a true index to the superiority or otherwise of the various strains under trial. Then again, as the seasonal factor from year to year affects one and the same strain differently, care is always taken to eliminate its effect by continuing the test for at least three seasons consecutively, as it is

number of forms resulting out of this cross he searches for plants that are resistant to alkalinity and at the same time producing white rice. When once these are secured in pure breeding forms, what next remains is their multiplication and testing under suitable conditions to arrive at the best strain in the group. Examples like this, where suitable combinations of characters have been brought about by crossing, can be multiplied indefinitely. It will be clear from the above that the paddy breeder not only isolates and selects superior individuals from the varieties already in existence but also tries to create new strains that never existed before, to meet the requirements of special conditions and particular environments.

As the soil and climatic conditions in different paddy areas of the Presidency vary widely, it has been found by actual experience that strains suitable to one locality are not always found to do well when tried in another. And it is also futile, say for instance to attempt to produce a strain in Coimbatore for flood resistance in Malabar or Godavari when we know it is impossible to test in Coimbatore such a strain under natural conditions of a flood that occurs so very often in the latter districts. It is because of the existence of such peculiar local problems that it is very essential that they should be dealt with on a station situated within the locality itself. So, for instance, in Malabar the Station will have to set to itself, among other things, the task of evolving strains suitable for dry lands, flood resistance and salt water lands known as "Kaipadus" occurring near sea coasts.

What the Paddy Breeding Stations at Coimbatore and Aduturai have already achieved.

The Coimbatore station, besides adding very materially to the existing knowledge of the fundamentals of genetics in general, has been able to evolve four strains that, at a very modest estimate have spread to very nearly a lakh of acres mostly in the districts of Coimbatore, Salem, Trichinopoly and Madura.

The Aduturai strains (seven in number) during the 1923-24 season have been estimated by the Deputy Director of Agriculture, V Circle, to have covered nearly an area of 35,000 acres. Taking one tenth of the produce of this area to have been reserved for sowing during the 1924-25 season and taking the average produce per acre at 1,870 lbs. and the seed rate at 50 lbs. per acre the total area under this strain must have been 130,000 acres during the last season. The extra monetary return to the ryots of these tracts by growing these improved strains during the last season would have been over a million rupees, assuming 1500 lbs. as the average yield of ordinary varieties per acre, ten per cent as the increase in yield by growing the improved strains and taking its monetary value at 8 per 150 lbs. of grain. But let us remember that the Paddy breeding station at Aduturai alone has to deal with nearly a million acres of

Cauvery delta and it is a question of a few more years before it is wholly cropped with the strains evolved by this breeding station. When this hope is realised, even assuming that no more increase in yield than the present ten per cent was possible, the total annual extra income to the paddy cultivators of this tract will be about 8 million rupees.

In conclusion it is hoped that sufficient has been said to indicate the main lines of work undertaken on paddy breeding stations in a general way to make the people realise what potentialities for good such stations have before them.*

Discussion.

Mr. Rajagopal Naidu said:—Of the different kinds of activities that are being appreciated by the people surrounding Coimbatore the most prominent is that of the Paddy Breeding Station. It has evolved a certain variety namely G. E. B. 24 which has been taken up by the ryots in the surrounding parts and elsewhere. The paddy station at Coimbatore when the College was being started was confined to a tract of 50 acres mostly saline in nature. And that land with intensive measures of cultivation has been giving a steady increase in yield. Of course the cultivator tries his best to go as deep as possible but his resources are limited and his capacities too to go in for costly implements to plough deeper, and the surface conditions governing his plots of ground do not allow that soil, sub-soil drainage. If these conditions are created and brought into effective operation amongst the ryots, land, no doubt they will also get the same results as the experimental farms.

Mr. G. N. Rangaswami Ayyangar, Millets Specialist, said: I come out to speak, as I thought that when the call came from the Chair, it must be obeyed. With regard to the need for sub-stations I can speak with some experience, having worked in Rice which is what I consider a well disciplined crop, and now working on Millets, which I designate a rabble compared with Rice. Doing work on Millets, my conviction with regard to the need for sub-stations has become strengthened. I have had Millets from various parts of the Presidency, some of them grow well, some better than in their own habitat, and a good number that have made a name elsewhere are miserable failures here. It is not always possible, in dealing with a crop, for people to realize that we are dealing with a live plant which is as much a victim to circumstances as any other creature is. When a case is put up for a Sub-station, it must be realized that we are not like the Carnegie Institution engaged in abstract research independent of the trammels of economic applications but dealing with economic crops which touch the pockets of the ryots. We belong to the Agricultural Department and are engaged in research

*Paper read at the M. A. S. U. Conference on 16th July 1925.

under the limitations which the regional distribution of each crop imposes. It is not enough that we are able to grow good crops under the hot-house conditions or in pot cultures, but we should endeavour seriously to cater to the needs of the ryot in his own localities. We thus find ourselves impossible to grow everything in a central station. A sub-station on a regional basis, is felt a compelling necessity. The point is there is no use of saying I have Cholan here, I have Cholan there but to consider whether the region mentioned is of a sufficiently important nature, to merit attention as an economic unit. In the case of rice, after good fundamental research at Coimbatore, we had the Aduturai station for the Tanjore Delta. Next the Kistna station is taking shape. Malabar is to have one soon and Ganjam is waiting its turn. Thus, the first desideratum is to gain experience at headquarters devoted to fundamental research and then in due course spread out to sub-stations buttressed with the results of such research. If we are to fool about any problem let it be at headquarters, instead of precipitately flinging our foolery all over the Presidency. We have to go about our problems with a calm and sober mind, and so to say, hibernate at headquarters for a series of years. Having done that, the next thing to do is to choose a big Economic region and work out the salvation of the staple crop thereat. It is necessary to equip ourselves with the necessary trained staff to run these places. In this connection I may mention that economy is misplaced in equipping these stations, and any misplaced economy may taint the very fountain sources of all seed purity and excellence. I would end with the solemn warning that what is wanted is a thoroughly well equipped sub-station both in men and material, and no patch-work.

Mr. Govinda Kidavu said that Breeding Stations are absolutely necessary to produce good seed, and maintain their purity, to raise a very good variety and point out the land most suitable for the variety and to study several problems incidental to the spread of good varieties in different tracts.

Agricultural education among the masses.

K. UNNI KRISHNA MENON.

Assistant Director of Agriculture Tellicherry.

That education has been unmaking agriculturists was the complaint in many civilised countries like America. The tendency of the educated man to live in towns is not also confined to our country. It has been seldom possible here to get the really educated man to take to agriculture and to lead a contented and happy life in a rural area. As a result of this, it is also felt that in the same family the unfortunate amongst brothers who was unsuccessful in his educational career goes back to his lands as a matter of necessity. Thus in many families there is a sort of aversion created to farming as it is meant

to be the profession of the failures. By this process of selection as a rule the least intellectual of the brothers of a rich family goes to manage or cultivate lands and the man who could not get into schools on account of his poverty also happens to be the farmer of the village. Perhaps the largest proportion of the present day farmers belong to the latter class. This is quite an unfortunate state of affairs which retards progress in farming.

It is not within the scope of my short paper of to-day to go into the details of the cause or causes that create this situation. I confine myself to the best way of educating the man behind the plough who is as a rule both illiterate and conservative. He is destined to follow this walk of life often quite against his own will. He has to be taught improved farming by a system of practical coaching in which the results must be made to actually pay him better. This is the work that every agricultural propagandist is doing now. I therefore propose to place before you for discussion all important lines of work of the agricultural officers in order to obtain more information on the subject from all practical points of view.

We all know what low percentage of farmers we come across who condescend to hear an agricultural demonstrator. In how many instances a Demonstrator gets the sympathetic request to go home before the sun gets hot when he would have actually wasted time over his cautious farmer friend, is a fact too well known to the worker in the field. Out of the small number of patient hearers we get a very small percentage to adopt improved methods even half-heartedly. Thus the number of actual farmers to follow improved methods of agriculture is but a few men in every ten thousand. We also know the enormous extent of work we had to do for what we have achieved hitherto. My idea is that we must be able to concentrate our energies on teaching the farmer about our methods in a more telling manner. The results obtained at the various Government Farms far from or near a farmer's home do not appeal to him strongly enough to prompt him to act up to the Demonstrator's advice because the farmer generally believes that we are spending enormously on farm crops without any economic justification. The demonstration plots opened by rich farmers also share the same fate as the farm in their effects. In this case, he attributes the better results to the good luck also of the rich villager. It is not therefore easy to get an ordinary poor farmer to adopt new methods in his cultivation till he gets convincing results. The responsibility for the apparent risk, which deters him from adopting improvements should be divided among the members of a society. Several individuals in a village should have pecuniary interest in an undertaking like this so that they may be well impressed with the results. There should also be several plots to prove one and the same item of

In dealing with the education of agricultural masses we have to look far ahead in the matter of practicalities and whether we are fit to teach at all. Consequently if the agricultural department wants to spread education among the masses it should be imparted in the language of the ryots by persons who know agriculture in all its details so that they may show practically in the field what they intend the ryots to take up.

Mr. N. S. Kulandaswami Pillai.—The District work in the fifth circle is mainly confined to Paddy. With the results obtained at the late Manganallur farm some demonstration farms have been started in Trichinopoly and Tanjore. The demonstration plots are laid out in the ryots' fields and expenses for manure and seeds are borne by the ryot but all the demonstration is done under the supervision of the demonstrator. No doubt co-operative societies are the best means for spreading agricultural education among the masses. But their object is quite different from improving the agriculture. As their object is only borrowing and lending money, it is difficult to do any agricultural work, among them co-operatively. To teach them, to put them in the way and create an interest in them, the President or a secretary or a member who has interest in agricultural improvement is generally selected and the demonstrations are conducted in their fields. In a village of the Trichinopoly district, in Lalgudi, the headquarters of the taluk, several ryots have been doing this sort of demonstration work. There, members have been clubbed together and a co-operative demonstration society started. This society is on trial. It was started this year. Its main work is this, ten acres taken on lease are laid out in 2 acre-plots to show improvements suggested by the Department, where deep ploughing is compared with ploughing with the country plough, local manure with the departmental manure. And a portion of the field is under economic planting to show its advantage over bunch planting. If this proves a success many more societies will be formed and affiliated to the Central Society. These societies can pay a percentage of their profits to the Central Society and the Central Society can later usefully employ a demonstrator and a demonstration maistry. Then the expenditure of the department will be reduced and their usefulness enhanced, as this would give them opportunities to turn their attention to other societies.

Mr. D. Ananda Rao.—Mr. Menon's sheding of the paper was rather misleading to me. I thought he was going to treat of the education at an institution. His central point of discussion was, I believe, that demonstration could be done more successfully and more completely with the aid of certain societies, because the differences may be in the soil or due to other reasons. That is a very good idea. And with the same idea I attended a co-operative society meeting

at Cuddalore and tried to persuade the people to organise themselves into one particular society to take up demonstration. The headquarters of my demonstrator is at Cuddalore. I was not able to get a suitable secretary of the society in Cuddalore to do this demonstration. The scheme was pointed out and several people living in the same village promised to have demonstration plots in the village. I was not able to go but I sent my Assistant Director to inspect. He found that all the instruction that was given was of little avail, whether in the application of bone meal or in the cultivation of groundnuts, cholan or dry paddy. I give this as a sort of warning to myself and to others that demonstration plots can be successful if the demonstrator is on the plot from the beginning to the end. Whether the demonstrator with his other work can manage successfully a number of plots is I think a debatable point. I do not think it is possible for him with other work to go to demonstration plots more than once or twice at a particular period and to be present during grain harvest. I do not think it is possible for the demonstrator to successfully manage a number of demonstration plots. But Mr. Kulandaswami Pillai's experience is different from mine. I have almost lost faith in demonstration plots. I know a case where a demonstrator was asked to spread fish manure and even finally he could not go there in the right time. But then the manure was spread by the owner and in a wrong manner. These accidents whether knowingly or unknowingly do occur and I do think—at least my belief is—that one plot of $\frac{1}{2}$ an acre or so under the demonstrator's eye could be likely to be much more successful than a number of demonstration plots scattered all over at least 50 per cent of which are unsuccessful. All the work in a demonstration farm is done by a trained cooly and the demonstrator is on the spot practically throughout a good part of the year. Whenever any mistakes are likely to occur these are controlled by the demonstrator and these are likely to appeal to the people more than the demonstration plots. In this direction the co-operative people ought to help us more. I think a co-operative society member is no more educated than the ordinary ryot, perhaps, he is less of a farmer. But if they are farmers, with such members of societies, it would be certainly much more easy and much more possible to run demonstration plots successfully far away from headquarters on the lines on which they are run at headquarters asking them to do most operations themselves.

Mr. N. S. Kulandaswami Pillai rose a second time to supplement the information and observed:—Of a few gentlemen who run these demonstration farms in the Fifth Circle, one was Mr. Rajagopalayyar a retired engineer of Madras who sought advice through the Director and wanted to have a demonstration farm. He is a man

who lives in the village and has got most of his relations in his village and he is a very good agriculturist and there is another retired gentleman Mr. Srinivasan who has a demonstration farm. If such retired officials take up this work and run these farms with success, I should think these demonstration farms will prove useful. I do not say that some mistakes may not be committed but such mistakes, if they occur, are very few and are quite negligible.

Dr. Norris said:—I was hoping the discussion would have taken me to a wider process but it has only gone as far as the question of demonstration is concerned. And the title of the paper I think covers a very much wider ground of discussion. We should have heard something more for example of the theoretical side as to how far the experiment of the Agricultural Middle Schools had been considered a success or not. Now the short course at the College has been abandoned. It is surely necessary some sort of substitute followed and it should be decided what the nature of the substitute must be. I have myself had some experience. I am acquainted with a few conditions. I should think that instruction should be in the form of vernacular of some kind in one or two areas, but then again, to add to it, at what stage that course should begin and what character of people we can get, lead to questions of a different kind. Really this question seems very much wider, it is not merely a question of imparting direct agricultural education. The whole thing seems to me to hang on the question of general education not only of the masses but of the whole body of population. It seems to me that lack of education does hinder the department very much. People whom we may expect to work for the department are very often amongst the worst critics and criticism is very often uninformed. Of course the main aim of the Agricultural Department is to try to educate the upper classes by propaganda or by any other means because if they do really understand what the department is trying to do and give very careful consideration to the work, undoubtedly they can do much work in the cause of education for the masses.

Returning to the question of demonstration which has been the main topic of discussion it seems so far to turn on the question of demonstration farm plots. While there are reasons to show that demonstration farms could be more efficiently managed the reasons which Mr. Ananda Rao adduced for the failure are not convincing. It really means the experiment was not carefully conducted. The demonstration farms were a failure because the man in charge was inefficient, that is an essential point in trying demonstration plots and it can be done by a thoroughly efficient man properly trained for work. Otherwise it is simply doing more harm than good. "The farm here, this form of the Government with unlimited resources gives good results. Can we get them ourselves?" That is how a critic thinks. That is why I think there has been a certain amount

of criticism of our present system of farming in the districts. Naturally a farm which carries out research work, experimental work and demonstration work cannot be run and hardly be expected to pay, that is the criticism which comes here. Where a farm does not pay to carry on such methods, the great deal of expense is due to the experimental side of the farm, that is a criticism misunderstood. We could keep experimental farms and demonstration farms as separate farms. To improve the conditions of the different localities I would like to say, demonstration farms were run simply for that very purpose and it can be shown definitely that such farms can be run in an economic manner. And that is the surer way to convince the ryot and to say it is a profitable concern. Duplication is a great thing. It can be done in bigger centres. We must continue these demonstration plots. I do recognise and it is essential that such demonstration work should be carried out only by men who have got time and necessary knowledge to carry on the work efficiently.

Mr. Ananda Rao again said:—I am awfully sorry that Dr. Norris has misunderstood me. By demonstration farm I do not mean a Government Demonstration Farm. In my circle there are four demonstration farms run in cultivators' lands by the demonstrator and the expenses paid by the cultivator for all items of labour and capital except in the case of manure like phosphates etc. These plots compare side by side with the local methods. In my administration report of last year he will see how these farms have been successfully run. I mean by demonstration farm a small plot of half an acre run in the cultivator's land. The difficulty is to choose suitable sites for cultivation.

The President intervening said:—I believe there is some misunderstanding in the use of the word 'demonstration farms' and 'demonstration plots', when you apply the term 'demonstration farms' you mean areas owned by the Government, but in the demonstration plots your advice is given and the ryot is asked to watch what he does and what is done through the agency of Government.

Mr. P. H. Rama Reddy:—In my circle there are not very many demonstration farms. We have got at present two farms which are started only for research work. If we take pure demonstration plots, last year they were fairly successful. And I think on this point it is much better my friend here Mr. Tandu Mudaliar speaks. As regards mass education I can assert with a certain amount of confidence that I have been on the fair way to success and winning the confidence of the ryots. The co-operative department has given help has shared the responsibility and registered societies for the purpose of selling cotton lint.

Mr. Tandu Mudaliar. (Honorary visitor to the College from Bellary) said :—President and gentlemen, I am neither a politician nor a schoolmaster. I am not much accustomed to speak in public and if I do not place facts in an eloquent manner as my previous speakers have done, you will pardon me. Now particularly in Hospet with the aid of the Department I was conducting some experiments on paddy and sugarcane in the methods of transplantation suggested by them. We had some demonstration, we had pretty good results and we have started some more trials. The surrounding ryots have also taken the very same methods and are having very fair results. We tried to bring a new cane variety from Hebbal and also from Coimbatore and the results are not yet known. After coming to the College I have been taken round these palatial buildings to see all things. My question is how far does this institution in any way meet the demands of the numerous ryots in the Ceded Districts? Our difficulties are enormous, because of very little rainfall. One of the most important subjects arising out of it is the conservation of moisture and I think the investigation should be taken up here immediately. And if this investigation is carried on it will be a great boon particularly to the Ceded Districts.

And now about Mass Education. There are about 50 graduates here and these 50 men are maintained at a cost of about 20 millions and my friend Dr. Gowd assures me that in other countries with less staff they are sending out 1500 graduates every year. And I cannot say that they are not doing good work here and that they are not having to meet the immediate needs of the people. The general complaint now is that it is not possible to bring the ryots together but we know, gentlemen, that we have got a number of School Final students who could not get admission into the Government service. They do not know what to do. I wish to know whether you could not make use of them. You need not give them higher education but at least you may give them the rudimentary knowledge of the subjects. And if these men are trained in agriculture when they go to their villages they would be spreading their education and thus they would be helping the Department in the demonstration &c.,. Some of the high officials may ask where to find the money, but I may say a portion of the land revenue may be earmarked and the local boards asked to work it. That would be my point. Several members spoke yesterday that some posts should be given to the agricultural graduates. We have got a big college here and a co-operative Stores is going on and meets all the demands of the people here. Why not the College start a Co-operative Society and force all the students to become members and give training to each of them in the practical method of maintaining a Co-operative Society and in its management. That of course is the best training one can have and infinitely better than some of the lectures given on the subject.

Mr. T. V. Rajagopalachariar :—Gentlemen, I rather appear in the closing scene. The subject took a different turn to what the title of the paper seemed to indicate and mostly turned upon the merits of the demonstration plots and demonstration farms. Dr. Norris has pointed out that Demonstration farms would have been a failure only on account of inefficiency. We have been having demonstration plots of this type only for the past 2 or 3 years and it is too early to know all about these, and judge correctly.

As regards the question taken up by Mr. Mudaliar our honorary visitor, I claim to possess some knowledge of the Ceded Districts. Mr. Mudaliar lays some stress on the question of the conservation of the soil moisture. The Ceded Districts ryot takes all possible care to reserve moisture for his purpose. Yesterday Mr. Sankaram Pillai dwelt on the superior methods adopted by the Central Taluks of the Guntur District which represent the black soil conditions there. He said that chillies and tobacco are grown on a commercial scale and in the best manner. If now this sort of cultivation is not adopted elsewhere with the same elaborate care and attention bestowed on the Guntur Black Soil tract the ryot knows the conditions there are different. The rainfall is confined to a few months and he takes care to see that the moisture is retained. He ploughs and he opens up the soil in various directions and thereby wants to get all the rain water and tries to conserve moisture. After he has conserved this moisture he plants chillies and tobacco. Fortunately for him weather conditions are different there from the rural parts of the other tracts, the temperature is very low and rain is preserved in the best manner possible. I do not know if the conditions here are such as will admit of trials being conducted here to benefit the Ceded Districts ryot.

Labour.

T. B. ANDERSON, Landlord, Danishpet, Salem.

Honourable Chairman, Ladies and Gentlemen, it gives me great pleasure indeed to be here amongst old friends and I recognise many familiar faces in this company including the Honourable Chairman who was my father's great friend while he was working in our Division. Our Secretary gave me rather a surprise when he wrote and asked me to read a paper on some subject which was dear to me and which would be of interest to you. It was quite a long time before I could think of anything that would not only interest but also be of some use to you. I was nearly giving up in despair for it seemed to me that whatever line of my work I thought of was a failure.

still, after going through it all, I decided to take as my subject 'Labour' a question which has given me much to think over and study and I hope that what little I am now able to say will be of some little help to at least those of you who have to deal with Labour like myself.

Labour is a question which does not interest all people who have to deal with it and this results in its being badly handled, making the life of both labourer and employer a great misery. Labour is the back-bone of Agriculture. It does not matter that you know all about agriculture, all about crops, about plants, about soils, about manures, about pests and how to overcome them, and the whole lot of that or that you have had your training in this College or whether you studied in foreign countries, still if you do not know how to manage labour you will make a sad failure. The first thing we have to take into consideration when we have to deal with Labour is that labourers are human-beings and not bulls or buffaloes, though I must say that some of them behave as if they were such. To treat them as human beings one has to give them a living wage. To me it seems that field labourers are paid far too little and hence they are living under poor conditions which cannot but detract from their efficiency, but on the other hand the customary wages of your neighbourhood should be taken into consideration. Paying too high wages will not, as one would think, make the labourer respect you, but on the contrary may make him look down on you and you will soon find that instead of working harder he will grow as I seem to have a tendency, and will much prefer the shade to the hot sun, and a good if possible smooth stone to support his further extremities than a crowbar to remove that stone from the field.

It is not unfrequent that land-lords and labourers look on each other as mutual enemies, which almost seems as if this were the root of all the trouble with Labour. The land-lord tries to exact as much work as he can out of the labourer and gives him as little as possible whereas the labourer shirks as much as he can and tries to squeeze out of the land-lord as high wages as possible. This should not be the case; there should be friendliness, co-operation between land-lord and labourer. In Denmark, my father says, that when a labourer enters a farm he works as if that farm were his and the employer treats his labourer as if he were his brother. The land-lord should pay sufficient wages for the labourer to live comfortably, and still, he should conduct the work in such a way that the labourer does a good day's work and that with ease and pleasure. This is easier said than done, and, can only be reached by carefully, intelligently and sympathetically studying your man, by looking for his abilities and putting him to such work as he is fit for by appealing a

little to his pride, by bringing out his latent good qualities, by encouragement and also by introducing a little competition. Each labourer should be given a work for which he has a bend, for instance one who has a liking for animals should be put to take care of the cattle, and he will give you twice as much work for your money with this than, say, if you made him work in your paddy fields and he will still find pleasure in it. The labourer should be induced to take some pride in his work. A little fun made of bad work and encouragement of good will help a lot and will sometimes bring out the labourer's latent good qualities. My father says that in Denmark labourers take so much pride in their work that they strive to do better work than their neighbours and still get it done quicker. He also mentioned once that the bigger farmers when they were striving to make Dairying a success found that they were not able to get good men to take care of their cows when they were called "Cowmen" but they soon found that better men who had more pride were available when they changed the name to "Cattlefarmer." And then comes in the question of competition. Competition also helps much to improve the labourer. I have for the last two years divided my men into three blocks so that there is competition, and I find that this has helped immensely, though they are yet far from perfect. Those that before, when all together, used to make the hard workers do their share of the work now find they have to do their own share while the others do theirs. I am of the opinion that much could be done on the Central Farm in this line-but I am afraid that most of them are such old hands that they know all the tricks of the trade.

I will then deal just a little on the different kinds of workers. They may be divided as follows:—(1) The slow steady worker with common sense. These are the ideal and one does not run across them every day. They will work at a steady pace the whole day without stopping and will work whether you are present or not. They also do not need so much supervision as their common sense will guide them in their work (2) The slow steady worker without common sense. These will work all right without supervision but only on work with which they are thoroughly acquainted. If left alone with some work they do not know much about, you will find to your sorrow on your return, that a lot of work has been done, but, unfortunately will have not only to be undone but also redone. So to get the best out of these one should never leave them alone unless one is quite certain they know their work thoroughly.

I have a man who can be included in this type. I was much struck once when I wanted a huge tree about eight feet in diameter cut down to make a 'dug out' that after asking several people without success he replied on my asking him 'It does not matter how big

it is-it is only a tree' He has done a lot of forest work. As I left him at the tree and returned that evening I found to my great pleasure the tree lying down on the ground.

(3) Those who work while you are present who, in other words, may be called eye washers. These to the inexperienced will seem the best workers. There are I see some of these among the labourers on the Central Farm. As long as you are about they will work at a rate which you cannot but regard as splendid, but those who have some experience will know that this cannot go on for more than ten or fifteen minutes and that if you leave them alone at the end of the day you will find they have not done much more than when you saw them last. A remedy for these is either to stop with them for a couple of hours and make them work at the same rate as they have been working or measure the work they have done and tell them they have to show a proportionate amount of work in the evening.

(4) The fourth division are the 'Dandies'. Those that come to work grandly dressed up with a fine turban etc—who can nearly not bear the sight of a mummattee, who are put to a very great inconvenience indeed when a bit of 'slush' splashes on their clean clothes. I generally think twice when such a man comes to me for employment and I will only take him if I think a wet shirt (if he has one on) will rectify him.

(5) We then come to the last but I am sorry to say not least in number—those who shirk work. These again may be divided into (a) The unintelligent—They are the easier of the two to deal with. They are not clever enough to hide themselves when they shirk. You will find them sitting down often and they take an awfully long time to open their bags and find their tobacco etc., and if one is not careful one can also find them having a good sleep under the shade of a tree. These can be righted only by closer supervision. They absolutely cannot work when left alone. (b) The other division of the shirkers is the intelligent. These are very hard to deal with. There are, I think, many of these on the Central Farm and it is because they belong to this class that I mentioned previously that they would be hard to deal with. They shirk work without your knowing it. Outwardly they will appear to be doing very hard work but actually they are doing practically nothing, their mummattees if they are doing mummattee work will be moving continually, but if you look carefully you will find that three strokes are used where a good worker will use only one. Such workers love to work in company so that they can make those who work hard do their part of the work. A good remedy for them is to divide them and make them work separately. They will then soon see that they are far behind the good worker and

will have to hurry on to catch them up, but if you are going to remedy you will have to see that you have a good worker amongst the lot.

When dealing with labour our main object should be not to get the most for our money but to see what good can be got out of the work for the labourer. Often those who have to do with labour say that labourers do not know what kindness is, and this is true in a way especially when excessive kindness is shown, and some labourers who have not more common sense will think you are afraid of them and therefore will not give you due respect and this may end in sad results. While showing kindness you should still keep your place so that you will win both respect and love from your labourers. Harsh words at inopportune moments may for ever break the good relationship between land-lord and labourer, harsh words should be used with great care. Continual nagging is also a thing that nearly never should be used. Each time you speak to your labourer you are brought down one grade in his eyes, and you break a link in the chain of good relationship between land-lord and labourer. If a mistake is made it should be noticed and rectified at once and as far as possible should never be brought up again. Another thing I find is that breaking the monotony of the life of the labourer works wonders. I can get much more out of the men by letting them have a day or half a day off now and again and take them out hunting or let them go to some feast or other. We all know from our school days the old saying "All work and no play makes jack a dull boy" and it is just the same with your man. I have gone so far that, right in the middle of the busy paddy season when I have had about sixty ploughs out, I have let them stop work to finish off a stray boar who had lost his way and got stuck in the 'puddle'. And now in closing I would like to say that while you treat your labourer with love and sympathy you must still see that he gives you honest work and enough of it and at the same time that he gets the most pleasure possible out of it. And lastly I would like to impress on you that while much depends on that labourer we are the "Intelligentia" and it is up to us to make our own lives happy and profitable by making the lives of our labourers more of a pleasure and less of a grind*.

Discussion.

The President. The paper that has just been read by Mr. Anderson shows very clear evidence of the thought that he has bestowed upon the subject of labour. It is a very difficult subject but on which information can usefully be imparted. He has classified labour under several heads and given statistics. I would rather that

*Paper read at the M. A. S. U. Conference on 16th July 1925.

each man here searches his heart to see in what class he will place himself. Everyone would like to go into the first class, true; but let him first search, and make sure how he is justified in placing himself in that class.

I happened to know Rev. Mr. Anderson long ago. I am sure the knowledge that the son has brought to bear upon the subject must have been gained from his father because I found the father to be almost an ideal farmer. I went one day to see cholam in his farm and I saw his crop was much taller. And that shows that the spirit that pervades through the paper has been taken from the Danish farmer, who but for the assistance rendered to him by the labourers would not have been successful. The young man is following the footsteps of his father and I should really think he has shaped his way. I see he has thrown a little challenge on the Central Farm and I should like to hear from those who are in responsible charge of the Central Farm to come out with a vindication of their existence.

Mr. T. V. Rajagopalacharya.—I have no direct connection with the Central Farm now. I was once the Farm Manager here and now am Assistant Professor of Agriculture. Mr. Anderson was one of my students and was closely studying the labour question. I am inclined to endorse all his views except to a certain extent. There was no competition from outside in earlier years and decentralisation has now gone on too far. Now several subjects have come into prominence. I am afraid the earlier procedure that whenever labour is entertained by other stations the Central Farm ought to be consulted and the Central Farm rates ought to be adopted has fallen into disuse or has been largely departed from. During Dr. Barber's time it was an understanding that whenever wages were to be raised or lowered, the Central Farm authorities would be consulted but now whenever a man is found unfit in Central Farm, he is able to get some job, say in the Millets Station or Paddy Station or in other stations. I find that during the last few years, men who are found unfit and should not be entertained do get work in other sections in these stations. This is one of the reasons for the low level of work in the Central Farm. If a sort of co-operation existed among the various units here—probably the Central Farm could not have received such criticism and I would only say this much that the conditions require reorganisation and a sort of co-ordination between the several employing agencies is needed so that the labour efficiency which the farm had at the beginning may be regained.

Mr. Seshachariar.—No doubt there are some old hands in the farm as in every other old institution. Periodically those whom we find to be slack are sent away. The casual labour demand is so

large nowadays and is not always quite satisfactory. Whenever feasible we select the best hands that are available

Mr. Muthuswami Ayer.—I have some knowledge of labour. I know partly the conditions on the Central Farm and elsewhere. I know of instances where it is impossible to replace a cooly. It only depends upon the supply, urgency of operations and on the person who controls. Most of the menials employed in the College were small ryots when the College was started and did work in their own lands. They had better self-respect and sense of duty than now. Further the outlook of labour has changed during the past 15 years. Labour has been asserting itself, that is why an area of 400 acres which could be managed by 2 or 3 officers is now found difficult to manage with about the same number, that is why one cannot expect the same amount of work now as before. But I believe Mr. Anderson meant his criticism to be quite friendly and not a challenge. Mr. Anderson was a student here and I think as a student he knew most he came in contact with and now from his enlarged experience outside has been able to look at labour from several standpoints.

Mr. Ramaswami Sivan. To Mr. Anderson the labourer is human. Labourer is a unit. He cannot be classed as cattle and this kind of human sympathy profits the private farmer. Whether it is Mr. Anderson's farm or a Mirasdar's farm there is a certain amount of affection between the owner and the labourer. I have been once to his farm and have seen what is meant by personal affection which the labourers have for Rev. Anderson. Whether Rev. Anderson is in the field or not when they have finished their work Mrs. Anderson would wait for them. There is a certain amount of personal affection shown by the landlord and the landlady. So far as the Govt. institutions are concerned it would not be possible to treat them with the same sympathy and in this the officers are to be a little more tactful.

Mr. Unnikrishna Menon. I do not think Mr. Anderson threw out a challenge. He has simply explained the nature of the work. In order to give just a sort of comparison he referred to the Central Farm. In other places he would have given local instances. Certain coolies would certainly like to work in the Central Farm, and others in Breeding stations. There they have lighter work. In the Central Farm it is more hard labour. The Central Farm has a larger area under cultivation. We have to deal with much more labour than in other places and there is enormous difficulty in always picking out and yet getting an adequate amount of labour.

Mr. Vellingiri Gounder. M. L. C. I do not want to say anything about labour. I want to say something about the views expressed on the control and supervision. I agree with the views

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in his classification of the labourer; especially when a man happens to employ a large amount of labour he is bound to come across different species. He must see the suitability of people for the work given. I find from Mr. Sivan that as Government officers they find it difficult in considering labourers as human. I do not see where that difficulty comes in. Does he think there is life in the labourer or he is any lifeless material. Certainly the supervising authority is not precluded from treating the labourer in the way in which a private farmer does and I do not know whether there are any rules and regulations which prevent that. As one of my friends here said there is no doubt when the college began they had self-respect and the conditions of these things have changed. It all depends upon the supervising authorities and especially if we are able to make these labourers feel they are treated as human beings they will certainly prove efficient and useful and to bring them to this level is not impossible. Everything here is more looked into by rules and regulations. It is impossible to bring humanity under the rules and regulations and as higher officers no doubt aspire for promotion or for more emoluments they may not show this quality but they ought to remember they have got a duty to perform and so gentlemen you must be able to show by your own conduct, and infuse good spirit into your workers so that it would be a benefit to the employer and the labourer.

Mr. G. Rangasawmy Ayyangar. I beg to be pardoned for talking on this question of labour, for I am no member of the Labour Commissioner's office. I am interested in this question, as a small employer of labour and when there are not crops to watch and study you spend some time in watching the labourer that gets ready the land for the crops. I am interested in this question of efficient labour, more on account of the poverty of the budget and how to make what little is available to go longest. I am also indirectly interested in it, in that I am directly concerned about the efficiency of the officer managing labour on my station. I have had opportunities of employing a fair amount of labour in the Paddy station and now on the Millet station and have some claims to talk with interest though not with authority. I endorse every word of Mr. Anderson and am pleased at the intensive study and critical outlook he has brought to bear on this problem, in the light of his personal experience.

I may take this opportunity of saying that as far as the Millets station is concerned, there is not a single ex-central-farm employee employed in the station. The labour supply of the station is from the village of Velandipalayam—not Pudur, the source of the Central Farm. Moreover the convention of asking the parent farm for a reference about an ex-employee of theirs ensures the non-employment of their cast-way men.

In this connection, in fairness to the Central Farm, I would feel it my duty to make mention of a few special circumstances, which contribute to make the situation in this farm peculiarly difficult. Here there are multifarious interests at work. The farm caters to the varying labour needs of the many sections of the Institute. A large part of its labour is devoted to the raising of fodder for the large herd of Live-stock officer. There are then the ever changing batches of students passing in large numbers through the farm operations for practical work. Added to this a large central farm like this suffers a good deal from lack of cogency of control on the part of the superior staff, often transferred. The net result of this is a situation peculiar in itself and not comparable to anything of the kind that ought to exist on a normal Government Experiment station.

Any one wanting to judge of the efficiency of Labour should spend studying the same in any of the Breeding stations run by Crop specialists. Here, there is the unity of control and one-pointed interest, in its efficiency, which brings out the best elements of labour into play.

With regard to the utility of competition referred to by Mr. Anderson I may mention a little experience of mine in the Paddy station. There is a thorny weed in paddy bunds, the blue flowered *Hydrilla verticillata*. This is a nuisance to the constant use of bunds. I separated the area of the farm into blocks and told off a cooly to each of them, with instructions to root up this weed. The competition set up between blocks was so keen that in a week the whole area was free, each cooly vying with one other in having as big a gathering of this pest as he could.

The labour question is a subject of profound interest to agriculturists and I congratulate Mr. Anderson on the directness and insight with which he has handled this big problem.

Interpretations of Yields in Agricultural Experiments—Some Limitations.

BY. MR. V. RAMANATHAN.

Assistant to the Cotton Specialists.

It will be admitted that every experiment is only a search after truth. It is also known that variability is inherent in life. So when we desire to get at the truth of an organism we have to make a number of observations so that the truth about the relation between variability and environment may be definitely gauged. In agricultural work, where we have to deal with many known and unknown organisms, errors form an inevitable accompaniment. Our efforts are only to reduce and to make allowance for such errors in the results obtained. One of the common ways of measuring errors is with the

aid of a mathematical formula called "Bessel's Formula for the Determination of Probable Errors".

We are all indebted to Mr. Parnell for calling our attention to the existence of this formula. Its knowledge has been responsible for a change in the laying out of plots and in the interpretation of the results obtained. I am sure that many a worker, during the course of the conduct of the experiments might have been landed on to some irreconcilable doubts which could have made them question the utility and the significance of the probable error concept. I am of opinion that such apprehensions are partly due to the want of a deeper insight into the limitations in the application of this formula. It will be admitted that if any formula is to be applied correctly, the postulates on which the proof of the formula is based, must not be lost sight of. As many of the workers in the districts have not got the facilities to know what these are, I thought it will be useful if they are apprised of the assumptions implied therein. Further as two of the experts in the department have been deputed to take stock of experiments conducted in the various farms of this Presidency, I believe that this will be an opportune moment to bring up such a subject for discussion.

I propose to restrict myself to two phases of this problem.

All the officers of the Department will be quite conversant with the method adopted at present in finding out the superiority of one strain or treatment over the other. For the sake of those who do not know this method I will describe it briefly. Suppose there are two strains to be compared about their yielding capacity in a certain locality. The two strains will be sown alternately in long narrow plots. Let us take for granted that each strain has been repeated nine times and the following yields have been obtained.

Strain A.			Strain B.		
Yield	d.	d ² .	Yield	d.	d ² .
65	2.6	6.76	82	5.1	26.01
70	2.4	5.76	78	1.1	1.21
68	0.4	0.16	69	7.9	62.41
74	6.4	40.96	75	1.9	3.61
66	1.6	2.56	76	0.9	0.81
64	3.6	12.96	70	6.9	47.61
72	4.4	19.36	85	8.1	65.61
69	1.4	1.96	77	0.1	0.01
60	7.6	57.76	80	3.1	9.61
Total	608	148.24	692		216.89.
Average	67.6		76.9		

Probable Error of a single determination in

$$\text{Strain No. A} = 6745 \pm \sqrt{\frac{Ed^2}{n-1}}^* = \pm 2.9034$$

$$\text{„ No. B} = 6745 \pm \sqrt{\frac{Ed^2}{n-1}}^* = \pm 3.5118$$

$$\text{P. E. of the Mean} = \pm .9778 \quad +1.1706$$

To find out whether this difference of (76.9- 67.6) 9.3 lbs. in the averages connotes anything, we calculate the number of times this difference is greater than the P. E. of the difference. To get at the P. E. of the difference, the higher P. E. of the mean, which is in the present case 1.1706 is multiplied by $\sqrt{2}$. As the quotient

thus obtained $\left\{ \frac{9.3}{\sqrt{2 \times 1.1706}} = 5.6 \right\}$ is greater than 3.2 times the P. E.

of the difference, we conclude that strain B is a better yielder than strain A. This conclusion will be correct only when certain conditions are fulfilled.

We are not warranted to take the higher P. E. and then multiply it by $\sqrt{2}$. That will hold good only when the two P. Es. are equal. The P. E. of the difference in the averages in the above illustration may be taken for the present as $\pm \sqrt{.9678^2 + 1.1706^2}$

Now most of us are aware of the Tamil Proverb ஒரு வே அரிசெஞ் ஒரு அரிசி பதம்.

i. e. the house-wife tests only one rice to know whether all the rice grains in that pot have been properly cooked. In other words we judge the whole by a small sample. We presume that the characters of the sample represent correctly those of the entire population. In field experiments we have to rest satisfied with certain number of trials and these results have to be taken as forming a 'random' sample for the application of formulae worked out in the theory of sampling. This *a priori* assumption has certain limitations. One important consideration in the theory of sampling is that each unit should be independent of every other i. e. the removal of one individual should not affect the qualities of the rest. To put it in more general terms there should not be any correlation amongst the individuals composing the sample.

* E N.B.—represents summation.

Let us see if this condition is fulfilled in field experiments. In the Cotton Breeding Station, Coimbatore, a field of 2 acres in area was cropped with Cambodia Cotton Strain No. Co. 1 during 1923-24. Just prior to the picking, the whole area was divided into 801 plots making allowance for irrigation channels. The produce of each plot was collected separately and weighed after the season picking was over. The results in 63 plots were suspected to have been influenced by the proximity of bunds and therefore discarded from calculations. If a table is formed correlating the yield of one plot with its next, the correlation co-efficient works out to +.3816. This signifies that if the yield in one plot indicated an increase over the average, its neighbour will also move in the same direction. But if there is no correlation the yields of the neighbouring plot will not follow any order; while one plot shows an increase its adjacent plots may manifest an increase or decrease.

This relation may also be demonstrated in the way indicated by "Student" in *Biometrika* Vol. 15.

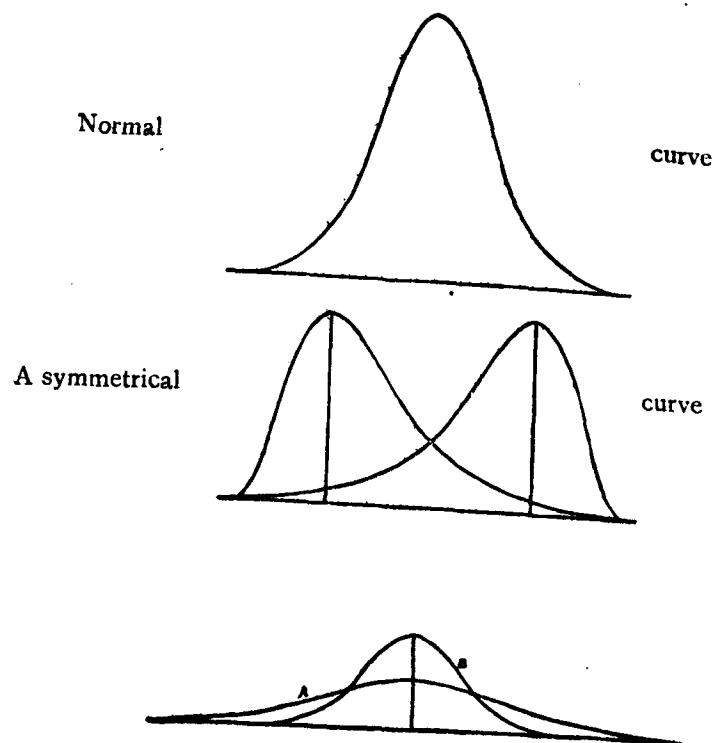
By taking all the 738 plots, we get 18.05% as the P.E. for a single plot. By grouping the yields of two neighbouring plots together, the P. E. for a single plot in 369 such plots works out to 15.43%. But according to Bessel's formula for random sampling it must be $\frac{18.03}{\sqrt{2}} = 12.75\%$. Again by adding the yields of 3 adjacent plots the P. E. of a single plots is 12.55% while as per Bessel's formula it is $\frac{18.03}{\sqrt{3}} = 10.41\%$. When the yields of 6 contiguous plots are added the P. E. of single plot has been found to be 10.34%, but the application of Bessel's formula gives $\frac{18.03}{\sqrt{6}} = 7.36\%$. When the yields of 9 plots are combined, the P. E. works out to 8.66%; but the Bessel's shows a P. E. of $\frac{18.03}{\sqrt{9}} = 6.01\%$.

Thus we find that the theory does not fit in with the actuals. This should not be regarded as failure in the theory of Bessel's formula. But our premise is not correct. The assumption that there is no correlation between contiguous plots is responsible for our getting a lower probable error. If the correlation between adjacent plots is to be allowed for, the formula of our finding

out the P. E. when the yields of two plots are summed up is $\sqrt{P.E_1^2 + P.E_2^2 + 2rP.E_1 \times P.E_2}$ where $P.E_1$ and $P.E_2$ represent the P. E. of the plots added, and r co-efficient of correlation between the neighbouring plots. Arguing in a similar way for working out the P. E. of the difference in two strains, the formula will be $\sqrt{P.E_1^2 + P.E_2^2 - 2rP.E_1 \times P.E_2}$. In our present method of using Bessel's formula we are neglecting this correlation and as a result the real differences in yields of two strains are being masked. Incidentally it may be mentioned here that this formula gives a clue to the method of making the P. E. of the differences small. If the plots are arranged in such a way as to increase the correlation co-efficients, the above expression gets smaller and the term $\frac{\text{differences in averages}}{\text{P. E. of difference}}$ will become quite significant. Another effect of this correlation is to make the distribution of errors not normal. A normal curve of error can be explained thus. When you make a number of observations and if the differences of all observations from the average are plotted out in a paper, the curve similar to the one shown on page 208 will be obtained. It has the characteristic property of having the values of mean, mode (the place where the largest number of individuals will be found) and the median coinciding. It is also easy to calculate the areas of the portions of the curve cut by any straight line. This property has been taken advantage of in framing the tables for finding out the odds. We are taught that a straight line drawn at a point 3.2 times the P. E. of the mean from the mean will divide the curve into two parts the areas of which will be the ratio of 30:1. An author subscribing himself as "Student" in an article in *Biometrika* Vol. VII has shown that even as small a correlation as .1 amongst the individuals leads the frequency curve to be a-symmetrical. In such a curve the mean and mode do not coincide and a line drawn at a point 3.2 times the P. E. will sometimes not cut the curve at all. So the table for odds used in the case of normal curve of error should not be used when we know that the individuals of a sample are correlated, as in the case of field experiments.

Another limitation in the application of the Bessel's formula is the paucity in the number of determinations. Let us take the two normal curves A and B. The averages in both cases will be the same, but the limits within which they vary in samples taken from each will be unequal. In curve A, if a small sample is taken and average worked out, it may at times give a wrong indication, as the chances of getting observations near the real average are fewer in the 'deal'. In field experiments where the variabilities are always

magnified due to the operation of various factors, the probabilities of getting widely scattered results are very common.



Again when the number of determinations are small the probable error itself is subject to an increasing error. "Student" in Biometrika Vol. VI has shown that the distribution of the standard deviation of the averages approaches the normal curve only when the number of determinations is large. In cases like field experiments where the number of repetitions has to be few the curve is definitely skew. This property makes one to put little confidence in the P. E. of the mean as calculated by Bessel's formula.

These two limitations viz., the existence of correlation amongst the plot yields and the fewness in the number of determinations obtained preclude one from using the Bessel's formula. "Student" has devised a method which will give a far more reliable result than the one in use. In that method the differences between the yields of

plots to be compared are tabulated and the ratio $\frac{\text{average difference}}{\text{Standard deviation}}$

(designated as Z in that article) is worked out. A table suited to the use of that formula has also been added as an appendix to find out the odds. Kemp has shown in his article in A. S. A. Volume 16, how the correlation between the plots has been eliminated in this method. The only conditions for the application of the "Student's" method are that the experiments should lend themselves to the pairing of yields and that there must be a greater number of check plots.

Some Useful Agricultural Practices in Cuddapah.

R. SWAMI RAO.

Agricultural Demonstrator.

One of the best ways of improving agriculture is by the introduction of one good agricultural practice existing in one place into another. Much of the improvement done in the past in our agriculture has been the outcome of such introductions.

2. These introductions may be either foreign or local.

3. The chief or the most outstanding foreign introduction or importation that has largely contributed in our country to the improvement of agriculture is the introduction of the iron mould-board plough on dry lands. I need not remind you about the inefficient work of the time-honoured wooden country plough, the wedge shaped furrow it cuts, the unploughed land it leaves between two ridges unless the land is ploughed twice breadth-wise and lengthwise. The mould-board plough cuts, on the other hand, a rectangular furrow, leaves no unploughed surface and the work is in all respects thorough, thus obviating the necessity for ploughing the land three or four times, as in the case of the country plough. A ryot will be able to manage a larger area by the use of the mould-board plough. The larger number of sales of these implements during the last year in our presidency alone (1340) bears ample testimony to the popularity of these ploughs.

4. The use of sprayers and insecticides against plant diseases is another improvement which we owe to the foreign countries. The large campaign carried against the Mahali disease of arecanut and the successful way in which the disease is combated are things too well known to need mention as also the antismut campaign in the Ceded districts. There has been a money gain of eight laks of rupees by the use of such measures in Malabar alone.

5. The introduction of the efficient, cheap and labour saving implements of the black cotton soil tracts of the Ceded Districts such as the drill, the guntaka and others-into the south is another example to show that improvement in agriculture can be effected by the introduction of one good agricultural practice prevailing in one tract into another.

6. The use of artificial and bulky organic manures such as fish guano, bonemeal, is largely due to the introduction of the system obtaining elsewhere. Fish guano has been used as a manure in the West coast and this has been introduced into the East coast and other places, where it is not available. The large quantity of sales of fish guano and the agitation carried on at various agricultural meetings to stop the export of bones is a proof sufficient to indicate the attitude of the public-especially the farmers towards these manures.

7. The system of growing green manure crops like sunnhemp, wild indigo and dhaincha in paddy fields to provide leaf manure for the paddy crop thus obviating the necessity and the trouble of going to forests is a practice which has been prevailing in certain local tracts. In Rajampet, Cuddapah District, sunnhemp is grown as green manure for paddy. The use of wild indigo as a green manure crop was first tried at the Sivagiri farm by Mr. Rao Sahib A. Rama Rao and the popularity and the extensive use of this crop as a useful manure for paddy is largely due to him. How much benefit the ryot has derived by this system of growing green manure crops can be sufficiently gauged only by noting the large quantity of green manure seeds sold during the past years. In fact the popularity of these manures is becoming so great as to make the Government contemplate in certain localities to completely close the forests against the ryots for procuring green leaf manure.

8. The introduction of the system of raising the paddy crop by transplanting in places where broadcasting is the rule has also contributed towards improvement of south Indian agriculture. This system has been prevailing in certain tracts—I mean the economic transplanting of paddy especially in Kistna district in parts of Guduvada and other places. This system is gaining favour with the ryot as it saves time, seed and labour and irrigation water without any diminution in the matter of yield. In Cuddapah taluk if this system becomes universal there will be a saving of Rs. 30,000 in the matter of seed alone at the rate of one rupee per acre.

9. Loose box system of storing manure prevails in a crude form in Rajampet taluk. Animals are tethered in the cattle shed

with green leaves under their feet. Dung is collected and urine is allowed to accumulate. The decomposed leaf and manure is removed to an open pit. In certain places, where buffaloes are tied, the dung, urine and leaves are never removed, until they are required for fields. This system has been in vogue in Mangalore, South Kanara District and is being copied elsewhere. That the proper preparation of good manure without losing its valuable contents such as urine and dung leads to the better production of crop and in turn to amelioration of the condition of the ryot needs no saying.

10. From the foregoing it is evident that much of the improvement effected in our agriculture has been mainly the result of the introduction of good agricultural practices prevailing in one tract into another. Below are noted some, that have come within my observation, that need some attention.

11. The system of tying animals to yoke in Coimbatore is one which calls for much criticism. A right animal is always yoked on the right side and left animal on the left. It looks well at first sight. But what is the trouble in this system? A left animal refuses to work if yoked on the right side, even at the point of a bayonet and the right *vice versa*. Most of you who have passed through this college course here must have experienced this trouble, especially at the time of examination. The eagerness with which we approach the yard mastery just to tell us the animal to be tied on the right side with certain amount of trepidation is well known to all of us. If a student is not shrewd enough he has the bullock on the wrong side and its effect is shown in ploughing especially while turning at head lands. The animal pulls in the direction in which you do not want. It may provide some amusement to the onlookers, if not examiners, but the position and the feelings of the teacher and the student will be something indescribable and can be realised by those who have undergone similar experience.

This is not the system that prevails in Cuddapah and other parts of Ceded districts. An animal that is tied on the right side in the morning is made to work on the left side in the evening and *vice versa*. There is no trouble of any kind and the efficiency of the work is not at all impaired. It is suggested that this system may be adopted here without any demur, as it does not involve any extra expense. I am told that animals trained to pull on one side alone will be able to pull better than if trained on both sides. I cannot vouch for this statement. On the other hand I am seriously led to believe that the case of yokegall may be more in places where the animals are yoked on one side only than in the other system.

System of naming animals. Another thing which contributes towards the efficiency of the working of animals is the system of names given to animals in Ceded districts especially in the Bellary district. Animals are known by names. The driver simply calls out the names of the particular animal (Hanuma or Bhima) which is slack, the animal responds to the call of his master and sets right his mistake. This system is useful when heavy implements drawn by 4 or 5 pairs are used, such as the black cotton soil plough or the disc plough. Instead of every driver sitting on the yoke of each pair handling and guiding the animals the man on the seat of the machine can guide all the animals by calling out names. This system prevails in Africa. An attempt was made at Coimbatore to direct all animals by means of a long whip tied to a long pole. But this was not very successful. In place of four men at the rate of one for each pair two men were employed one on the seat and one to guide all animals by means of the long whip. There was a saving of two men. But the animals did not respond properly to the call of the whip, used from a long distance. The attempt was, however, given up. The system of naming the animals like Hanuma, Bhima, Arjuna would have facilitated the work.

12. The arrangement for loading carts is perfect at Nandyal and is one which can be held up as being worthy of being copied elsewhere. The box carts of Coimbatore are of no use. A Nandyal ryot carries twice as much as the Coimbatore farmer does in his carts.

The arrangement is as follows:—Six vertical posts are fixed as follows:—2 in front, 2 in the middle just above the axle and two in the rear of the side shafts. Three horizontal posts are laid across these vertical posts and are made long enough to extend beyond and above the rim of the wheels. 4 bamboo pieces are tied two on each side of the side shaft. These are made to arch over the wheels. The cart is filled and then loading is done over the frame work.

At Bezwada and Guntur there is a peculiar system or arrangement for loading the carts. Two bamboo poles are fixed in the nave of the cart, long enough to pass on either side of the shaft into two holes of a wedged shaped vertical piece of wood fixed on the shaft just behind the yoke 1 ft. high. A net work of ropes making up a hammock as it were, is tied on all sides except the side on which the driver has to sit. The whole thing presents an appearance of a cradle in front of the body of the cart. Without this cradle a Guntur ryot finds it extremely difficult to drive carts. I had much difficulty in using the Bellary carts got from Bantanahal farm to Guntur farm. The coolies said they would fall down without the cradle arrangement. These cradles in front of carts provide comfortable and com-

modious accommodation for the driver to sleep in, unmindful of the vehicles that come in front. This arrangement helps in loading carts with straw up to the yoke of the carts, without in any way putting any weight on the animals. The arrangement at Nandyal is perfect in all respects and is worthy of being copied elsewhere.

13. Burying harmless weeds at the time of weeding paddy is another good practice. Labour is at times wasted to remove the weeds to the bund. Any saving in labour is a gain to ryot and any practice which aims at this is fit for introduction in other places. This system prevails in Badvel taluk of Cuddapah District.

14. How conservative the ryot is in holding on to his time-honoured customs can be understood clearly if we look at the methods employed by him in lifting water for irrigation purposes. Different methods or contrivances employed for lifting water are intended to suit different depths. From the Malabar spoon to swing basket, to piccotah and to mhote there is a good gradation and all these are intended as remarked above to suit different depths. Swing basket can be used economically and efficiently when the depth of lift is 3 or 4 feet. From 4 to 10 feet piccotah will be economical. From 10 feet upwards to 20 feet single mhote will be useful and 20 feet upwards the doubt mhote. Instead of the above useful system we find the ryots clinging to custom. In the northern circars for depths varying from 10 to 20 feet the piccotah is the only system of lifting water employed. In the Coimbatore district single mhote is used for all depths and no attempt is made to avoid the necessity for the animals to back up the ramp in an awkward position by the use of the Bellary mhote—using two pairs. In Bellary and Cuddapah district one finds that the Bellary mhote is employed for lifting water from depths of 5 to 6 feet. If two pairs are not available the animals are untied and the mhote rope is held by a cooly until the animals come round and stand in position at the top of the ramp. The cooly walks up the incline and fastens the rope to the yoke by means of a loop arrangement. Two men are unnecessarily wasted for one pair. In Northern India there are mhote buckets without tails and a special man is employed at the top of the ramp to empty the bucket. The addition of a tail will not be looked upon with favour by the farmer but is it not, I ask a decided improvement whose efficiency is proved beyond doubt. The introduction of this good practice into Northern India will greatly contribute to the improvement of agriculture as there is saving of labour.

15. The use of stone roller for threshing purposes is imperfectly understood. I think sufficient advertisement has not been made in the form of leaflets about the usefulness and economy of the stone

roller. The Bombay Department of Agriculture has one leaflet on this but not our Presidency. I request I may be rightly understood in making the above remarks

The stone roller is employed for threshing cholam, ragi, korra sajja, Bengal gram, horsegram in Ceded Districts. In the south cattle threshing or flailing with sticks is the system employed for threshing purposes. There is waste of labour in the system prevailing in the south.

It may be contended that some of the cholams, especially those of the irungu types, are unsuited for threshing by means of stone roller, as the grain is difficult to be separated out of the glumes which hold up tightly to the grain. But there is not much justification in this. Some of the cholam varieties when transferred to Ceded Districts for trial are threshed by the stone roller. Anyhow further attempts will be worth the trouble, as it will teach the southern ryot to make use of the labour saving threshing machine or implement—the stone roller.

I may be pardoned for laying so much emphasis on the common place observations. These are no doubt little things. But money saved in every operation required for the production of a crop preparatory cultivation, manuring, seed and sowing, aftercultivation, irrigation and harvest—is a gain to the ryot and this worked out on a large scale comes to lakhs of rupees, which will be no mean savings to the ryots.

The object of this paper is to provoke discussion and elicit information on any good practice that is prevailing in other parts such as the stacking of paddy straw in Tanjore so that all these may be collected together and adopted wherever possible*.

Discussion.

Mr. Rajagopal Naidu. Mr. President and Gentlemen. Husbandry practices in Cuddapah District are varied. I will give you a small piece of information connected with a certain village Kondakotta in the Jammalmadugu Taluk. It stands on the top of a hill and the village has got a population of over 4000 souls. It lies on a rock with only an artificial soil covering an area of about 80 acres. The produce obtained from these 80 acres is carried to 8 or 9 markets and their limes and chillies have become famous. It is a wonder how a population of 800 houses living on a small piece of 80 acres of land can support themselves. They are actually doing it and successfully too under most uncongenial conditions and in the early days the Rajas are said to have dug wells which went as deep as 45 to 50 yards.

*Paper read at the M. A. S. U. Conference on 16th July 1925.

Mr. Muthuswami Ayyer. Mr. Swami Rao incidentally referred to certain implements which are found in Cuddapah but which are not used in the Southern parts. I am yet to know whether the Telugus who settled in Tamil Districts brought with them these implements which the Tamilians did not take up. I believe it was more due to the climatological conditions. It would probably be an interesting piece of information if we would know how these implements have been introduced and found ready acceptance amongst the Tamil ryots in the Tinnevely District during the past 15 to 20 years.

Mr. A. V. Thirumuruganatham Pillai. I was connected with the introduction of drill cultivation in Tinnevely for several years. Recently I have been posted to that Circle. My previous experience is that Drill cultivation has no doubt been taken with some difficulty by the ryots and rainfall is almost the determining factor. In years of not only excessive but continuous rainfall Drill cultivation is still possible whereas sowing with the ordinary plough is not when the land is miry. But in the Tinnevely District the rainfall is more or less restricted to two months and even in these two months sometimes the rains continue for one month. By that time the season is long past. Drill cultivation saves a good lot of the time and people certainly appreciate it. In some localities ryots quite independent of the weather conditions always use drills. Figures under drill cultivation have gone on increasing. The one natural deviation now is that we are not helping the ryots as before. When I was Farm Manager I was not only Farm Manager but I was also a Demonstrator. I used to take implements and help with trained coolies. Now people make their own implements. No doubt in times of excessive rainfall the figures go low in some villages. I do not know how the Ceded Districts implements came into disuse even among the Telugu ryots, the method of stocking and other things being exactly the same as in the Ceded Districts. The drills do not appear to have been brought here. Perhaps the Telugus came as soldiers and did not bring with them implements. It is only Telugu ryots that like these drills and other implements. The Tamilian complains they look cumbersome, and it is very difficult to take them very long distances in black soil.

Mr. U. S. Ramaswami Iyer. When I was first transferred to Udampet I was asked to introduce Drill cultivation. The very first question that was put to me in the first village I went to was, "Does the Government take any responsibility of paying damages if the drill cultivation were a failure?" I know that drill cultivation had never been and would not end in failure if attempted in suitable tracts. I persisted. Next year the ryots saw how the increase in yield and reduction in the cost of cultivation were quite possible by the use of

drills. In the Tamil districts of Erode, Bhavani and Anavashi where there are 18 to 21 inches of rainfall, Drill cultivation is quite possible and bids fair to spread.

Mr. Ramaswami Sivan. There is one village called Kilachari in Chingleput District. The village is one of the foremost in co-operative work and is inhabited almost completely by Telugu ryots who came and settled down there during the famines in the earlier years of the 19th century and in that village you will find all Ceded District implements, peddamadaga, gorru and all. You have got the Tamil ryots all round and these Tamil ryots have neither copied nor adopted one single method from them. This was only 33 years ago. Perhaps Mr. Ananda Rao will be able to tell us whether that is still the case or whether Telugu men were not copying the Tamilian method of Paddy cultivation. The Telugus would not enter the Paddy land and they adopted what was called the pulidikal system and I believe that shows how very unyielding sometimes these ryots are.

Mr. Ananda Rao said. Mr. Sivan has dragged me into the discussion. I have not visited Kilachari but I know of a village nearly on the way to Walaja inhabited by the Telugu ryots. They originally came from Guntur and bring with them their own cattle from Guntur almost annually. I have not seen peddamadaga in use in this village but have seen guntakas and 'gorrus. Cotton is practically unknown and still these implements remain. Nobody else has copied. As Mr. Sivan says the Telugu ryots do not seem to get used to the local methods and that is why perhaps they introduce the pulidikal system and try to irrigate the paddy later. The system has, I hope, been copied through the Chingleput district. Indeed they have this system again at Villipuram. Without the Departmental intervention this system has been carried on and drilling is also going on. Why a crop like paddy should be treated like this I am not able to say? Some Economist, I suppose, that is, one who has got time to investigate into the matter would probably give his considered opinion. I am not able to give you anything at present.

Seed and Demonstration Farms of a New Type.

M. ANANDAN.

Assistant in Economic Botany.

There is a general impression abroad that all Government managed farms are costly institutions and do not admit of being copied as a sound business proposition by the generality of farmers in this country. There is apparently a good deal of truth in this contention, though it has to be painfully admitted that the critics entirely overlook the most important fact that almost every agricultural station in this

Presidency has, as its primary function, the carrying out of some kind of experimental work or other. And as every one knows, experiments in any field of human activity are always costly and often irritatingly slow in yielding results of permanent value. We have, however, to remember that it is these experimental stations that are in the main responsible for producing tangible improvements in various directions, for demonstration and adoption by the ryots. The trouble comes in when we are compelled to try and show that these experimental stations can be run on profitable lines just as any well conducted private estates. Even in cases where it is possible, the ryots naturally get suspicious of our figures.

It seems to me that we have arrived at a definite stage when we ought to have in the country besides the regular experimental stations a net work of seed and demonstration farms conducted strictly on commercial lines so as to make the public realise that the improved methods suggested by the department are capable of yielding enhanced returns to the ryots. With the object in view, I would take this opportunity to urge on the attention of this Conference as an experimental measure, the starting of at least in each taluk centre a combined seed and demonstration farm for paddy cultivation in the Cauvery delta. If the experiment prove a success it may with suitable modifications be extended to other paddy centres, as well as to other important crops of this Presidency. On these farms no experiments or investigations of any kind are to be carried out. Experiments and investigations are to be confined to the regular experimental stations, where every facility for such work should be provided and the commercial aspect of the work on such stations should not be unduly stressed by the public. Of course, they will be welcome to offer helpful criticisms bearing on the lines of work undertaken on such stations. But with regard to the demonstration farms, that I am going to suggest, they should, on the other hand, be invited to look into the commercial aspect very thoroughly and criticise freely if such farms fail to fulfil the promise with which they began. It is only by tabooing every-thing savouring of experiment from such farms that it will be possible for us to demonstrate the commercial possibilities of scientific farming to the fullest extent and show to the people that we preach only what we practise. This, in other words, means that these farms should adopt only those methods that the department, through its demonstration staff, wants the ryots in the various tracts to copy.

Tanjore delta is deliberately chosen for the trial of this experiment for the reason that the strains evolved by the Aduturai Paddy Breeding Station have become so popular that it is almost impossible to meet even a fourth of the demand for our strains with the limited supply that could be made available on the station, especially because

very little area on the station could be used for their multiplication. Coupled with this, the ryots have a partiality for the farmgrown seed of our strains even when they are assured that the seeds grown under seed farm conditions on ryots lands will be, for all practical purposes, equally good. In spite of such assurance, ryots from distant places in the delta come all the way to the Paddy breeding station to get their supply of seed. The following figures of demand and supply during this season will make the position clear. Written demand for seed registered in the office alone came to 160,000 lbs. and to this must be added another 64,000 lbs. asked for by ryots in person, thus making the total to 224,000 lbs. But the station could meet this demand only to the extent of about 66,400 lbs. leaving thus an unsatisfied demand of 157,600 lbs. If it had been possible to supply this quantity as well, the Aduturai strains would have been grown in another 7,000 acres during the current season. And we can only expect that the demand for our strains in coming years will be much keener than what it is today and unless we make adequate provision to meet it in full, I am afraid, that we will be only partially realising the benefit that the station is capable of bestowing on the ryots.

Another reason of equal importance is the very encouraging results obtained by the use of iron ploughs and systematic manuring involving only an additional sum of Rs. 10 to 12 an acre on the average. Though more than two thirds of the paddy breeding station are devoted to experimental work the average yield per acre for the last 3 seasons has been 1950 lbs 2450 & 1976 lbs. respectively. The last season was the worst experienced for paddy and in spite of that the Farm average was 1976 lbs. while the average yield in surrounding locality was not even a 1000 lbs. The normal average for the Tanjore delta is 1800 lbs. It is hoped that by the systematic cultivation of the land that before long we will be able to bring up the average to 3000 lbs. The future is very hopeful and that if through the agency of the various demonstration farms we are able to raise the average yield to 3,000 lbs. and make the ryots copy our methods throughout the tract, the department can take legitimate pride in having been instrumental in doubling the out-put of paddy in the Tanjore Delta. The hope expressed is only a very modest one, if we remember that the average yield of the Central Farm wet lands has been raised from the low figure of 2,500 lbs., to somewhere near 4,500 lbs., an acre and within the course of the last 15 years.

Following is the bare outline of the Farm proposed, as I am afraid details would be long and wearying. 10 such farms for the Cauvery delta would I consider be a fair number. Each farm should be at least 50 acres in extent and in charge of an Assistant Agricultural Demonstrator assisted by a Plant Collector specially trained

on the Paddy Breeding Station for the purpose. The cropped area of the farm should be taken on lease from the leading mirasdars of the tract for, say, 12 or more years on a fixed annual payment in cash. The lease amount will range from Rs. 50-60 an acre, on the average. But the land on which buildings and thrashing floors are to be put up, should be acquired by the Government to avoid legal complications and lose tax when the fields are finally handed back to the mirasdar if he so desires or the Government wants to discontinue the station at the end of the lease period. For this purpose I would suggest acquiring not more than one acre of land for putting up the necessary buildings. Thus the initial cost to Government for starting each station may be put down at 10 thousand rupees, made up of the following items including the first season's working expenses.

Land Rs. 1000, Cattle 6 pairs at Rs. 200 Rs. 1200, Combined seed stores, manure depot and the office Rs. 2500 Cattle shed Rs. 1500, Thrashing floor Rs. 800, Ploughs and other implements Rs. 100, Furniture Rs. 250. Two carts Rs. 200, Miscellaneous and unforeseen expenses Rs. 450. Total capital cost Rs. 8000, Working expenses for the first year at Rs. 40 an acre Rs. 2000, Grand total Rs. 10,000.

The demonstration farm should be the headquarters of the touring Agricultural Demonstrator working in the tract so that he may have his office and Depot in the same building thereby, in addition to saving the rent paid on private buildings, he will be necessarily attracting a large number of ryots to these farms who will be coming in for seed and other things from different localities.

The annual working expenses in succeeding years of the farm excluding the pay of the Demonstrator and the Plant Collector may be put down at Rs. 2000 at Rs. 40 an acre. The annual yield at 2,500 lbs. grain per acre for 50 acres will be 125,000 lbs. which would when converted into money bring in about Rs. 6,000 at Rs 3 a kalam of 60 lbs. The net amount left over, after deducting the lease amount of Rs. 3,000 at Rs. 60 an acre will be Rs. 3,000 out of this a Rs 1,000 will be left over after deducting Rs. 2,000 for expenses as stated previously and can be distributed in the following way. Depreciation on building at 3 percent Rs. 140 depreciation on cattle at 10 % Rs. 120 and the remaining Rs 740 will represent over 8 % interest on the Rs. 8,000 invested as capital, thereby showing that we can run these farms even on leased lands without incurring further expenditure on the working of the farm in future years except the pay and office expenses of the Demonstrator and the Plant collector.

These farms should be under the administrative control of the circle officers and the breeding station will, in addition, to supplying improved strains, act in an advisory capacity whenever called on to

do so. These farms in addition to being demonstration centres of a very practical kind will be the ideal seed farms for the Breeding station so that we will have every year seed of the Aduturai strains enough for 50,000 acres in the hands of the department to supply the needs of the ryots. The Breeding station in this case, will be able to supply these demonstration farms fresh seed of all the strains every year so that the question of their deterioration can be entirely eliminated. The scheme is suggested in preference to the outright purchase of the land by Government as it will enable us to utilise one lakh of rupees for ten farms of the kind I suggest, instead of a single Central Farm in one corner of the tract*.

Discussion

Mr. Kolandaiyami Pillai. Paddy Breeding involves strains. After a strain is found successful in the Breeding Station it is given to the District Officer first. After it is found satisfactory in the Districts it is propagated and distributed to the ryots.

The method adopted is this; the paddy is given without any payment at the time of sowing. The condition is that 1/5 of the produce is reserved by the owner of the land for his own seeds and the rest is sold away to the department on the market rate plus 2 annas more per kalam of 24 Madras measures. This system was working fairly well for several years but overtaxed the energies of the staff and has now been given up. Later on another system was adopted that is every interested ryot is given enough seed of the strain for 10 acres. The ryot grows it for this Department and sells 50 per cent of it to the Department for seed purposes and disposes of the balance as he likes and a list of ryots to whom seeds have been distributed is kept up. These ryots generally are either Presidents or Secretaries of Co-operative Credit Societies, and they get to know and get trained in seed Union business. For the last two years we have been working this system in the Tanjore Delta.

Mr. T. S. Venkatraman. There is one experience of mine which appears to bear somewhat on the subject of this paper. In North West Frontier Province when a strain of Sugarcane is found superior to the local cane the manager goes into the nearest fair, invites the ryots and distributes a maund of cane to each. In one case the cane was so delicate and the Punjabies are so fond of sugarcane they ate it all in the way. When they reached their villages what little was left they planted in their fields and the yield was 175 per cent more than the local canes. Last year there were

20 cents, this year it is 600 acres. That is an idea worth working here also and that particular Farm Manager whenever there was a Co-operative Society meeting used to attend the meeting with a cartload of canes and distribute them to the cultivators—and by this means within a short period of 2 years he was able to spread this cane far and near. He was also able to give a lot of valuable information about the behaviour of this particular Coimbatore seedling in his locality.

I wish to say just a word in regard to the new type of demonstration farms of which Mr. Anandan has spoken. I think it is going to be of much greater help to us than the demonstration plots that have been found in the different parts of the Presidency. It is much easier to convince the farmer of the efficiency of a new type of implement by showing to him by actual work on the farm than by telling him how to do it. If the agricultural Department would lease some 10 acres of land in a good area and plant rice and sugarcane and make the manager of the farm use modern methods of cultivating the soil with manure, at the end of a year the neighbouring ryots will surely copy. And I think the Government would not be going to any extra expense on that because they will be making the manager pay back his living. The same can be attained with ryots where they could use new strains and where they could use somewhat of the modern ideas of conservation of manure. They could know what can be attained by using copper sulphate for sorghum and what can be done for some labour saving machinery. This ought to be done in a large number of areas.

Mr. Tadulinga Mudaliar enquired if Nellore Samba that is rapidly spreading in Chingleput and the G. E. B. 24 are the same and Mr. Ananda Rao said they were.

Mr. Unnikrishna Menon. I do not know how we can have two diametrically opposite things one after the other. We have seen Telugu implements for the past 100 years never copied by a Tamil man. This has been the statement made now and demonstration farms to be effective must be farms under co-operative management. Otherwise there is no interest taken by ryots. I believe without money interest it would be difficult to educate the ryot and he will not take even real improvements.

Mr. T. V. Rajagopalchariar. I only wish to offer one remark namely that Demonstration farms of the type Mr. Anandan mentions

* Paper read at the M. A. S. U. Conference on 16th July 1925.

are desirable but I would submit instead of entrusting these farms to Government Agencies we may entrust them to students who are unemployed. Some of them may take up such farms, 9 or 10 or dozen students, and manage them and the distribution of the seed and this idea would commend itself to anybody. At any rate it is worth trying. What I would suggest is that these farms may grow select types of seeds and these will certainly give profit. It is worth the consideration of our students and they may even approach Government.

Mr. G. R. Hilson (Director of Agriculture) said. Demonstration is only part of the work of the department and as we cannot demonstrate or teach without first finding something to demonstrate or teach, which is done by means of research I think it is necessary to review the position as a whole. I will begin first with the fundamental work of the department, viz., research, go on to the demonstration, the logical successor to research, and end with education.

This morning reference was made to Paddy Breeding Stations and their usefulness. You heard then a reference to the limitations of plant breeding work. The speaker remarked that a continued distribution of improved strains of crops would eventually lead to the exhaustion of the soil with the consequent result that we would fall into disrepute and defeat our own ends. This idea is not new, but it seems to me to lead to a different conclusion to that arrived at by the speaker, who was arguing that attention must be paid to cultivation and manuring and that this could not be given on a breeding station. The testing of a new strain has to be carried out under the conditions under which it is going to be used, if it is thought worthy of being distributed. If, therefore, it is thought necessary that a system of manuring should be devised to supplement the plant breeding work, it seems to me obvious that the breeder must himself carry out the experimental work necessary to devise this system in order that he may be able to test his strains under the right conditions. It therefore, appears obvious to me that in so far as this section of the research work of the department is concerned the proper development of the work will take the form of appointing crop specialists. These crop specialists will be provided with a central station in which they will not only carry out plant breeding work, but will also do a large amount of cultural and manurial work. It seems to me inevitable that this must be so. With their work concentrated on one crop these specialists get to know it in a way that the District Officer cannot. Ideas are bound to occur to them that some change in the method of cultivation, the type of implement used or that such and such a manure will be good to use and so on. They will test

these ideas and that side of their work will naturally develop until it takes the form I have mentioned. As has happened in the case of paddy, first a central station, then a succession of stations to cater for those tracts which can really not be served by the central station, so will it happen in the case of all the other crops. On these stations we will get our results. By this, I mean that after a certain length of time we shall be in a position to say that such and such a strain, or manure or method of cultivation will mean a profit of so many rupees per acre. It is at this point that demonstration should begin, but not until this position is reached. In passing I may remark that there appears to be some confusion as to what is demonstration and what is experiment. I am inclined to think some of the plots, farms, areas, which are termed demonstration are not really concerned with demonstration but with experiment.

Having obtained results on the experimental stations, it appears to me necessary that a further step should be made. A steady stream of strains is now issuing from Vedapatti and Aduturai breeding stations. Now it does not follow that because these strains have been proved satisfactory at these stations they will be so everywhere, even over the whole of the tract in which the stations are situated. I, therefore, think that it is necessary to open sub-stations to test the results obtained at the main stations whether they refer to varieties, manures or methods of cultivation. This is experimental work and cannot be properly carried out on a demonstration farm or in the ryots' own land. The results obtained at the main stations can be demonstrated at once in its neighbourhood, but further afield the sub-station is necessary to test the results obtained on the main station under the slightly different conditions which prevail in a different part of the main tract served by the main station. Having thoroughly tested the results we are now in a position to demonstrate.

Demonstration, once we are in a position to say that we have thoroughly tested the strain, manure or method of cultivation and provided that we do not try to apply our results to conditions widely differing from those under which they were obtained, can best be carried out on the ryots own land. We can safely go to the ryot and tell him that we have got such and such a result, that we get an average profit of so much per acre out of it and induce him to try the improvement whatever it is. He may not get so much, he may get more profit, but we can be reasonably certain that over an average of years he will get a profit, provided of course that exceptional conditions do not prevail. The ryot having tried the improvement and found that it pays him to adopt it has been educated to that extent. Demonstration is only a form of education.

We now come to another form of education, the agricultural middle school. The whole point of these schools is to get hold of the sons of cultivators, and teach them the principles of agriculture with special reference to the tract in which the school is situated. After they have finished the school course these boys are intended to return to the land and continue to cultivate it. The ultimate object aimed at is to raise up a class of cultivators who shall be better cultivators than their fathers.

Reference was made in the course of this discussion to a village where certain methods of cultivation were in vogue. These methods were admittedly more efficient than those of the neighbouring villages. Yet although for 100 years the neighbouring villagers had this practical demonstration before their eyes they clung to their old methods. This illustrates how conservative the cultivator can be. We know however that by going to the cultivator, and shall I say, pestering him, we can get him to change, but it is slow and we have not really made a great deal of progress in educating the ryot by means of demonstration. We also know that the cultivator can be induced to send his sons to school, paying fees for him, if at the end of his schooling there is a reasonable chance of his getting a Government appointment. But what argument have we to offer to induce him to send his son to an agricultural school, charging fairly high fees, if we expressly lay down that no employment will be offered at the end of the course. We have none that he can understand, or that will carry any weight with him. We must first educate him to understand the value of agricultural education. To try and do this by means of schools is too slow and too expensive. What we need to do is to speed up research work, find more improvements to demonstrate, and to increase demonstrators so that we get into touch with many more cultivators than is the case at present. Then when we have educated him in this way and incidentally improved his economic position there may be some hope that we will get the ryot to send his sons to an agricultural school which offers no avenue to Government employ. Agricultural education of this kind is an end-product of our work, not the foundation on which our work rests.

Now, I would like to refer to one point in connection with the demonstration farms which it is proposed should be opened in Tanjore. These farms are to be run by Government. It is understood that they will pay their way, but at the same time, they will employ staff which might be otherwise usefully employed. In Europe the work of producing new strains of crops is largely carried on by seedsmen. In this country Government makes

itself responsible for this work, and will have to do so for a long time to come. I see no reason, however, why Government should continue for ever to make itself responsible for the distribution of seed beyond a certain point. Our aim should be to get this work done by some other agency. Here, I would suggest, as I have done before, there lies an opportunity for the students of this College to do useful and profitable work outside the Department by taking over the work of distributing on a large scale seed of strains produced on the Government plant breeding stations.

Mr M. R. Ramaswami Sivan. I almost completely agree with Mr. Hilson but there was to my mind a note of despondency about what we have done so far which rather took me back. I believe every one in the department realises that research begins first and we are engaged in producing tangible results and then only these results are carried into the districts by the circle officers. I believe there is a general understanding and I believe it is done by all circle officers, that what has been proved to be correct is alone advocated to the ryot. Now if work on research be concentrated in chemical, biological, mycological, entomological, and crop experts and if you are going to have good results from the stations and then develop them in the stations and wait until the time when these results are ready for being carried over, you live to wait over a very long time. Is the amount of the money we have already spent thus all wasted though what you have done so far may not give the same good results everywhere. I believe that is the way in which I must look at it. I believe we cannot wait until the millenium comes to understand the benefits of education. Even as to primary or elementary education people have not taken to it. And education of this particular kind where everybody thinks he knows agriculture from childhood and when a certain amount of English education is given people do not take easily. The experiment Mr. Hilson quoted showed how very conservative people are; even a man from the Telugu districts does not care to copy from the Tamilian about paddy growing. But certainly he is taking to it gradually. It is really very difficult to make certain people believe we are taking to things very easily. But first under research I believe slowness is essential; as long as the world lasts, there will be new problems for research; what is called research is not going to have a finality. How long are we to wait? I believe there must be a stage when we must have arrived at some results which must be capable of being demonstrated and that is the general idea with which we have to work. I understand that so far within the last 15 or 20 years, several experts who have used the ryots' money including myself have evolved some ideas which we have carried on. Mr. Parnell for example has evolved certain ideas which

are suitable for promulgation. It may be, we have to modify them, and therefore the idea that one has got to finish before another is to be taken up is what I cannot approve. I quite agree that research must precede demonstration but what I say is research also comes next. When you have evolved even a few results they must be taken over and then at the end of a few years there must be a necessity for modifying some demonstration. Five years ago we found such and such a result and now we have a modification of it. That is why I say there is no finality to research and as long as the world lasts there will be research going on.

Mr. Hitson remarked. *Mr. Sivan* has carefully misunderstood what I said and I did not say that every thing we have done is wrong, but I consider we were in danger of riding for a fall. That is what I said; there is no reason why the results which have been obtained and proved as correct at agricultural stations under me, should not be published. What the station should do is to immediately demonstrate them in the immediate neighbourhood of that station. But what I say is when you get further afield from that station, possibly the conditions would not be the same as the conditions in which we tested and it is necessary to have a substation only to test the very same thing under the same set of conditions before you begin to demonstrate to the ryots in any particular tract that this thing is good.

Welcome Address*.

Once more it is my privilege as President of the Madras Agricultural Students' Union to extend to you all the Union's customary welcome and to thank you all for your presence with us at our Annual Conference. As time goes on, the pleasure of bidding you welcome becomes greater, it is always a pleasant duty to welcome old friends. Many of you have been with us on previous occasions and your return this year shows that you enjoyed your previous visit and that you continue to evince interest in our College and Union. To those present for the first time, I would issue a special welcome and invitation to see as much as possible of the College and Farm in the time at their disposal.

* Welcome speech by *Mr. R. C. Broadfoot* C. D. A. N. D. A., Principal and Ex-officio-President of the M. A. S. Union on 15th July.

In selecting our President it has always been our aim to secure some prominent gentleman closely concerned in our departmental activities and this year we have been extremely fortunate in persuading the Hon'ble Diwan Bahadur T. N. Sivagnanam Pillai Avl., Minister for Development to accept the honour. To him and to

Mr. Bracken, Secretary to Government in Development Department, we offer our cordial thanks for their presence here to-day. No matter what others may say, we here are agreed that Agriculture forms the most important branch of the Development portfolio and it is particularly appropriate that its Minister should preside today.

Coming now to events of interest to our Union and its Patrons during the year, I desire to extend congratulations to our Patrons, *Sir C. P. Ramaswami Ayyar* C. I. E., Member of the Governor's Executive Council and *Rajah Sir Vasudeva Raja* of Kollengode on the Honours recently conferred on them. *Sir C. P. Ramaswami Ayyar* attended our Conference last year, when he performed the opening ceremony of our Union Building. *Rajah Sir Vasudeva Raja* of Kollengode is one of our oldest Patrons and has always taken a very real interest in our College and Departmental activities.

It is with a deep feeling of regret that I have to refer to the passing of another of our Patrons *Sir P. Theagaraya Chetty*, who passed away in March last, deeply mourned by all who knew him: *Sir P. Theagaraya Chetty* presided over our Conference in December 1920 and continued to evince an interest in our work until his death.

The outlook for the coming year is very much more satisfactory than for the last three years or so. We look forward hopefully to an expansion of our Department and its consequent benefits to all engaged in Agriculture in this Presidency. The Secretary in his report of the Working Committee for last year will give you a full account of the Union's activities so there is very little need for me to enlarge on this aspect but I would appeal as I appealed last year for more support, both financial and active, for the union on the part of all district members.

We have a long agenda to carry through during the next two days. So I will conclude my remarks by adding my personal welcome to you all and I hope you will all have a very interesting and enjoyable time during your stay here.

Presidential Address*.

Ladies and Gentlemen,

It affords me great pleasure to find myself in your midst this afternoon. It is indeed a unique privilege that I enjoy to day—the privilege of presiding over the deliberations of a band of ardent workers in a Department whose laudable ambition is to promote the agricultural conditions of this country, and I thank most heartily the conveners of this Conference for the great honour that they have done me.

It is a matter of legitimate pride to me that *it is my privilege by birthright to associate myself with the agricultural class*, not only with that small section of Hindus known in the Tamil districts as the Vellalas, but with that larger community *constituting about 70 per cent of the population* of this vast land, who form the spinal column of this mighty nation, and *whose main pursuit in life is agriculture*. It has also been vouchsafed to me to spend the best portion of my life in the Revenue Department, which brought me into close touch with the tillers of the soil, rich and poor, and afforded me much facility to observe and learn at first hand their conditions, and take a keen interest in the arduous task of working for their amelioration. And it has now fallen to my lot, as Minister for Development, the task of piloting the Agricultural Department, the working of which has had a peculiar fascination for me, all my life. Many-sided and varied, indeed, may be the ambitious programme of a lover of his Motherland for the uplift of his countrymen. But it is inevitable that his cherished ideas, even if they have the patent of coming within the range of practical politics, must abide their time. *Tradition must be honoured, programmes already drawn up must be worked out, and their results patiently waited for*; and success in them alone will encourage one to enunciate new and progressive policies. I may therefore warn you at the very outset that *you will be greatly disappointed if you should have set great store on me as the Indian head of the portfolio and expected of me any policy to effect a meteoric progress in the working of the Department*.

It is greatly to be regretted that *agriculture is one of those Departments fated to be much misunderstood by the general public*. It is however *an encouraging sign of sincere co-operation that Provincial legislatures should throw the weight of their wholehearted support in all matters relating to agricultural advance*; and I avail myself of this opportunity to express my deep sense of thankfulness to the people's representatives in the Madras Legislative Council who, by their valuable suggestions and solid support, have helped me in my humble endeavours for the betterment of the agricultural conditions in this

Province. But we cannot overlook the constantly pricking thorn in the side—the class of urban dwellers who, without taking the pains to observe the work of the Department's field staff in the rural areas, and without the patience to wait for the results which time alone can reveal, take inordinate delight in decrying the utility of the Department. They are for the most part a class of irresponsible people who know not what they speak, purblind visionaries who are greatly disappointed that millennium has not dawned on them in a day as perhaps they might have expected; and the departmental officers engaged in agricultural work would therefore do well to ignore them quietly and push on with their work to the best satisfaction of their own conscience.

The difficulties that confront an Agricultural Demonstrator working in the midst of ignorant cultivators in an out-of-the-way village are best known only to himself and his co-workers; and his labour in counteracting adverse local conditions can best be appreciated only by an eyewitness of his patient toil. But "The pessimists among the critics," as Lord Ronaldshay once said "shake their heads in gloomy satisfaction at what they regarded as the failure of experts and the vindication of their own dismal lucubrations." These critics sometimes compare the slow unostentatious work done by the Department in our country, with the rapid progress noticeable in the agriculturally more advanced western countries; but they fail to realise that whereas other people, better educated and economically superior, felt the spark of divine discontent burning in them, ever pressed forward to better their social conditions, and concerted among themselves, without dry adventitious suggestion or aid from the Government, possible measures conjointly to make their soil yield more, it has throughout been the other way round with our own people who have had to be shaken up from their stupor of ignorance, coaxed, and slowly and gently drawn into light.

The Indian farmer is a conservative of conservatives, and has a propensity to cling to the ways and traditions of his forefathers instead of opening up new paths for himself. As a consequence, he raises his crops today as they were raised in the time of the Vedas, confident that his ancestors of primeval days knew better than he possibly could know the best way of doing things. He is also prone to take too much for granted in regard to his soil. He understands that if he fails to feed his bullock it will become too weak to drag his plough. He understands that if he starves his cow she will immediately cease to supply milk. And yet the thought seemingly never enters his mind that it is even more important for him to provide a plentiful and balanced ration to

his crops than for his cattle, for the animals can move about and forage for their feed, whereas the crop must needs stand still in one place, and can only express its hunger by failing to yield good returns. So far as the vitality of the soil is concerned, he was bankrupt before he was born. And yet he goes on blindly trusting to the Gods to give him a bountiful harvest, when he has failed to do his own part of the work. He fails to realise that in farming, as in every other pursuit in life, it is literally a case of "The Gods help those who help themselves."

It is sometimes urged that this conservatism is a result of his poverty, and that his commonsense does not allow him to launch out on any new plan of enriching himself by methods which appear to him only as speculative. There is an essence of truth in this observation, and the Agricultural Demonstrator working among the ryots has to take cognizance of this. By persistent demonstration of the benefit of practicable methods alone, can he gain over the villagers to his way of thinking. But such propaganda work is, by the very nature of the local conditions and mentality of the people, bound to be slow, and can show results only in course of time.

There are besides other circumstances as well, over which we have no control at present, and which prove as impediments to India's agricultural advance on scientific lines. The fragmentary state of landed holdings of most of the small farmers is in the main responsible for the poverty of the country, and for the failure on the part of agricultural officers to show immediate results. The traditional law of the people helps the disintegration of holdings under separate ownership and cultivation, sometimes as small as two or four cents in extent, and never large enough for the adoption of improved methods or for the economic independence of the ryot. The Hindu Law of Inheritance provides for the partition of a holding, however small, among the members of the family, and for the re-partition of the sub-divisions so created at each generation, and so on ad infinitum. And the natural result of this state of things is that in the course of a few generations even the largest of estates belonging to the wealthiest of agricultural families are frittered away into un-economical parcels; and the members thereof, if they are content with pursuing the industry of their ancestors in their respective farms limited in extent without striking out fresher paths of bettering their position, find themselves hard put even for eking out a bare livelihood. It is also a matter of common experience nowadays that labour on another's farm with the resulting remuneration in kind or coins pays on agriculturist much better than labour on his own small holding. Economists and agricultural experts who have had the interests of the agricultural masses at heart have laboured to find a solution for this formidable

problem. The Agricultural Board have had this subject before them for their deliberation. The conditions here are so opposed to those obtaining in the agriculturally more progressive countries, and they have the sanction of tradition and law for their existence. Every remedy suggested, though it works well in theory, is beset with difficulties when it has to be put into practice. Mr. Keatinge once suggested that the State should interfere if the agricultural class should be economically better at all, and should legislate "so as to enable land-owners or proprietary occupants to register (at option) a holding as an economic holding, and when a holding has been so registered to provide that it should then become impartible, like certain other kinds of property in Hindu Law." He also suggested that the member who inherits the economic holding must compensate the other members of the family by allotting to them other properties, or in the absence of other members by money payments out of the profits accruing from the economic holding. Mr. Keatinge's main object in his contention was that the holding should remain intact as a permanent impartible unit, which is what public welfare demands. It is a question of policy, who should take the initiative, the State or the people, in bringing about the desired legislative changes to protect the economic interests of the small landholders. Any attempt towards protection by legislative measures is bound to meet with a strong opposition from the agricultural classes themselves. Enlightened farmers no doubt are alive to the imperative necessity of such legislation, and there have been instances of late of parents who in settling their holdings on their heirs have definitely stipulated that they should continue in the family as impartible holdings. With the slow awakening consciousness of the masses to this root evil of their economic unsettlement, it may be hoped that the time will ripen soon for such a legislation.

There have been other remedies suggested as well. The Punjab has tried and tried successfully the method of consolidation of holdings by co-operative methods. In a land of small holdings like India, co-operation is practically the only means by which scientific agriculture can be made possible. There is much in the field of agriculture that can be achieved only by co-operation. The co-operative organisation is a vaster one than the agricultural, and there is a greater scope for a co-operator agriculturally inclined than for a regular agricultural officer with a large area under his jurisdiction to reach the cultivator in his village and convince him of the profitable nature of scientific agriculture. The encouraging results of the combined effort and sharing of responsibility by the co-operative and agricultural officers are already perceptible in the districts. Agricultural demonstrations are held in connection with co-operative conferences. The staff of the Agricultural Department inspect rural

societies. Co-operative institutions are affiliated to agricultural associations on special terms. Leaflets on agricultural subjects are distributed among co-operative societies. This does not exhaust the serviceability of the Co-operative Department for the uplift of the agriculturists. The co-operative idea can find application in every activity of the cultivator on the farm and at home. The possibilities of co-operation in agricultural matters are really great. The poor landholders may be taught to realise that a co-operative movement is potent with possibilities of improving their lot. Landless agriculturists may be advised to form themselves into agricultural societies and obtain lease of large holdings from wealthy landlords. But it is very doubtful if the landlords will easily make up their mind to lease out their lands to the societies. The rich and middle-class men have already realised that the co-operative movement is working against their interests. Until they are induced to come into the fold, there is not much to be expected of them. The trustees, however of Temple estates and charity endowments can in the meanwhile start the experiment by leasing the lands in their charge to co-operative agricultural societies. I do not think that the Devasthanam Committee or the Religious Endowments Committee will take any serious objection to this progressive step. I may suggest that persons interested in co-operative agriculture will do well to negotiate with the trustees of such estates as are meant for public utility, and, after securing from them a promise that they will lease their lands to agricultural societies with proper security in preference to middlemen contractors, start agricultural co-operative societies. I may also point out that it will be much in the interests of the ryots if managers of Court of Wards Estates are chosen from men with agricultural training and experience, who will then have ample opportunities of utilizing the allotments annually made for agricultural improvements, by introducing well thought-out reforms. The opportunities of co-operation in agricultural industries are equally immense. But when we think of the industrial advancement of the country we have to take into consideration the principal fact that India is primarily an agricultural one. The predilection of the masses for agriculture is the determining factor which limits our industrial outlook. The immediate concern of co-operators industrially inclined will be to devise schemes of industries which will supplement the agricultural pursuit of the people. Schemes on co-operative basis for manufacturing manures and improved agricultural implements must be considered. Nor are schemes for converting the country's raw materials into finished marketable products less important. To think of measures to successfully compete with firms already established in business will take time. But we can now look to better the economic condition of the poor farmers by affording them facilities to improve their cottage industries.

A cottage industry equally interesting to the agricultural and the co-operative departments is dairying. The condition of the dairying industry in India is admitted on all hands to be most unsatisfactory, although Indian conditions offer a good field for the development of dairying, second to none in the world. Dairy produce is one of the staple foods of the people and cattle in India are bred almost exclusively for milk and draught purposes. Dairying is a branch of agriculture which is specially suited for the development of the co-operative idea. Cultivators should be encouraged to grow crops which are specially fodder crops. Co-operative Societies under the guidance of agricultural experts may take up the business of production or sale of milk, the manufacture and distribution of milk products, and kindred subjects. Co-operative dairy societies are successfully worked in the Bombay Presidency in places like Belgaum and Gomathipur, and they should serve as good incentive to those co-operators who have the natural facilities at their command. The problem of supplying pure wholesome milk for consumers in the urban centres can find a solution in the starting of co-operative dairies in convenient places with easy transport facilities of the produce by railways.

Though the possibilities of co-operative activity on these lines have been brought to our notice a long time since, very little progress has been made in these directions. The one great administrative difficulty has been the difference in the ideal of credit and non-credit aspects of the co-operative movement, and the inevitable danger of mixing up the two. Activities on the non-credit side of co-operation were started in 1912, but their results compared with those on the credit side look small. Agricultural non-credit co-operation has been for all these years, as Mr. Noyce once aptly put it, a nobody's child. The Co-operative Department has had neither the leisure nor the men with the requisite experience capable of running agricultural societies. And the Agricultural Department has been labouring on with very limited field-staff who have their own duties to attend to. It is no wonder therefore that with these disabilities the non-credit enterprise of the Co-operative Department has made little or no progress since 1912. A solution of the difficulty is however possible when Graduates in Agriculture with the requisite knowledge of rural economics are drafted on to the Co-operative Department in the reorganization scheme. The Staff Selection Board with whom rests the responsibility of selecting men for the newly created offices of Assistant Registrars may be trusted to recognise the importance of agricultural training in the young men to be chosen for work in the department. It may also be hoped that if, after they have undergone the necessary training in co-operative work Graduates in Agriculture are placed in rural areas where there are facilities for the development of agricultural conditions, they will take up this much neglected subject of the

co-operative movement. With the proper administrative heads to direct, the Co-operative Department alone as at present constituted, with its steadily increasing net work of supervising unions and societies, can disseminate progressive ideas of agriculture, and help the organisation of co-operative combines for the development of the non-credit aspect of the movement.

The subject how best to educate the cultivating classes in scientific agricultural methods has been engaging the attention of expert thinkers in rural economics and agricultural education for a long time past. Many methods have been suggested, some tried and abandoned, some others worked and found successful, and the rest yet in the experimental stage. Agriculture is a branch of technical science which will fail to produce the desired results unless imparted in an adequate measure, at least on the practical aspect of the subject. The Agricultural College here has been doing very valuable work all these years and has produced its own students to man the department. Since the affiliation of the College with the University the status of agricultural education has been raised to a proper level. I am well aware that there is a growing discontent in certain quarters that the system of selection of students by a Committee for admission into the College, and the policy of limiting the strength of a class to a mere handful of students while much larger classes can be managed without a proportionate increase in the staff, deny many young men the advantage of a liberal agricultural education. The present policy is inevitable in consideration of the fact that the College has but very recently been granted University status, and that the product, at least, at the beginning, must be of an order that will justify the recognition. There is again the consideration of supply proportionate to demand. The Government cannot undertake to engage all the young men who pass out of the College. In the early years of the history of the College the Government were in a position to absorb in the department trained students from the College for purposes of reasearch and experimental farm work. After all, the Government is only a small machinery and requires but a limited number of hands to carry on its work. The Arts Colleges are every year turning out many hundreds of young Graduates, the bulk of whom only swell the number of the unemployed. And it is considered an unparadonable sin on the part of the Government that they are not in a position to find work for them all. If that be so, it is but natural that we should be chary in turning out young men with technical study and training but without a prospect of employment. It may be argued the other way that if a larger number of young men are helped to get a degree in agriculture, necessity will help them to find work. But that is a dangerous experiment. It is much safer to observe how the Graduates from the College who cannot be provided for by the Government

carry the light of their learning to the villagers, and then to arrange to send more of their kind for similar missionary work in the rural areas. It will not therefore be wise that the College should admit more students till it has been seen how the graduates going out of the College every year turn their learning to its full value.

To remedy the defect of the majority of students still regarding the College course as an avenue to employment in Government service, the Government decided in 1923 to try the experiment of opening agricultural middle schools in selected centres to give a practical course of agriculture, imparted entirely through the medium of the vernaculars, to the sons of farmers, in the hope that they would apply the knowledge they had acquired of new methods to the cultivation of their own land. The two places selected for the experiment were Taliparamba in Malabar and Anakapalle in Vizagapatam. I should hesitate to say that the experiment has yet proved altogether a success. Many of the students at the two schools gave up the course at the end of the first year, and the number who have completed the course and gone back to the cultivation of their family property is small. But though the results have been comparatively disappointing I think that the experiment should be persevered with and perhaps extended to new centres with such modifications as experience has shown to be necessary. The Government have under consideration the question of opening an agricultural middle school in the Tamil country and another in the Telugu country. The exact localities have not as yet been finally decided. The decision is dependent on the probability of attracting a sufficient number of the right type of students. I take this opportunity of inviting an expression of public opinion. If the Government can obtain a guarantee from a sufficient number of parents in any particular area that they will send their sons to undertake the course of instruction we propose, I should naturally be inclined to give preference to that area and early steps to establish a school in the most convenient centre. Owing to the partial remission of the Provincial contribution, fortunately, funds are available. It remains only for parents to come forward and promise their support. I can promise that the Government would be ready to provide the necessary land, buildings and staff as early as practicable.

The subject of unemployment of educated youths brings me by a natural transition to a consideration of a remedy, by a revision of educational ideas, suggested by the Calcutta University Lecturer on the Poverty Problem, Captain Petavel. The scheme propounded by him is now in working order in Switzerland which country is known as the "Laboratory of Educational methods in Europe", and as such, it can insure success for the right men

tackling it in the right spirit. In brief, it is more or less a self-supporting industrial-cum-agricultural course of education on a colonial system, which will find employment on living wages for the unemployed youths of the land, at the same time train up the rising generation of younger boys on self-reliant lines. The Colony, according to the writer, must consist of an agricultural farm of an extensive kind sufficient to produce the food products necessary for the maintenance of the students and the staff, and the farm must serve as a complement to a technical institute where boys can be trained in crafts which are productive of articles of necessity, such as clothing and agricultural implements and appliances, which will make the cost of working the farm comparatively cheaper. The boys receiving training must be boarded and taught gratis, and such of those as have received sufficient training, which will give them independence, must be continued in the Colony to be of service to batches of younger boys, while their service can be remunerated in kind to meet their own necessities and of those dependent on them. This in short is the principle involved in the scheme suggested. Certain so-called practically minded people might look askance at this, and hasten to pronounce the shibboleth of its being too idealistic. We must remember that the unattainable ideals of one age have been proved by history to have become the achievements of another. Success or failure of a scheme like this depends on two factors: our outlook, and the Time-spirit. Of these the first is dependent on, and shaped by, the other. When the Time-spirit has come to the right tension, and the popular feeling has been wound up to proper unison, even the most idealistic schemes will become practicalities. Now, the grim reality of unemployment is facing the public. The problem of educating the present-day children and equipping them to face conditions of a decade or a generation hence, when they will be old enough to enter life, must be solved even now. The flower and youth of the land are already beginning to foster a spirit of downright renunciation. All this must be taken into account when we sit to consider a solution for the present deadlock. There is ample work for mature thinkers, and for active and energetic workers in their following. And we may hope that a Pachaiappa Mudaliar or a Chengalvaraya Naicker or a Sir Annamalai Chettiar will come forward to their help with the necessary financial support.

Bengal has already started in right earnest her task of rural reconstruction. She has opened a Safety valve for the relief of pressure of her unemployed children, and at the same time begun a constructive programme of rural regeneration. Our youths are of the same mettle with their brethren elsewhere, and they can prove their worth equally well. Only individual economic independence can pave the way for national freedom. The only course left open to us to

attain economic independence and individual freedom is by a return to Nature. You might remember the significant cartoon of "The Unemployed Graduate" which appeared in the Daily Express of the 6th June, with an editorial explanatory note below, running as follows:—

"The Graduate, with his sheaf of certificates, his right hand palsied with too much writing, his left holding the torch burning the midnight oil, his back turned resolutely to the morning sun, his eyelids heavy with listlessness, he moves farther and farther away from the nourishing earth and the innocent spindle! Oh, the pity of it seems to be the thought of the artist."

There has also been appearing in the Tamil Monthly "Lakshmi" a series of articles from the pen of Mr. V. Rajagopalachariar, an experienced agriculturist, under the caption "Swarajya five acres". I take these as instances which reveal at a glance the Time-spirit. You may also know that the Muddiman Committee have recommended the transfer of Forest administration in our Presidency to the Ministers. Lord Birkenhead in his recent speech before the House of Lords has expressed his opinion that "a future of incalculable prosperity awaits India, if and when she learns to realise and to value her agricultural kingdom". He has also given the assurance that the development of agriculture will be given a powerful impetus in the near future, and that the disabilities of working the Agricultural Department, by virtue of its being a Transferred subject, will soon be removed. And as regards the recommendations of the Lee Commission, I may say that I share the hope expressed in the Report of the College Union just now read that "time and a clear understanding of the vital issues involved will bring about an improvement in the existing state of affairs". All this is full of hope of a glorious era for Indian agriculture. We may hope that a millennium is before us, but it rests with the youth of the land to retard or accelerate it, for it is they who must awake to the call of the country, and by attending to her immediate wants, shape her destiny.

President's Concluding Speech.

Gentlemen, Yesterday and today we had very onerous items before us and I am glad to assure one and all of you that we have gone through them all very systematically and very fully. Several papers have been read before this audience. I do not propose to go over the same ground, but certain important features may now be said at the close of the session. The first paper was about the recent development of Soil Microbiology. That I said, is a very important subject and whoever takes up this work earnestly will win the undying gratitude of the mass of cultivators. As regards the paper on Guntur Agriculture, there are certain difficulties in fact. I wanted to find out what the nature of the subsoil was; whether it was calcium and at what depth the black cotton soil was. At Koilpatti as a matter of fact the depth of the black cotton soil does not exceed more than 2 to 2½ feet and calcium which prevents the cotton plant from bug prevents the tobacco and chillies coming up so well as in the Guntur area. But in certain places as in Rajapalayam the chillies and tobacco have conditions as represented by the Guntur area. We are all doubly grateful to Mr. Grey for having been present here and given us the benefit of his experience in the co-operative field. As all of you know co-operation and agriculture are closely connected as also the Industries as I mentioned elsewhere and it is with that object I am carefully combining the work of all the three departments whenever the full benefit of it can be secured to the cultivators. We much thank Mr. Anandan for having given two papers; both of them were of a contentious nature; a number of them spoke on the whole. Even now I am not quite sure that what Government have proposed to do in the matter of imparting agricultural education to the masses has been correctly understood so far as practical agriculture is concerned. Agricultural education is also a very important matter. It is still on debateable ground because we see that certain cherished opinions of the Department before are now being questioned from another standpoint of view and what it will end in whether it will end satisfactorily are points to be judged later. Labour of course we have heard and then Interpretation of results of field trials. That was so technical that nobody ventured to make any mention of it. As regards the paper read by Mr. Swami Rao on "Some aspects of farming in Cuddappah" he said that what was well in Cudappah should be practised in other places also. We have now gone through all the subjects. And for the patient hearing which you have given to all the papers I must thank you very heartily and hope you will carry all the ideas and put them into practice for the next year so that you all might hear very much more. Again it would be like the germination of seeds which had been sown today.

Report of the Working Committee of the Madras Agricultural Students' Union.

For the year ending 30th June 1925.

MR. PRESIDENT, LADIES AND GENTLEMEN AND FELLOW WORKERS,

The Working Committee beg to submit their report for the Union year ending 30th June 1925 and on their behalf I stand before you as a poor representative of my genial friend Mr. M. U. Vellodi who acted as Secretary until 1st March and on account of his transfer from Headquarters could not continue in that capacity owing to the rigidity of the rules which would some of us consider need alteration.

2. The year under report has been no less eventful than its immediate predecessor.

3. This week last year saw the second year of celebration of the College Day and Conference after its reversion from December. 14th July 1924 marked the beginning of an unprecedentedly heavy rainfall which caused floods in Malabar, Central Coimbatore, Trichinopoly and Tanjore resulting in several breaches in the railway line, dislocation of traffic and untold suffering to several thousands of the agricultural population evoking the sympathies and prompt action of Government and other parts of India.

4. A recurrence of these conditions though on a very much less extensive scale brought anxiety to the agriculturist in September and in May when abnormal local rainfall and temporary floods occurred respectively in parts of Vizagapatam, and Guntur and Kistna, while absence of adequate rainfall characterised parts of Coimbatore and the Ceded Districts.

5. The year has, except for these aberrations, been favourable for the production of crops and prices have shown a downward tendency in general. Land values have visibly declined.

5. (a) Coimbatore—generally a dry zone—has with a rainfall of about 45 inches as against an average of about 22 seen the wettest year on record during the past 53 years.

6. Of the two and at present perhaps the *only* two kinds of activities of this Union which find a visible expression, the celebration of the College Day and Conference claims our attention first.

The last College Day and Conference were held on 14—17th July 1924.

Mr. F. Noyce, C. S. I. Secretary to Government Development Department very kindly presided over the deliberations.

7. *Sports*—The preliminary heats were successfully gone through as also certain items of competition among the Estate Scouts on Sunday the 13th which proved a fine day after a heavy rain on the 12th. A slight shower on the 14th at the time of the sports caused no disturbance though later the weather turned worse causing inconvenience to guests and visitors.

Precisely at 3 p.m. on the 14th the events commenced, and there was a large gathering of spectators and visitors of all grades to witness the progress of the sports. There was keen competition for all items, the champion cup was won by Karunakaran Nair, student of class II.

Mrs. Anstead kindly gave away the prizes to the several winners.

8. *Conference*. The Conference commenced at 12 noon on the 15th. Mr. Broadfoot, the President of the Union, welcomed the visitors and guests in a neat little speech after which Mr. Noyce as President for the occasion traced his connection with the Agricultural Department and the Agriculturists since his tenure in Malabar as an Assistant Collector before 1908 and frankly gave expression to his views on the future of the Agricultural Department and of the Agricultural College. Later the Union Building was declared open by the Honourable Mr. (now Sir) C. P. Ramaswami Ayyar, Law Member, who in an eloquent and forcible speech envisaged the bright prospects of the Tanjore ryot owing to the construction of the Mettur reservoir.

9. The following fourteen papers were read at the Conference:—

How to call our young men back to the Farm—by Mr. S. Ramachandra Ayyar,

Natural crossing in Summer cholam—by Mr. G. N. Ranga-swami Ayyangar.

The Agricultural Department—by Rao Bahadur K. S. Venkataramier.

Fruit growing on the Nilgiris—by Mr. F. H. Butcher.

Some coffee diseases of South India and their control—by Mr. K. M. Thomas.

A study of the Mango in relation to the Mango-hopper by Mr. S. Ramachandran.

The practical aspect of the Top to Bottom Ratio in ripening-tests of the Sugar-Cane by Mr. S. Kasinath.

My experiences on Danayakankottai lands by Mr. S. Venkata raghavan.

The place of Agricultural Improvement in Co-operation by Mr. K. Unnikrishna Menon.

A New remedy for the Potato Ring Disease by Mr. D. Marudarajan.

Agricultural Education by Mr. G. Rajagopal.

Evolution of a Popular Strain in Westerns by Mr. K. L. Ramakrishna Rao.

Present Position of Cotton Industry in Bellary District by Mr. V. N. Subbanacharya.

On Ploughs by Mr. S. Ramachandra Ayyar.

There was lively discussion following the reading of each of the papers and Mr. Noyce in his concluding remarks observed "that he was struck not only by the very high standard of excellence shown in the papers read but also by the great variety of the subjects dealt with. There were papers from the senior officers of the Department and in addition there were contributions from retired officers as well as from ex-students who had no official connexion with the College. In fact by attending the Conference one could have a glimpse into all the main activities of the department. He assured the Agricultural Department and the Students' Union that he would always have their welfare at heart and would in his official position as Development Secretary do his best in pushing their interests through."

10. The Committee's thanks are due to Mr. Noyce, Mrs. Anstead, Mrs. P. V. Ramaiah and other ladies and gentlemen who helped in different capacities to make the function a success.

11. *The Journal.* The second form of activity by which the Union justifies its existence and makes its influence felt in its own humble way is the Journal. And its success or failure in this line chiefly depends on the measure of support the Committee derive from the members and the agriculturally inclined English knowing public. As the result of the rules amended in July 1923, the strength in membership during the year was as follows:—

1. Members under the new rules who have the privilege of being supplied with one copy of the journal free.	112
2. Members under the old rules who have elected to subscribe for the Journal.	33
3. Members under the old rules who do not subscribe for the Journal.	62
and ordinary subscribers	109

This looks rather queer when apart from the number of non-agriculturally trained officers of the department and students of the late Saidapet College, we take into consideration that in this College alone since its inception in 1908, 346 students have come out successful and are almost all employed. The Committee is optimistic however that this need not cause very much dissatisfaction as they are aware of the existence and successful working of similar institutions elsewhere with a less number of members whose success has been rendered possible owing to the full knowledge of the conditions under which they work and the enthusiasm they have and evoke amongst the outside public.

The journal has worked its way through and is self-supporting as will be evident from the financial statement appended to this report, though, owing to minor reasons which the Union will, the Committee hope, look to in due course, the Journal was not always published punctually,

12. A certain amount of dissatisfaction is, the Committee believe felt by members in regard to the subject matter of the several issues of the journal. A consideration of the fundamental differences in the outlook of readers—students under training and agricultural officers who form the Union and have sovereign authority in determining its policy and the public who appraise the value of the agricultural publications from perhaps another standpoint—will the Committee think help to understand the present position of the Journal. A necessary adjustment has constantly to be effected always with an eye to the measure of encouragement and support the Committee receive from the different groups of subscribers,

The Committee feel subject to correction that they have done their best under the existing circumstances, and request that members would support the journal through contributions in money and kind and suggestions.

12. *Agricultural Education.* The Certificate of Proficiency Course which was started in 1914 came to an end in April this year, and out of 179 successful students of that course 78 were admitted into Licentiate in Agriculture course, With the remaining 101 and with 64 that could, not owing to the abolition of the L. Ag. course in December 1922, be admitted largely into the L. Ag. course the number of certificate men has stood at 165.

The total number of L. Ags. under the rules which became in-operative in 1916 was 71 and that of L. Ags. subsequently was 79. During the past three years 31 have obtained their University Degree. Almost all these have been absorbed by Agricultural Departments in Madras and the South Indian States, and agricultural education enters on a different phase to that of training men generally to meet departmental needs and the uncertain needs of agricultural employers which was the case up till recently. The College has, it is opined, to produce men who will devote their time to research which is the foundation of all agricultural progress and to the popularization of new ideas among the mass of agriculturists.

13. The present Committee cherish the hope that since agricultural education on modern western lines was first introduced into Madras in October 1876, their successor will take steps to celebrate the Golden jubilee next year when ample opportunities will be afforded to take stock of the progress that has been made during the preceding half a century. The Union is fortunate in that it can count upon several old students of the Saidapet College, officers and public men connected with the agricultural education during these 50 years who are yet alive and upon the present students, and staff of the College and the members of the Department.

14. The Committee take comfort from the thought that only the other day from his place in the House of Lords, His Majesty's Secretary of State for India, Lord Birkenhead, in reviewing the situation of India, analysing the existing conditions in England and India and making, it is hoped, an authoritative statement, declared that "as Agriculture had become a transferred subject this circumstance did not render a correlated and rational attempt to deal with it more easy but that it had been closely discussed between Lord Reading and himself and that he was not without hopes that during his tenure of office as Secretary it might be in their power to give to its further development a powerful impetus."

15. The advocacy of rural bias and the inclusion of rural subjects in the curriculum of schools seems not to have been quite well understood by the public generally and if the interpretation put upon the phrase "Rural Bias" by the Honourable E. Wood, Minister of Agriculture in England were more widely broadcasted there would seem to be better appreciation of the conditions under which agricultural education is intended to be advanced. Here are his words, "When they talked about Rural Bias they did not do so because they wanted every child in a country school who was born the son of an agricultural labourer to remain necessarily an agricultural labourer, all his life; but they did say that whatever he became, it was good for him to know the elements of agricultural life and to have them as an intimate part of his being." This will clear the air of a good deal of cant and enthuse ardent agriculturists to spread agricultural knowledge in the country.

In this connexion the Committee submit that the few agricultural schools started by the Government in this Presidency have not had sufficient time to make their influence felt and may prove very useful centres for disseminating agricultural knowledge and methods in time. One has to exercise patience when one notes that in this country education is very backward. Even in advanced countries where the need is felt the percentage of schoolgoing children is still very much less. Zimmerman of Aberystwyth Agricultural College, Wales, observes that 40 per cent. alone of the children in the primary schools of America were able to go to Secondary School. The figure in England was between 8 and 9 per cent and 92 per cent of the children in the Elementary schools left at 14 and got no further education.

15. (a) The Committee welcome the proposals of the present Ministry to found the Andra University and the Tirupati University where Agriculture, it is presumed, will occupy a very prominent place. Vernacular as the suggested medium of instruction in the Andra University should be a welcome feature in the spread of Agricultural Education and it would not be suprising if like the Hebrew University opened recently in Palestine under the auspices of an Ex-Prime Minister of England and one of the greatest of modern thinkers—Earl Balfour—the Andra University strikes an original line in University Education. Kerala is up for her own University. We hope it will be an accomplished fact soon.

16. This leads the Committee even at the risk of a little repetition to refer to the question of careers for agricultural students. The Committee feel that in this respect agricultural students have a bright future in that the Provincial contribution to the Central

Revenues is being reduced if not altogether remitted and there seem to be prospects of resumption of normal conditions which will afford facilities both for the Government and the Public to invest safely in Agriculture—the basic industry of the country.

17. The Committee approached the Director with a representation regarding the betterment of the Lower Subordinates and the enterainment of B. Ag. students. In regard to the Lower Subordinates the Director was kind enough to assure the Committee that deserving men would get promotion to the Upper Subordinate grade in due course and that in regard to the further request that "when a vacancy occurred in the last grade two posts in that grade might be abolished, one post created in the higher grade and thereby one last grade man might be promoted simultaneously with the appointment of Maistries as a distinct class in demonstration work," Mr. Anstead said that the scheme would be considered when the recruitment to the Lower Subordinate service was stopped.

18. As regards B. Ag's. the Committee felt that the Director was doing all he could. In this connection the Committee submitted a representation to the proper authorities to recognise the claims of agricultural students for appointments in the Co-operative Dept which, it is hoped, is receiving due attention.

19. *Personal.* We congratulate the Hon'ble Mr. C. P. Ramasami Ayyar, on the K. C. I. E. conferred upon him and Rajah Vasudeva Rajah of Kollengode C. I. E., on the distinction he has won.

We are gratified to note the confirmation in the Indian Agricultural Service of Messrs: D. Balakrishnamurthi, S. Sundararaman and G. N. Rengaswami Ayyangar,

(a) *Ramasastrulu—Munagala-Prize.* The Committee regret that competition is not keen in this matter owing to the nature of the subjects and the quality of the work demanded of the competitor. Two papers were received. Their disposal and the whole question of the prize are engaging the attention of the Committee.

20 *Obituary.* We have to record with deep regret the deaths of one of our Patrons and three members.

Sir P. Theagaraya Chettiar was one of the greatest sons of South India and with his forty years of experience in the public life of this Presidency was a tower of strength in the Council. His interest in the Agricultural Department was very well known and his words of exhortation from the Presidential chair of the Agricultural Conference 1920 not to neglect agriculture are still ringing in our ears.

Mr. K. Sanjeeva Rao was a promising young man whose geniality endeared him to his fellow students and staff of this College.

Mr. C. Sundararama Aiyar was cut off in the prime of his life and his loss is felt by his students and members in this College. His services as Captain of the Volunteers last year are still fresh in our minds.

Mr. V. Ramachandra Ayyar was another promising man who had a bright future before him. He died of Sunstroke while at Chintaldevi on district work.

21. *Our Presidents.* Our Permanent President Mr. R. C. Wood is still on long leave. We hope he has still a small corner in his heart for the Union which was almost his creation and which he tended with anxiety and enthusiasm. We thank Mr. R. C. Broadfoot, our Present President for the very warm support he has been giving to the Committee.

22. *The Lee Commission.* The recommendations of the Lee Commission have been the subject of acute none the less honest differences of opinion. It is hoped that time and a clear understanding of the vital issues involved will bring about an improvement in the existing state of affairs.

23. The Committee are glad that Mr. R. D. Anstead has just attended as a representative of this country, the international conference which met in Paris to discuss Agricultural matters, and that during his absence, Mr G. R. Hilson whom we have known for about fifteen years now and who has been taking interest in the Union has rightly taken his place. We hope that after Mr. Anstead's return Mr. Hilson will occupy an equally high place in the Agricultural Department.

24. The Committee renders its last and the most pleasant duty of thanking the several ladies and gentlemen who by their presence graced the College Day and Conference and contributed to its success. Thanks are also tendered to the President and the Director, Heads of sections at the College, the Circle officers and their staff both executive and ministerial for their hearty co-operation.

V. Muthusami Aiyer,

Secretary.

Madras Agricultural Students' Union

Balance Sheet of the Madras Agricultural Students' Union for the year ending 30th June 1925.

RECEIPTS.				EXPENDITURE.			
	Rs.	A.	P.		Rs.	A.	P.
Opening balance on 1-7-24				Purchase of stationery	...	3	12 0
cash on hand	820	1	2	Postage	...	6	4 0
fixed deposits in the Coimbatore Urban Bank	671	8	6	Expenses under Journal account	...	1344	1 0
in Bank in Current Account	67	11	3	" Union Building	...	1685	10 4
advances recovered				" College Day towards the making of Prince of Wales Cup instituted by Arunugam Pillai of Sundakamuthoor	...	119	4 0
Advances to students	315	0	0	" towards other expenses	...	371	6 8
" clerk	10	0	0	" making curtains	...	490	10 8
" curtains	296	11	7	Amount spent on and still kept as advances towards making of curtains now adjusted towards that expenditure	...	40	0 0
" building	1561	10	6	Closing Balance	...	266	11 7
interest on Fixed deposits	37	1	10	Cash on hand	...	811	15 6
collections under Journal account	1433	3	5	Amount in current account	...	371	9 10
donations under Building account	301	0	0	" Fixed deposits	...	733	10 4
" for the College Day celebration	540	5	0	Permanent advance to clerk	...	10	0 0
increase in the fixed deposits	25	0	0	Advance to students	...	315	0 0
						2242	3 8
				Total Rs.	...	6079	5 3

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Journal Account.

RECEIPTS.		CHARGES.	
Rs.	P.	Rs.	P.
Interest from Bank on Current Account	1 11 7	Establishment	302 0 0
Advertisement charges	112 0 0	Printing charges	894 10 0
Subscriptions for Journal	1301 7 10	Postage	125 14 0
Advances (temporary) recoveries	18 0 0	Miscellaneous	3 9 0
		Advances (temporary)	18 0 0
	1433 3 5		1344 1 0

College Day Account.

RECEIPTS.		CHARGES.	
Rs.	P.	Rs.	P.
From M. R. Ry. V. Arumugam Pillai of Sundakamuthur for Prince of Wales Cup	100 0 0	Printing charges	22 9 0
By entrance fees from students for sports	7 10 0	Postage	12 2 6
Donations for College Day	427 11 0	Reception (including at Home charges)	137 12 6
Miscellaneous Receipts (By Sale of Thatti)	5 0 0	Entertainment	47 10 4
		Preparation of Sports ground	18 3 4
		Cost of Prizes and medals	92 8 0
		Prince of Wales Cup	119 4 0
		Extra Remuneration to Clerk for College Day	10 0 0
		Miscellaneous	30 9 0
	540 5 0		490 10 8

Checked and found correct.

(Sd). T. S. Ramasubrahmanyam. Auditor.

(Sd). D. SRINIVASA RAO, Treasurer.

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Budget Estimate of the M. A. S. U. for 1925-26.

RECEIPTS.		EXPENDITURE.	
	Rs.		Rs.
Opening balance on 1-7-25.	2242	Journal	1344
Subscriptions and advertisement for Journal	1433	College Day and Golden Jubilee	1856*
Donations for Building Fund	800	Advances repayable on account of Building Fund	800
Donations for College day and Golden Jubilee celebrations	2000*	Closing Balance	2400
Miscellaneous receipts	25		
Total	6500	Total	6500

* Includes an additional provision of Rs. 1500 on account of Golden Jubilee.

V. MUTHUSAMI AIYER, Secretary.

The Union Annual Meeting.

On the 17th instant, —the Annual General Body Meeting of the Madras Agricultural Students' Union was held in the College hall with Mr. R. C. Broadfoot in the chair. Over 80 members were present. The President, in his opening remarks, congratulated the Union on the successful sessions of the College day and conference that had just closed. He thanked the several committees and particularly, on his own behalf and on behalf of the Union, Mrs. P. R. Ramayyah but for whose ready response, active co-operation and geniality the functions on the Sports day would have been a failure. He then called on the Secretary to read the statement of accounts for 1924-25. This was done. From the statement it was evident that for the first time after several years, the Journal paid itself, which was considered a gratifying feature. The President congratulated the Committee on this aspect and exhorted all members to send in their contributions both in kind and in money to help the journal going. He appealed also for clearance of arrears for the Building Fund. He then moved the adoption of the report and the statement of accounts. This was carried unanimously.

The Budget estimate was then placed before the meeting. It was duly proposed and seconded and passed unanimously. Special provision was made in the Budget for an increase of expenditure and income of Rs. 1500 for the celebration of the Golden Jubilee in July next. At this stage, Mr. M. R. Ramaswami Sivan appealed to the members to contribute freely to the Journal. One member suggested that a steady flow of contributions might set in, if perhaps there was a little relaxation in official routine and officers were permitted to send in contributions to the Editorial Board which was not an irresponsible body and which might, if it chose remit such articles, to official superiors of contributors when considered necessary. This would facilitate work as contributions will only be on technical matters and no articles involving breach of official discipline would be admitted. A number of members, however, expressed some difficulty in taking up this suggestion at this stage.

The election of office bearers was commenced. Mr. Sivan again stood up and suggested that in his opinion, the Committee should function for 3 years and one-third should retire every year, so that continuity might be kept up unlike at present when the whole committee is replaced once a year and its experience is lost. This question could not be discussed as it involved a change in the rule and no notice was given in proper time. The election then proceeded with the results noted elsewhere.

The Indian Officers' Association :- Agricultural Branch *Annual Meeting.*

The annual meeting was held on the 15th July. About 30 members were present. A group photograph was taken. The association was at home to meet the Honorable Minister for Development. As a branch of the Indian Officer's Association Madras, this association was formally recognised in October 1923 and there are now 39 members. The report of the working Committee of the Association up to June 1925 was read and adopted. Byelaws for the working of the association framed by the Committee were passed with some amendments. The old Committee was re-elected consisting of : Messrs :- M. R. Ramaswami Sivan, T. V. Rajagopalachariar, V. Ramanatha ayyar, C. Tadulinga Mudaliar, and K. Krishnamurthi Rao. The association has taken over the Swamikkannu Pillai Memorial Fund to be subscribed for by the members of the Association. A sum of Rs. 1000 has been promised and Rs. 500 have been paid and deposited in the Bank. The form which the memorial will take will be decided when the full amount has been collected.

A deputation of 7 members were elected to wait on the Honorable Minister for Development to evince an interest on the welfare of the members in all the grades of service especially in the new schemes for development of the Department. The deputation waited on the Hon'ble Minister on the 16th July and the Minister was good enough to give an assurance that he would always have the welfare of the Indian Officers of the Department in his heart and give careful consideration to any representations made by the association.

The meeting was a success in that it gave an opportunity to members from the moffusil and the College to freely discuss informally on various points.

The Lower subordinates Association—Second Conference.

The Lower Subordinates met at the Second Conference on the 17th July in the Union Office Building, Lawley Road., to adopt the annual report for the year ending 30—6—25 and to discuss matters of interest concerning the Lower subordinates.

The deliberations were conducted under the chairmanship of M. R. Ry A. V. Thirumuruganatham Pillai Avl, Assistant Director in charge, Madura Circle.

Members Present. Mofussil, Messrs. A. Kondaya sarma, P. Sambasiva Row, V. Achutham Pandulu, V. Narasimha Sastri, Haji Supi, I. S. C. Anthony, A. Ramalingaier, S. Rama Row P. Satyanarayana. *Local.* Messrs. R. Narasimhan, R. Narasimha-chariar, C. K. Subramanian, V. Viswanathan, N. Krishna Menon, C. V. Sankarnarayanan, C. Rangaswamy, S. Rajaratnam.

During the year under report 4 committee meetings and two general Body meetings were reported held.

The Secretary Mr. R. Narasimhan in his report further submitted, that representations were made to the Director of Agriculture direct and through the Union to better the prospects of the Lower subordinates and read the Director of Agriculture's reply to the Union, copy of which forwarded to this association ran thus:—

"I have the honour to offer the following remarks on the several representations seriatim".

1. To stop recruitment to Lower subordinate service from January 1926.

This will be done and it is the present intention of the Government.

2. To treat the new plant collector maistri group of men as distinct from the existing Lower subordinates.

This is so now. These men are on different scale and will remain on it.

3. That 20% of vacancies in upper subordinates' grade be earmarked for Lower subordinates.

Deserving men will no doubt get promotion in due course but it is not feasible to fix a definite percentage.

4. That a few of the Lower subordinates be chosen to undergo specialised courses preparatory to absorption as Upper subordinates.

This is done now and will be done as necessity arises.

5. That the existing vacancies in the first four grades be filled up.

There are no vacancies in the first two grades. The filling of other vacancies will be considered.

6. *That when a vacancy occurs in the 1st grade, two posts in the last grade may be abolished, one post created in higher grade and thereby one V grade man may be promoted and maistri also appointed.*

This scheme will be considered when recruitment is stopped.

(Sd.) R. D. ANSTEAD,
Director of Agriculture.

The meeting considered several motions and amongst the chief were:—

1. That the members' subscription to this association be not collected until necessity arises, as there are sufficient funds at present.

2. That the Madras Agricultural Students' Union be requested so to modify their rules as to take in automatically into their Working Committee two members elected by this body at the General Body meeting of association.

The following is the statement of Receipts and Charges for the year under report. *Receipts.* Amount collected prior to 1924 Rs. 10/- 4, Entrance fee from members Rs 15/- 4, Subscription from members Rs. 100-6, Interest upto 9-7-1925 Rs. 1-1-1 Total Rs. 125-15-1.

Expenditure. Expenditure during the year Rs. 10-2-6, Cash in the Urban bank in fixed deposit Rs, 100-0-0. In savings bank Cash on hand, Rs. 10-12-7, Total Rs. 125-15-1.

The Association requested those who are yet outside to enrol themselves as members, as on their united strength alone their interests will be advanced.

LIST OF WINNERS AND RECORDS FOR—1925.

Events.	Successful competitors.	Record.
100 Yards Race.	1. Karunakaran Nair, V.	11 3/5 Sec
	2. Abraham, M. C.	
	3. Ramaswamy, K.	
Long Jump	1. Varadachary, K.	16 ft. 6 ins.
	2. Ramaswamy, K.	
	3. Abraham, M. C.	
Putting the Shot	1. Rajagopalan, N. S.	21 ft. 6 1/2 ins.
	2. Abraham, M. C.	
High Jump	1. Karunakaran Nair, V.	4 ft. 6 1/2 ins.
	2. Venkatacharya	
	3. Abraham M. C.	

Quarter Mile Race	1. Ramaswamy K. 2. Karunakaran Nair V. 3. Sundaresan.	64 sec.
Throwing the Cricket Ball	1. Ramaswami, K. 2. Sundaresan.	85 Yds. 4½ ins.
Half Mile Race.	1. Ramaswamy, K. 2. Karunakaran Nair, V. 3. Sundaresan.	2 min. 34 4/5 sec.
Three Legged Race. Deadheat	{ Abraham, M. C. Varadachary, K. Karunakaran Nair. Sivasankara Menon. }	
Half Mile (Open)	1. Yorke. H. Stanes High School	2 min. 22 sec.
Dead Heat	{ Pharoah, S. Kunjunny Tampan, K. }	Do. Medical School
Hurdle Race	1. Venkatacharya. 2. Abraham, M. C.	25 seconds.
Old Boys' Race	1. Dasappa Malli. 2. Ratnavelu.	
One Mile Race	1. Ramaswamy, K. 2. Narayanan T. R. 3. Raman Nair.	6 min. 8 sec.
Obstacle Race	1. Narayanan, T. R. 2. Abraham, M. C. 3. Padmanabhan.	
Cross Country Race. about 5 miles	1. Ramaswami, K. 2. Narayanan, T. R. 3. Karunakaran Nair, V.	40 min. 50 sec.
Inter-Tutorial Relay Race	—Rao Saheb Y. Ramachandra Rao's wards.	
Do Tug of War	—Mr. C. Tadulingam Mudaliar's wards,	

BEST ATHLETIC RECORDS.

Events.	Record.	Year.	Competitor.
100 Yards Race	11 sec.	1921	J. Balaraj.
Long Jump	18' 2½"	1921	S. N. Venkataramanan
Putting the Shot	29' 6½"	1921	T. B. Anderson.
High Jump	5' 1"	1923	A., Jiyaratnam.
Quarter Mile Race	60 2/5 sec	1923	M. Ratnavelu.
Throwing the Cricket Ball	97 yds.	1918	A. V. Babi.
Half Mile Race	2' 26 5/8"	1921	C. S. Doraiswamy.
Hurdle Race	18 4/5"	1919	T. Seshachalam.
One Mile Race	5' 4"	1918	K. S. Krishnamurthi.
Cross Country Race	37' 55"	1923	M. Ratnavelu.

CHAMPIONSHIP RECORD.

Year.	Marks.	Name of Champion.
1911	39/71	Gururaja Rao, K. M.
1912	39/71	Mal, R. G.
1913	39/71	Mal, R. G.
1914	33/81	Venkatachala Mudaliar.
1915	32/91	Venkatachala Mudaliar.
1916	53/91	Ramanna Rai, K. S.
1917	39/91	Dharmalingam, S.
1918	51/91	Babi, A. V.
1919	59/91	Dasappa Malli, B.
1920	—	Dasappa Malli, B.
1921	40/91	Doraiswamy, C. S.
1923	55/91	Ratnavelu, M.
1924	41/91	Karunakaran Nair, V.
1925	55/91	Ramaswamy, K.

List of Visitors to the College Day

Non-official:—Dr. R. V. Norris, Bangalore; Dr. H. Naganna Gowd, Ph. D. Hospet.; Mr. Tandu Mudaliar, Hospet.; Mr. Krishna Raju, Fernhill.; Mr. T. B. Anderson Danishpet, Salem.

Official Gazetted:—Messrs. G. R. Hilson, R. W. Littlewood, A. C. Edmonds, B. Ramiah, P. H. Rama Reddi, D. Ananda Rao, N. S. Kulandaiswami Pillai, A. V. Tirumuruganatham Pillai, M. Govinda Kidavu and C. Narayana Ayyar.

Non Gazetted Upper subordinates:—Messrs. D. Panakala Rao (on leave) R. Vasudeva Rao, N. Rama Doss, M. Anandan, G. Sitharama Sastri, Jagannatha Rao, R. Swami Rao, C. S. Krishnaswami Ayyar, T. G. Muthuswami Ayyar, L. S. Natesa Ayyar, V. T. Subbiah Mudaliar, M. Muthia Nattan, V. K. Subramania Mudaliar, K. Ramana-Rai, T. K. Balaji Rao, K. G. Sankappa Bhandari, Arokiaswami Pillai V. S. Ramaswami Ayyar, S. M. Kalyanarama Ayyar.

Non-Gazetted Lower subordinates:—Messrs. P. V. Sambasiva Rao, P. L. Narasimham Pantulu A. Kondayya Sarma, P. Satyanarayana, V. Achyutam Pantulu, Hanumantha Rao, V. Subba Rao, S. Rama Rao, S. Venkataraman, J. S. C. Anthony, S. Janakiramaia, A. Ramalinga Ayyar, V. Narasimha Sastry, Haji Soopi.

Students' Corner.

25 students were admitted into B. Sc. class. I and joined on 1st July. As many as 10 are from Malabar and this shows the keenness with which the West Coast is taking to agricultural education.

Estate Notes

Dr. C. A. Clouston visited the Cane Breeding Station on the 13th and 14th Instants.

Editorial Notes.

College Day and Conference:—Unlike last year, the proceedings of this year's College Day and conference started, progressed and ended in very glorious weather. No uncomfortable winds nor chilling intermittent drizzles were in evidence. The guests arrived on the 13th and 14th and were suitably lodged. The sports commenced punctually at 3 p. m. on the 14th and the Freeman building afforded ample facilities for accommodation of seats for sight-seeing, on the veranda.

and in the commodious rooms inside for Union's AT HOME. All the events were keenly contested and the day's proceedings terminated with the presentation of prizes by Mrs. Butcher followed by cheers for the kind lady who had at great personal inconvenience consented to preside on the occasion.

The conference met at 12 noon on the 15th on the ground floor of the College under the Presidentship of the Hon'ble Minister for Development M. R. Ry Diwan Bahadur T.N. Sivagnanam Pillai Avl. Principal Broadfoot welcomed the visitors in a neat little speech which was marked by an absence of mere conventionalities.

The Secretary then read the report for the year in which he touched upon the present satisfactory financial state of the Journal and referred in passing to the statesmanlike utterance LORD BIRKENHEAD made as the result of Reading-Birkenhead conversations.

The Hon'ble Minister next gave his presidential address in which he dealt in detail with the situation of the agricultural scientific worker in India and of the spirit which should prompt him in his efforts to advance the cause not only of science but of the country in which he was born.

This over, being called upon, Dr. R. V. Norris read his paper on 'Recent developments of microbiology' in which the necessity for the study of biological problems connected with the soil was emphasized.

The second paper was by Mr. K. Sankaran Pillai on 'Guntur agriculture' which dealt with the improvements possible in Indian agriculture even with the limited means at our disposal.

Mr. J. Gray the local Registrar of Co-operative societies, in the third and last paper for the day on the "importance of the study of co-operation to the agriculturist" described the tremendous strides that had been recently made in the field of co-operation.

The second and third sessions which met on the 16th, were characterized by an unusual amount of very friendly and constructive criticism which followed the reading of almost every paper, except the one by Mr. V. Ramanatha Ayyar, on 'some limitations of Bessel's formula' which was too technical. Mr. Anandan's two papers which dealt with two aspects of work of the plant-breeder elicited much comment and the other three by each of Messrs. K. Unnikrishna Menon, T. B. Anderson, and R. Swami Rao kept the audience intensely attentive and it was a unique feature of this year's conference

that the question of LABOUR was allowed to be discussed showing the attention that this subject demands in any agricultural development. On the 16th night "Eye of Love" in Tamil and "The Magic Button" in English were staged. Admission was regulated by tickets. The Union expresses its grateful thanks to all ladies and gentlemen who in one way or another, contributed to the success of the present sessions.

The Andhra University Bill. University education for the Andhra districts has assumed a definite shape and it is presumed that, before the year closes, the Andhras will realise the fruits of their labour for the past 15 years in trying to secure a separate existence. That there is enough room for more than one University in this province has long been known but mere number does not count if, as Dr. Rabindranath Tagore put it, brick and mortar and fragile glass cases alone become the be-all and end-all of educational enthusiasts. It is a good thing that due importance is given to the vernacular which becomes the medium of instruction in the proposed University. This would save a student very many years of unprofitable work in studying a foreign language and leave him ample opportunities and time to think and express in his mother tongue and quicker improve his knowledge. We are sure that Andhradesa that has shown greater enthusiasm and earnestness of purpose during the past two decades than were before will persevere and lay her foundations strong and deep for a material and distinctive contribution to the uplift of this country.

We are gratified to learn that in the scheme proposed agriculture is given an honoured place and it is all for the good since the Telugu districts are better situated in the matter of natural conditions than other parts of this province.

July Weather. The weather conditions this year are favourable and in this district, cholams, wherever they were sown in usual time, matured well. Gathering has commenced. The grain ear-bug which made considerable havoc last year in summer cholam fields is very much less in evidence and the suspicion created that earlier sowing than in Chithrai might be the cause of the appearance and spread of this pest should be laid at rest, if the size of the present crop is any indication and causes are to be sought for elsewhere.

The Golden Jubilee. The Union has enthusiastically taken up the celebration next year of the Golden Jubilee of the introduction of agricultural education in India by first founding the Agricultural College in Madras. A number of events are expected to be gone through and the Government, District Boards, Educational institutions and the landed aristocracy will, it is hoped, take an active

interest in the celebrations and help the Union in all ways, to show to the country what a small band of enthusiasts can do in the present state of confusion in India, to steer clear of the dangers ahead in reduced production that will become inevitable if Nature's warning is not heeded in time. In this connection, we would invite our readers to the Budget estimate of the Union for 1925-26 published elsewhere in this issue.

The Mettur Project. His Excellency Viscount Goschen performed the pleasing ceremony of inaugurating the construction of the Mettur project in Mettur on the 20th instant. The Honble, the Law Member in charge of Irrigation portfolio and a number of M. L. C's and leading landholders were present. Mr. Stoney, the Special Superintending Engineer gave a short history of the project. It is as old as the middle of the last century when the late Engineer-statesman Sir Arther Cotton was thinking out his schemes amidst very uncongenial surroundings. This scheme aims at bringing under wet cultivation 300,000 acres of dry lands in the Tanjore district. The ryots of Coimbatore and Salem also are keen on profiting by the scheme and we hope the utmost that is possible will be done to satisfy all interests.

Departmental Notification.

Transfers and Postings:—

1. Mr. A. Ramasawmy Ayyar transferred to Tindivanam as Agricultural demonstrator in charge of Gingee and Tindivanam taluks.
2. Mr. K. E. Visvam Ayyar Assistant Agricultural Demonstrator to Polur to relieve Mr. A. Ramaswami Ayyar.
3. Mr. Eggiyaswami Ayyar to be in temporary charge of the Tindivanam depot until relieved.
4. Mr. A. J. Mascarenhas, Upper Subordinate Vth grade, Cotton Specialist's section transferred to the Agricultural section in the same grade in the vacancy caused by the death of Mr. Ramachandra Ayyar and posted to IIInd circle.
5. Mr. G. Jagannatha Rao Offg: Assistant in the Vth grade on probation with effect from 1st, August 1925 in the vacancy caused by the transfer of Mr. A. J. Mascarenhas to the Agricultural section.

Leave etc.

First Circle:—

Mr. V. Achyutharamaiah, Farm manager, Anakapalle leave on average pay for one month, from 1st July.

Mr. Mr. V. Butchi Raju, Assistant Demonstrator Vizianagaram, extension of leave by two months, on medical certificate.

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(vii)

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Mr. T. A. Rangaswami Ayyangar Assistant Demonstrator Salem, leave on average pay for 14 days from 25th July.

V. S. Narayanasawmi Ayyar, Demonstrator, Salem, leave on 3 average pay for 29 days from 27th June.

Mr. K. B. Visvanatham Panthulu Farm Manager leave on average pay for twenty days from 16th July.

Agricultural Chemist's section:—Mr. K. Govindan Nayar, Assistant, leave on average pay for two months from or after 5th July.

Cotton Specialist's section:—Mr. V. Ramanatha Ayyar leave on average pay for 15 days from 27th July.

Entomologist's section.—Mr. C. K. Subramaniam Sub-Assistant, leave on average pay for one month from 21st July.

Mr. C. V. Sundram, Assistant leave on average pay for one month from 1st July 1954 after 25th July.

Millet Specialist's section.—Mr. Somasundaram, Maj. Assistant Manager leave on half-average pay from 24th Jan. and leave not due for 2 days in continuation.

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The Journal of
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