

Journal of the Madras Agricultural
Students Union.

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Journal of The Madras Agricultural Students' Union.
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THE JOURNAL
OF
The Madras Agricultural Students'
Union.

Vol. XII.

JULY 1924.

No. 7.

"How to call Our Young Men back to the Farm."

S. RAMACHANDRA AYYAR, DIP. AGR.

India has just reached the stage which all other progressive countries in the world had to pass through at one time, i. e. the stage when all the young men desert villages and crowd into towns out of thirst for higher education and with higher ambitions in life and would not owing to the present economic dislocation of the villages go back to them even though disappointed in their aims.

How to call these young men back to the Farm is therefore the foremost problem in the programme of all Local Governments in India and is the foremost aim in the minds of all scientists, poets and philosophers in India—Bose, Ray, Tagore, Gandhi and Andrews. If the causes are correctly diagnosed the remedy is easy.

88% of the population of India depend on Agriculture. So farming has been almost the only profession for the masses and land has been our only property from time immemorial. It is therefore no wonder that the division of property between the members of a family has been a necessity and that, since every man works more for himself than for others our ancestors had, in order to encourage intensive farming, to legislate and make the Hindu Laws which are in force to this day.

Moreover in all the countries the size and nature of the holdings depend mainly on the available capital and on available power,—man, animal or mechanical. The general poverty of the country and the only available man and animal power determined the holdings to be small. Over and above this, the capricious rainfall distributed over a small number of days in a year and the precarious sub-soil water as well as the inefficiency of the agricultural implements play an important part in deciding the size of the holdings as small. The general poverty of the soil and the great variations in the fertility and in irrigation facilities of different plots in the same vicinity have tended to keep the holdings highly scattered, since India is a country of peasant or subsistence farming by which the ryots grow all that they want and consume all that they grow. Joint farming (as in the case of betel-vine and tobacco-cultivation) rather than large holdings may go a great way to increase the yield per acre. Even here the scope for joint farming is limited owing to the limited supply of sub-soil water and the lack of labour saving appliances. India is not rich in coal or petrol nor are we in a position to manufacture our own machines. Till 30 years ago agricultural experts proclaimed at the top of their voice that western labour saving machines could not be introduced into India for agriculture owing to the cheapness of manual labour. Though labour conditions have considerably changed within these 30 years western machines have not yet been introduced with success in agricultural pursuits owing to certain other peculiar agricultural conditions of the country.

Irrespective of these conditions which are unique, Dr. Voeleker, during his travels in India, was very much struck by the highly scientific methods of farming using simple and cheap agricultural implements and tools, by the presence of innumerable varieties of every crop, varieties of fruits and grafts of splendid types and breeds of cattle suited to different conditions. By the way in which various agricultural operations are conducted he was convinced that most of the scientific principles of farming which the western countries learnt in the 16th or 17th century, such as principles of ploughing, manuring, irrigation, drainage, bare and green fallowing, mixed cropping, rotation, mixed pastures, seed selection, plant and cattle breeding, grafting, budding etc., have been known in India from time immemorial. To this I may add that the crops and cattle of olden days were in no way inferior to the best present day production and if there were any differences, they were due to differences in climatic conditions between then and now.

It is common knowledge, that the art of cultivating the soil in this country is perfect. The implements of husbandry are simple and cheap, the cultivators are intelligent and hard-working, yet the out-

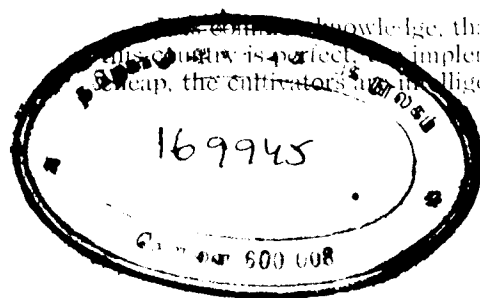
turn is poor due to want of water and manure. In examining the agricultural conditions of India, Dr. Voeleker has said that no great agricultural improvement is possible except by way of securing more water and manure to the ryot. Another indirect proof of the superiority of Indian farming is that thousands of Indian agricultural labourers even after working in the agricultural farms in various other parts of the world have not been able to bring back to India any improved methods of farming, a simple cheap agricultural implement or a good variety of crop except Mauritius ground-nut and plantain into South Arcot.

Within the last 30 years the conditions of the ryots as regards facilities for water and manure have in no way improved and if at all have remained stationary.

70% of the arable lands depend for their irrigation upon sub-soil water. At varying depths there is always an inexhaustible store of water. If with suitable "water finders and boring apparatus" we get at different water levels an assurance of a large out-put of water, a great temptation will be held out to our absentee land-lords to get back to their villages.

Looking at the rapidity with which Americans, who inhabit the opposite side of this globe, are carrying on their well-boring operations with power drills, I have begun to suspect if they would not run their bore-holes right through and reach our surface, carrying away the little water we have, and leave India dry. I do not vouch for the possibility of such a contingency as I am neither a Physicist nor a Geologist. Anyway we must hurry on our boring operations to establish our right for half the mass of the globe.

Most of the wells in India do not give more than 1,500 to 2,000 gallons of water per hour which a pair of good bulls can lift in an hour. This quantity is about enough for half an acre a day and thus not more than $2\frac{1}{2}$ acres can be brought under cultivation under a well. Owing to the introduction of railways and power machinery in our village industries viz., hulling, shelling, ginning, crushing, and milling the demand for cattle is growing less, so much so that many of our cattle breeds such as "Punganoor", "Pulikkulam", "Alambadi" etc., are becoming extinct and the rest are also deteriorating. Price of cattle has grown high though their capacity for work remains the same or is getting less. Ryots apprehend great deterioration and risk of yoke gall for their valuable cattle when put to *whole work*. Lift irrigation is thus being slowly given up. So with better water finders, borers and bakers there is a great future for India. Increased well irrigation not only does more good to the country but also prevents the emigration of



useful agricultural labourers for want of work for nearly 6 months in the year and the water thus brought to the surface during summer will only come back to us as heavier rainfall.

Pari passu with the increased development of water facilities increased supply of manure should also be made. Because good irrigation makes the crop and soil more and more hungry and heavy manuring makes the crop and soil more and more thirsty. So water and manure must go hand in hand. The success of the Japanese in their farming is due to their careful methods of manuring. The great care with which every house preserves even (to us the most detestable) night soil is clear proof of their thrift in farming.

The chief sources of manure in India are the refuse of all animal, vegetable and mineral products not useful to man. Immediately after harvest all the vegetable and animal products are carried away from villages, thus depriving them of their utilisation to which the and cattle fields have a right. Irrespective of the loss of the bye-products as bran, husk, oilcakes which serve directly as valuable cattle-food and indirectly as manure to the fields that produced them, the villagers and animals are deprived of an industrial occupation during the non-agricultural season. The extinction of these village industries and the deprivation of the fodder and manurial bye-products are the main causes of the impoverishment of our soils, the deterioration of our cattle breeds, the depletion of our village artisans, the emigration of agricultural labourers and of absentee landlordism. How can we expect our young men to stay in villages for the sake of a few months' farming on impoverished soils wanting in manure, with cattle deteriorating for want of fodder and work all the year around, wanting in village artisans and without sufficient labourers. So farming is now left in the hands of poor and illiterate lessees who earn only a living wage more by manipulating the accounts than by real farming. Resuscitation of village industries is the only solution for all the draw-backs in farming. Owing to small and scattered holdings, and insufficiency of water, western machinery has not been much of a success in agricultural operations. The paucity of cheap fuel and machinery stands against their being used in villages for village industries alone. It is needless to mention that the agriculturist has to maintain a certain number of cattle for cultivation and appliances in which these cattle could be used will be the most economical means to him. Our man and animal power now available in the village are too feeble to cope in industrial work against power machinery. Other countries, when they changed over to mechanical power, changed their system of holdings and took to capitalist farming. Large holdings and capitalist farming are equally impossible in India owing to the

capricious monsoon, precarious sub-soil water supply and other conditions stated above. We have therefore to evolve some kind of machinery by which our men and animals could be utilised to the best advantage. In this respect our ancients left us a clue. Man's energy has been most efficiently utilised in several parts of this Presidency for drawing water and for husking paddy by using their full weight on an oscillating seesaw. Following this idea, the late Rao Bahadur C. K. Subba Rao utilised the weight of a bull on an oscillating platform for generating power to draw water. Encouraged by his pioneer work, I have placed in the market another mechanism by which the full weight of an animal is utilised for generating power to lift water from a well. Dr. Gilbert Slater, after a careful study of the present dislocated economic condition of Indian villages, of my mode of applying animal power as in the lift and of the possibility of doing so for village industries, stated publicly that "men and animals engaged in the agricultural industry get little or no help from machines". Introduction of large labour saving machines has already disturbed our village economic conditions. Small multiplication of man and animal power by mechanical means is the only solution for the improvement of Indian agriculture and village industries. We are often told that we have a duty to the man behind the plough, but I have been convinced that our first duty is to the animals in front of the plough. By liberating our dumb animals from their yoke and by securing a humane method of utilising their energy by devising suitable mechanisms as demonstrated by the lift you saw the other day, turning out far more work than the same animal would do under the yoke, we can successfully fight the mechanical power for our scattered and small holdings, providing work for our men and animals all the year round both in agriculture and village industries. Sufficient bye-products of our village industries will be left in the villages to serve as fodder and manure. A few concrete examples would not be out of place here. Ginning of cotton is purely a physical process of removing the lint from the seed. The cotton growers of small holdings not being provided with suitable and efficient man and animal power-machines to work in their own homes, are now compelled to carry the kappas to a distant ginning factory and return home even without seeds. With the energy of men and animals that carried them to a distant place, they could have ginned the kappas in their own homes with enormous advantage.

It takes nearly a month to crush an acre of sugarcane with one or two pairs of bulls. But, if the ryots can crush the canes with the same men and animals in a week's time, sugar cultivation is sure to extend by leaps and bounds. What a boon will it be to the ryot if he is enabled to crush all his oil-seeds and available bones in his own

home during the non-agricultural season? Owing to the capricious nature of the monsoon the whole village goes out for ploughing as soon as the rain falls and sows all the seed in a day or two for fear of losing the moisture. This shows the need for high speed ploughs and seed-drills. Owing to the present dislocated labour conditions, manual reaping machine for paddy and ragi are keenly felt in many districts as a want. Invention of a good machine for removing prickly-pear will not come a day too soon. After cultivation to crops is badly neglected for want of labour-saving appliances. With such inventions our soils and crops could be improved, our village industries could be revived, the conditions of village artisans will be bettered, our village agricultural labourers will stay away in their own homes with a better earning capacity all the year round and absentee landlordism will automatically cease. With the help of motor-cars, high speed trains, telegraphs and telephones, both wired and wireless, our journalists, merchants, doctors, lawyers and engineers have enormously improved their earning capacity. Our middle class men have had their conditions enormously bettered with the help of motor-cycles, bicycles and tram-cars. Typewriters, shorthand and fountain pens have so miraculously improved the condition of the clerical population that Madras clerks are found all over India. But alas! what about the poor agricultural population! We are still crawling along the ground with wooden ploughs and half starved animals. We are still plodding on backwards in an unnatural position on steep ramps with our animals frothing and breathing hard while lifting water. Our reaping knives and oil mills are still proverbially crude.

Where are the improved machines, one of you may ask? I have only placed before you the results of my study and experience of Indian farming in a humble way gained in my attempts to meet one or two of the present needs of the country. If by mechanical means we are able to increase the efficiency of man and animal power, Indian farming will soon see a great advance. Such an increase in efficiency of man and animal power will be a great addition to the power supply of the whole world especially when the supply of coal and petrol are apt to diminish. With the expected supply of white-coal in India, other industries have a great future. India has thus a chance of becoming one of the richest countries of the world, both agriculturally and industrially, like America. Will not the increase in the efficiency of man and animal power out-doing the work of small power engines call back our young men from towns to their villages for purposes of farming? Agriculture will never become a paying profession unless educated men take to it. Our educated men will not take to it unless labour saving and economic appliances afford a powerful help in agricultural operations, making agriculture a paying profession. Western researches and inventions in agriculture,

unlike those in medicine, engineering and other industries, have been found to be inapplicable (at least without great modifications) to present Indian conditions pertaining to agriculture and village industries.

We have, therefore, to evolve our own better methods of farming to suit our present conditions of holdings, water supply, soils, climate, and available power and thus our educated young men have a great scope for their energy and mental capacity not so much because agriculture is a paying profession as that there is such an enormous field for research and invention for making it a paying profession.

Discussion.

Rao Sahib M. R. Ramaswami Sivan declared that the chief impediment in the way of Young Men going back to the Farm lay in the lack of capital. He stated that what the agricultural graduates would ask for from the Government was neither more appointments nor more scholarships, but encouragement for practical Farming. Darkhasts should be given on easier terms and also state aid for starting private Farming, in which case, he said there was every hope of having numerous Home Farms throughout the country as wished for by the President. He also said that some legislation should be brought in to prevent the breaking up of land.

Mr. S. Seshagiri Aiyar—Agricultural Demonstrator declared that the average ryot was very poor—his earning capacity being only about Rs. 30 per head per annum. What was needed by him most was in his opinion (1) loan of money at easy rates of interest (2) supply of good manure on easy terms and (3) reliable markets for selling his produce.

Mr. G. Rajagopal Naidu stated that he was an example of a man who had gone back to the Farm as desired by the reader of the paper; but he had found to his cost that the conditions of village life and village morality needed a great deal of reform to make Farming attractive to an educated man.

Rao Bahadur J. Chelvaranga Raju—Retd., Dy. Director of Agriculture declared that in order to become a successful Farmer the agricultural graduate should be given a special course of apprenticeship in Farming. What was most needed in practical Farming was experience of various places and conditions and if the Government desired that the student should take to Farming after passing he should be given special training by a course of apprenticeship.

Mr. Sivan pointed out, however in this connection, that conditions of apprenticeship differed in different professions, for while the lawyer built up his experience with the money of his clientele, the agriculturist had to depend on his own capital.

Mr. S. Ramachandra Aiyer replied that in his opinion what the agriculturist wanted for his prosperity was a scheme whereby he had full work all the year round, which would not only improve his condition but also correct—what was termed—his morality. He concluded by declaring that the economic condition of the villager needed a deep and thorough study and suggested that an enquiry should be started early.

Natural Crossing in Summer Cholan, —a problem in seed purity.

G. N. RANGASAMI AYYANGAR, B. A.,—*Millets Specialist.*

Introduction:—The improvement of a crop is effected by improving its seed. The seed (to use popular language) is the product of the fusion of the two sexual elements,—male and female—that exist in the flower of the plant. When the pollen or male element of a flower fertilises its own stigma or female element it is a case of self-fertilisation; and when this pollen happens to fall on, and fertilizes a different neighbouring stigma it is called cross-fertilization. The purity of seed is assured in all cases of self-fertilization. But where cross-fertilization is possible any pure seed that is introduced in a new tract is liable to taint from its inferior neighbours. It will thus be evident that the extent of natural crossing that occurs in a particular crop is a matter of very vital importance in the methods adopted for its improvement and the maintenance of its seed-purity.

Previous work:—The amount of natural crossing occurring in Cholan has been variously estimated by different workers. In the year 1915 Graham working at Nagpur estimated the proportion of natural cross-fertilization in a loose-panicked type as 6 per cent and in a type with a compact panicle as 0.6 per cent. In one of his varieties as much as 20 per cent occurred. In 1919 Karper and Conner working in Texas, U. S. America got an average of 6 per cent. In 1922 Kottur and Kulkarni working at Dharwar experienced a range of crossing from nil to 12 per cent with the largest frequency at 2 per cent. The experience of these workers leads to the belief that the nature of the panicle, nearness of contamination and the conditions of wind prevalent at the time, have a combined influence in determining the percentage.

Method of determination:—In Cholan it has been recorded that yellow is so to speak a strong character and white, a weak one; so that if yellow and white are crossed with each other the product will be only yellow, the white not showing. The result is that when pollen from the yellow plant falls on the stigma of the white plant the seeds of the white plant when sown the next year would give rise in addition to the usual whites, a few yellow heads. Advantage was taken of this fact in 1922,—the year in which the Millets Section at Coimbatore started work—to harvest the heads from a belt of white cholam adjacent to and to the east of a field of yellow cholam. During the summer Cholan flowering season, strong south-west winds begin to blow and optimum conditions obtain, favouring natural crossing. The white seed that was thus gathered, was sown in the year 1923, and the resulting crop consisted of 17,346 white heads and 1,288 yellow heads making a total of 18,634. The percentage of yellow plants comes to 6.9 or very nearly 7. Here is a case in which white was sown and a few yellows gathered along with the whites, a case of reaping not exactly as we sow. The deduction is obvious viz., that these are the result of natural crossing. To make this deduction doubly sure, a few of these yellow heads were sown and in every one of these cases, the behaviour has been confirmatory of the fact that all these yellows are crosses.

The following table will show every one of these is *splitting* or *resolving* itself into the component parts which went to form it. The rogues, as we commonly call these natural crosses, are showing out in their true colours.

Family Number	Yellow	White.
847	177	60
850	123	38
852	135	45
858	156	47
859	94	30
861	119	43
862	118	41
863	115	43
867	109	34
869	194	60
	1340	441
Expected 3:1 ratio	1335	445

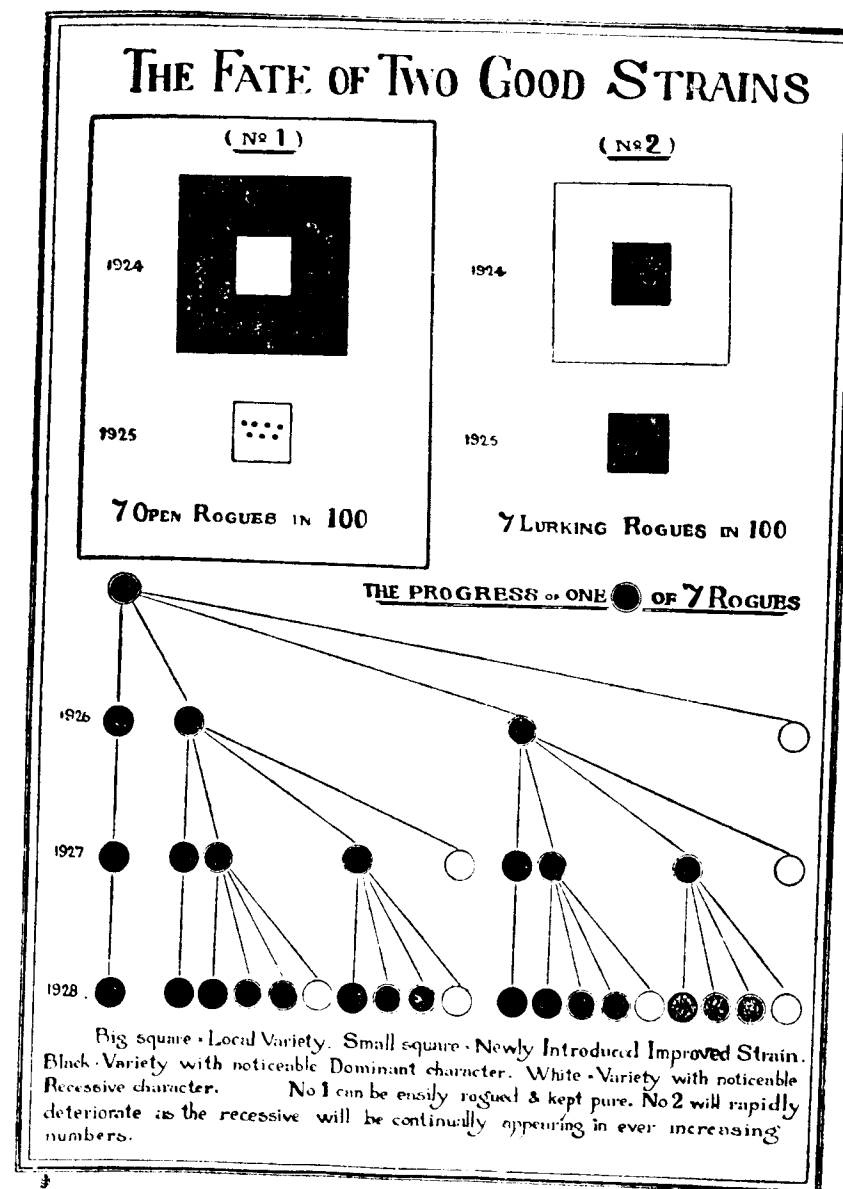
I am exhibiting the progeny from one of these families recently harvested along with the parent head. This instance that I have taken is as between two different varieties, yellow and white.

The trouble from natural crossing will be very acute when it is a question of an improved strain of any one of these varieties, either yellow or white. The difference between the improved strain and the local bulk crop will not be great and consequently the question of keeping the improved seed pure becomes very difficult. It is in this connection, that as a plant breeder I would insist on the supreme necessity of introducing into the improved strain some easily distinguishable character with the help of which all crosses, mixtures or rogues can be readily pulled out. It is essential that this character should be what is usually called a recessive character. I would instance a non-purple-pigmented variety as the one that should be introduced in a locality where the existing variety is a pigmented one. The advantage of this is as follows:—When the non-pigmented variety is distributed, it would in its initial stages have for its neighbour, the local pigmented ones. Any natural crossing that occurs will show, the very next year, pigmentation being dominant, with the result that these plants can easily be pulled out and further contamination avoided. The recessive character that I mention need not necessarily be in pigmentation only but may take the form of panicle shape or be, as in the case of a variety of Cholan, a sweet stalked stem recognisable by a dull leaden mid-rib. In the absence of this character it is very difficult to maintain seedpurity and it is no wonder that we often hear of the rapid deterioration of a reputed strain. The introduction of a distinguishing dominant—as opposed to a recessive—character has disadvantages of a very serious and practical type in the fact that any strange blood that creeps into the new strain has a tendency to keep insidiously running through and rapidly spoiling its purity. The illustration herewith exhibited will graphically show how ineffectual it is to be roguing under conditions in which the distinguishing feature of a strain is a dominant character. It will be seen that, like the monster in the fable, the impure blood develops through each generation and effectively checks all attempts at purification.

Since writing the above I have just seen an article by Kearny in the Journal of Agricultural Research in which, writing on Pima cottons, he dwells on the utility of a strain without an eye spot on its petal as an easy way of roguing and keeping pure an improved strain of cotton.

To summarize the points in this paper,

1. It is necessary to determine the amount of natural crossing that occurs in any particular crop, before adopting measures for the purity of seed of any superior strain,
2. In the case of summer cholam it has been ascertained that there is as much as 7% of natural crossing.



3. When a superior strain has been evolved, and is ready for distribution a vigorous scheme of successive waves of seed distribution should be inaugurated and maintained.

4. It is essential that a very thorough and systematic roguing should be practised in all seed farms.

5. To ensure this roguing being done easily it is essential that a readily recognisable recessive, weak or easily smothered character should be built into the strain that is spreading.

6. In doing this, care should be taken that such visible characters are not associated with adverse economic characters.

7. When it is inevitable that two varieties of Cholan have to be grown side by side, say yellow and white, as in the Chitral Cholan season, it is advisable to sow the yellow on the side from which the wind blows at flowering time.

Discussion.

Rao Bahadur J. Chelvaranga Roju in complimenting the reader of the paper on the value of his work wished to know whether there were any characters by which plants could be rogued before heads actually formed.

Mr. R. D. Anstead—Director of Agriculture in congratulating Mr. Rangaswami Ayyangar on a fine paper enquired whether the effects of cross-fertilisation in the Cholan crop could not be eliminated by rejecting the edges.

Mr. M. Anandan stated that the effects of cross fertilisation were due to the particular combination of the chromosomes of the male and female cells—these chromosomes being known to be the carriers of the characteristics of the parent organisms. In crossing work, he stated, it was essential to distinguish between desirable and undesirable combinations.

Mr. G. N. Rangaswami Ayyangar in replying stated that there were numerous characters such as the shape and colouration of the leaf, the midrib, the earhead etc. by which an early discrimination could be made, but these were yet to be studied. He also said that crossing need not necessarily be confined to the edges, but any one familiar with a ryot's threshing floor, he declared, could see how easy it was to mix up local inferior seed—which would be a case of the enemy not at the borders only, but within the camp.

"The Agricultural Department."

RAO BAHADUR K. S. VENKATRAMIER, B. A., NEGAPATAM.

The subject I have chosen is not one which requires any special study, training or expert knowledge. I should not have ventured to read the paper but for the sympathetic interest that the officers of the Agricultural Department have been showing to me and the indulgence which I can claim at the hands of the Agricultural Experts and the students.

The Agricultural Department was one of the Departments to which Government in years gone by had been showing a step-motherly treatment. It is only in recent years that Government organized the Department, though in my opinion Government are not allotting even 10 per cent. of what the Department really needs. Better late than never.

That the Agricultural Department has amply justified its existence requires no proof. The interest at present taken by some of the intelligent ryots in regard to the improved methods such as:—

(1) applying leaf-manure on a large scale and growth of leguminous crops for purpose of manure in their lands.

(2) collecting farm yard manure and not allowing the same to be converted into cakes or allowing the same to lose its manurial value by being exposed to sun and rain,

(3) by taking to the application of phosphatic manures,

(4) using select strains of seeds,

and (5) economic planting and sowing,

are all due to the gradual work of the Department and its Officers. I have personally visited the Agricultural Farm at Manganallore and the Paddy breeding station at Aduthurai and I can with confidence say that the work turned out (past and present) are well worth the expenditure incurred by Government. Various problems connected with agriculture such as:—

(1) designing of agricultural implements suited to the Indian soil, and the unsteady fickle monsoon,

(2) the evolution of improved varieties,

(3) the manufacture of manures at a cost at which the ryots may be able to purchase and use the same on a large scale,

(4) the improvement of live stock,

(5) the conservation of manure,

(6) the rotation of crops,

(7) the preservation of the richness in the soil by careful application of manures and seasonable and proper tilling, and

(8) the combating of insect pests,—require patient investigation for years before they can be certified to be a success and recommended to be adopted by the ryots.

The Indian ryot is always conservative and he will also hold fast to any method if he finds it to be a success. If a single experiment proves a failure it is apt to be misunderstood and it will spoil 20 successful experiments as the ryot will attribute the success to nature and his good luck.

The suggestion of the Director of Agriculture to open Demonstration areas of 10 acres in the ryot's own land has been accepted by Government and the experiment is to be tried in the Districts of North Arcot, South Arcot, Chingleput, Chittore and Kistna. It is a pity Government did not sanction one for the District of Tanjore which has its peculiar system of irrigation and wet cultivation unlike the Northern Districts where dry ploughing and tank irrigation are done largely. The money spent on the Demonstration areas is money well spent. Much useful work can be done by co-operation in Agriculture and which may be possible only if the Officers of the Agricultural Department are drafted into the co-operative Department. Out of more than 8000 Co-operative Societies, less than 20 are Agricultural Co-operative Societies. The Co-operative manure society at Nidamangalam and the Co-operative Agricultural and Industrial society, Shiyali do much useful work though they deserve more encouragement from ryots and Government.

I have been suggesting that Government should take some shares in such societies so that Government may have an officer of the Department on the management and see that the concern is successful. It is only then that the Government will have an indirect interest to work the concern at a profit to the benefit of the ryots.

Should the concern become successful and work well for some years, Government can then withdraw from the management and leave it to the private enterprise of the remaining shareholders. The Legislature by which Government were enabled to give State aid to the Industries cannot go far to help the Industries especially Agricultural Industry. Why not Government subsidise Co-operative

Societies intended for the benefit of the Agriculturists or guarantee a certain dividend! The distribution of mixed manure some years ago, free to the ryots as an experimental measure through the Agricultural Department at the instance of Mr. Sampson had a great effect on the ryots and the Department was able to sell the manure to a larger extent in the succeeding year. Even now those who used the manure often ask why Government do not sell such manure afterwards. I have had to direct them to Shiyali Society which is working against odds and which is in need of substantial aid from Government. Government can very well grant a large loan to the society with interest repayable after five years, so that the society can get on without encroaching on its capital and establish itself on a sound basis. The very fact of Government Aid will infuse confidence in the minds of shareholders and the ryots. All these should be done through the agency of the Agricultural Department. In some Districts the Pumping and Boring Departments may well be abolished and the money diverted to the Agricultural Department, as in my opinion it has not done much useful work in the deltaic Districts.

In India, especially in the Madras Presidency nearly 75 per cent. are agriculturists and the income from land is the chief source of Revenue to Government. Considering the advance in the agriculture of Japan, Denmark, Holland and other countries, it may be said that India is far behind. In spite of the practical work turned out by the Demonstrators, agriculturists in the rural areas view with distrust the officers of the Department. Till the educated men take an intelligent interest in improved methods of agriculture, much practical work cannot be done by the Department. Wealthy land-owners should give up the idea of educating their sons for appointments under Government or for taking up law. The scope in the Agricultural Department of Government is not large and before long all the Government posts will be filled by men turned out from college. It will be then said that there are more qualified men than there are posts to fill up and the college will dwindle in strength and may have to be closed eventually for want of admissions.

In order to command confidence in rural areas an officer must have some power and enough influence to make himself heard. What a stir there is when a Sub-Magistrate is to camp in a village! Even a Revenue Inspector commands more respect than an Agricultural Demonstrator, though drawing lower salary. Now-a-days even Tahsildars do not command so much respect as Deputy Tahsildars, because the former do not exercise magisterial powers and have no incometax duties at present. In my opinion students who undergo a successful course in the college should be taken into the Revenue Department freely, so that in their tours in the rural areas

as Revenue Inspectors, Sub-Magistrates, Tahsildars, and Deputy Collectors, they can bring their knowledge in Agriculture to bear on the ryots in rural areas and thus spread scientific Agriculture sooner and more efficiently than a separate agency can expect to do. An Agricultural graduate will make as good a Revenue officer as an Arts graduate. An Agricultural graduate by virtue of his training will be more sympathetic and free with the ryots and can thereby have special facilities to give advice and help to the ryots who require more of persuasion than a mandatory order.

One more matter which will conduce to the better working of the Department and of which I had occasion to refer to when I presided over the Aduturai Conference is the provision of a larger sum towards the travelling allowance of the Demonstrators who rarely meet with a sympathetic ryot that can give him accommodation and food in a village, for the officer can get no food in a village for money but only for love. The Demonstrator is a stranger to the village officers and though the latter are expected to give help, they may not help them even in getting a conveyance. One characteristic which I have observed in most of the Demonstrators is their extraordinary patience and the persevering tenacity with which they try to convince a ryot who scorns and laughs at their suggestions.

I may also take the liberty of suggesting the formation of an Agricultural Advisory Committee composed of intelligent and practical ryots, not necessarily members of the Legislative Council, to advise the Development Department on the needs of the Agriculturists, as I find that there is a tendency on the part of Government to appoint only members of the Legislative Council to such Committees but not invite many a competent non-official who may be willing to give the benefit of his knowledge and experience and spare the time for such honorary work. I may also take the liberty of suggesting that both Government and the members of the Council should agree to give a fixed proportion of the Land Revenue (i. e.) at least 20 per cent to the Agricultural Department for at least a period of ten years, as the prosperity of the country depends mostly on the prosperity of the Agricultural population.

In the absence of the writer, the paper was read by Mr. K. Ramiah L. AG. Asst. Economic Botanist.

Discussion :

Mr. C. V. Venkaramana Aiyangar, M.L.C., stated that he generally concurred in the views expressed by the writer of the paper and freely acknowledged that the Agr. Depart. had done some good, even

though in applying the Pest Act to the cotton plants it had assumed the rôle of a doctor amputating the leg simply to cure a guinea-worm attack. He said that the Department ought to be capable of doing a greater amount of good and that its officers ought to approach the ryots to a much greater extent and teach them improved methods. At present, he stated by way of an instance, from want of demonstration improved ploughs sold to the ryots were mostly being relegated to a corner of the village museum. He declared that there ought to be more of demonstration and that the demonstration staff should be strengthened and their prospects bettered. He was of opinion that higher education in agriculture was bound to fail in the long run and what was really needed was instruction in practical farming to the actual agriculturists. He concluded by declaring that, since the prosperity of the Government ultimately depended on the farmers, persuasion and not coercion should be the policy of the Agricultural Department.

Rao Sahib Mr. Sivan spoke on the work of demonstration already done in the districts and enlarged on the necessity, on the part of the Government, of providing proper facilities for taking up private farming so as to give opportunities to agricultural men for proving their worth.

Rao Bahadur J. Chelvaranga Raju remarked that a demonstrator's work required a great amount of tact and instanced his experience as to the difficulties he had in popularising the improved plough in Tinnevely and stated that the chief impediment in this matter proved to be the village carpenter (who was afraid his interests would suffer) rather than the ryot himself.

Mr. S. Ramachandra Aiyar instanced his own experience in the matter of ploughs.

Rao Sahib Y. Ramachandra Rao explained, with reference to the remarks made by Mr. Venkataramana Aiyangar, the purpose underlying the enforcement of the Pest Act against cambodia cotton. He said that while country cottons were usually removed at the end of the season, there was a strong tendency to keep cambodia cotton on the ground for more than one year, as it grew more luxuriantly and yielded heavily. This gave opportunities for the cotton pests to breed continuously and increase enormously in numbers. Introduced cottons like cambodia always proved more susceptible to pests and this was one of the chief reasons why most of the foreign cottons introduced in the past — such as Peruvian, Egyptian, and Caravonica — had rapidly deteriorated. The Pest Act was in reality being applied in the best interests of the ryots. It was regrettable that on account of the

loopholes in the law, the act was not being properly applied and that the observance of the dead season of two months was usually more noticeable in its breach.

Mr. Rajagopal Naidu said that, in the matter of the introduction of iron ploughs, Rao Bahadur A. Sabhapati Mudaliar of Bellary had done able pioneering work. It was mostly due to his efforts that the iron plough had spread widely in the Ceded Districts. As to repairs, village blacksmiths had soon learnt to attend to them. He declared that the Government should in his opinion open workshops in various places so as to be of use to ryots taking up improved implements.

After some more discussion, *the President—Mr. Noyce*—remarked that while the demand for more of demonstration was no doubt justifiable, it appeared to be generally forgotten that if research work in science at Research Institutes were not attended to, there would be little or nothing worth demonstrating to the ryots. For instance, he said, if continued research work had not been done at the Paddy Breeding Station in an attempt at evolving superior strains of Paddy, demonstrators would not have had any new paddies to distribute to the ryots.

Humility.

She walks not with uncertain gait,
Nor hangs her head in shame,
She knows her strength, if small or great,
And honours her own name.

She kneels before no altar rude,
God is her single law,
Only before Infinitude,
She bows herself in awe!

GILBERT THOMAS.

A ship with no port in view is the purposeless life. It may bustle this way and that, it may look busy, but it is going nowhere.

"Adversity" said Carlyle, "is hard upon a man; but for one man who can stand prosperity, there are a hundred who will stand adversity".

Making mistakes is not so bad as being so afraid of making them that we do nothing. The people who sit idly by and say, "we feared it would not succeed," are neither doing nor saying anything of value.

From "GREAT THOUGHTS".

Fruit Growing on the Nilgiris.

F. H. BUTCHER, *Curator,*

Government Gardens and Parks, the Nilgiris.

The object of this paper is to show the progress made by the Agricultural Department, during the past few years, to further the cause of fruit growing on the Nilgiris, in the hope that encouragement will be given to Officers of the department, to endeavour to popularise the growing of fruit in their Circles, by laying down plantations of fruit trees and plants suitable for their districts, and propagating and distributing the same, with advice as to their cultural and manurial requirements. If this is done a start will have been made to remedy the present unsatisfactory state of fruit-growing in the Madras Presidency.

Madras, situated as it is well within the Tropics, is suitable for the cultivation of many tropical fruits, and the mountainous districts of the Presidency, with their sub-tropical and temperate climates, render the growth of temperate fruits a practical proposition. In spite of these favourable conditions, Madras cannot claim to be noted for its fruits. The reason for this is, I believe, due rather to want of organised effort than to adverse climatic conditions. What little progress has been made is due almost entirely to foreigners, who brought the love of fruit-growing with them from other countries, and more important still, plants or seeds of the different fruits. But individual efforts soon wane, and it is only when such work is undertaken by an Institution or Government, that efforts are likely to be continuous enough to give satisfactory results. Take as an example the history of fruitgrowing on the Nilgiris. It will be seen from the remarks given below that very little has been accomplished, although a hundred year has lapsed since fruit-growing was undertaken, during which period much labour and money have been wasted by individuals, mainly through want of knowledge and to climatic conditions.

The first attempt to grow European fruit trees on the Nilgiris was made by Sullivan about 1821, when that gentleman had apples, peaches, and strawberries growing in his garden at Dimhatti near Kotagiri. McIvor mentions in his Annual Report of the Government Gardens for 1858 that "the late Mr. Casamajor and General Kennett spent large sums in their endeavours to introduce European fruits, and the results of their united efforts, extending over a period of 15 years have been to secure to the country two varieties of apple only". Burton speaks (alluding to 1847) of only strawberries and peaches as being obtainable in Ootacamund. He, however, refers in a casual way, to the visitor to the Hills falling into an "ecstasy at the sight of peaches, apples, strawberries and raspberries, after years of plantains, guavas and sweet limes". Generals Morgan and Baker and later Mr. Charles Gray and

Mr. George Oakes undoubtedly did a considerable amount to further the cause of fruit-growing, and Mr. Oakes at the present time has a fine orchard at Downham near Ootacamund. There is a good pear orchard also called Misquith's Farm, and there are also a few good orchards at Kotagiri, but really good and well-cared-for orchards are rarely seen, and many old ones appear to have died out. This, as I have said above, I attribute to want of knowledge and to climatic conditions. The former can be got over by experience and study, but the latter will always be a great drawback to the growing of exotic fruits on the Hills. Many people are under the impression that the climate of the Nilgiri Hills is superior to that of the temperate regions of the world for the growing of temperate fruits, but that the soil is wrong. It is my humble opinion that climatic conditions are the source of the difficulty. Mr. George Oakes, who is by far the best authority on fruit growing on the Nilgiris and has been growing fruits in his garden at "Downham" for more than 20 years, is of the same opinion. He believes that the main drawback is the want of a distinct cold season to rest and to ripen the fruit bearing branches. Mr. Oakes has practised several different methods to induce his fruit trees to "winter", or in other words, to stop growing and shed their leaves thus enabling the current year's wood to ripen. One method employed by him is that known as "root pruning" which consists of excavating the soil from under the trees and in cutting off the tap roots which grow deep down into the soil and draw up sub-soil water thus causing the trees to continue growth during the dry season, when they should rest. Root pruning also prevents the trees from throwing out strong sappy branches, which are useless as fruit bearers and prevent an even distribution of sap throughout the tree. Another method employed by him is to pave the bottom of the pit, in which the trees are planted, with stone, thus preventing the roots from penetrating into the sub-soil; Mr. Oakes has found this method only partly successful as the roots grow through the crevices of the stones. Concrete bases would be satisfactory, but the heavy cost prevents the use of this method. Neither of the above methods has been practised in the Pomological Station at Coonoor to induce cropping, but as our trees are still young and have not had time to root deeply into the soil, it may be necessary to root-prune later. It has, however, been noticed that some trees planted 12 years ago are not now bearing well, whereas the young trees of the same variety are doing so, which bears out Mr. Oakes' contentions. Another difficulty is the sterility of the flowers of some varieties and cross fertilization has produced no effect up-to-date. I believe the solution of the problem lies in the adaptability of certain varieties to various climates, and it is in this direction that much of the work done in the Pomological Station has been accomplished, and much expected in the future.

It will be seen from the above remarks that cultivation of European fruits presents certain difficulties in the Hills of the Presidency, and their cultivation should not therefore be undertaken without a considerable amount of forethought. That certain varieties of Plums, Apples, Pears, Peaches and Quinces can be cultivated in the Hills of South India is an accomplished fact, but all require constant attention and considerable skill. The Pomological Station at Coonoor has been established to study the different problems connected with fruit-growing and to disseminate information; also to distribute young plants of those varieties suitable to the district. Already several varieties have proved a success and thousands of grafted trees have been distributed.

I give below brief hints on the propagation and cultivation of these for the benefit of those persons who are fortunate enough to live in such districts; and are interested in fruit growing.

The Apple:—This fruit is a native of South-Western Asia and adjacent Europe and has been cultivated in temperate climates from time immemorial. It is adaptable to varying climates, and I have seen quite good crops in Bangalore, Yercaud and around Ootacamund each of which has quite a different climate. The apple is propagated by grafting on to suckers, which are thrown out from the roots of old trees. Where plants are scarce, pieces of root make good "stocks". The method of grafting is that known as "tongue grafting". The young grafts should remain in the nursery until the resting season and then transplanted in their permanent quarters 12' apart. When removing the plants from the nursery, the stem should be cut back to within a foot of the graft, and the thick roots should be pruned back with a sharp knife; all broken roots should be similarly treated. The ground in which the young trees are planted should be given a dressing of well rotted cattle manure and a double handful of slaked lime to each tree, well mixed with the soil. The roots must be carefully spread out, and the plants staked and well watered in. It is a good plan to shade the young trees from the sun with bracken or grass until they take root. On no account must the plants be allowed to become dry. Pruning is done during the resting period, and plants, a year after planting, require to be cut back to within a foot of the previous year's cut; which will cause the plant to branch when growth commences again. After this, annual prunings are necessary for several years in order to build up the tree. Apples should be made to form spurs along the branches and this can be done to some extent by hard pruning of the leading growths. The trees should not be allowed to produce fruits until about 5 years old, and then only sparingly. The varieties recommended are "Rome Beauty", "Irish Peach", "Jonathan", "Allsopp's Early", "Winterstein", and "Ligne Tillisch", all of which do well on the Nilgiris, especially the two former.

The two great enemies of the apple in the Nilgiri district are "Woolly Aphis" and "Stump rot". The former is an insect and attacks both the root and stem of the trees and if not kept down by spraying with an insecticide will eventually destroy the tree. Great care should be taken to secure young trees from pest-free areas and to examine them before planting, as once established Woolly Aphis is difficult to get rid of owing to spraying being impossible below ground level. This pest has destroyed whole orchards on the Nilgiris and is, I believe, the main reason why there are so few apple trees to be seen there.

Stump rot, or root disease, is a fungus which attacks the roots of trees of all ages. There is no effective remedy as far as I know, but I believe a heavy dressing of lime to the soil at the time of planting helps to keep down the disease.

The Plum:—The only kinds that thrive on the Nilgiris are the Japanese varieties which are hybrids of *Prunus salicina*, said to be a native of China. These are vigorous growers and some produce heavy crops three years from planting. The plum is easily propagated by budding on to peach seedlings. The procedure followed is to sow peach stones immediately they are removed from the fruits in beds containing sandy soil, and when the seedlings are 6" high to plant them 2' apart in nursery beds. The seedlings are large enough by January for budding, they are then headed back to within 6" of the ground and budded by the method known as "shield budding". The following October the trees are ready for planting in their permanent quarters, the method adopted being the same as recommended for apples, but in this case they are planted 18' apart. Pruning consists mainly of removing the superfluous wood and shortening back the leading growths which eventually form the main branches of the tree. Plums form an abundance of lateral growths along the branches and these should be cut back to within 6" of the stems to form fruiting spurs.

If growth is satisfactory the trees will produce a crop in about three years from planting; when this occurs the trees require a heavy dressing of cattle manure yearly, to maintain the fertility of the soil. A dressing of bone meal will also be beneficial. If growth is excessive, and poor crops are produced, the trees should be lifted during the resting period and root pruned; when replanting a heavy dressing of cattle manure and lime or Bone meal should be applied to the soil.

The varieties recommended for the Nilgiris are "Shiro" "Abundance", "Hale", "Wright's Late", "Satsuma", "Kelsey" and "Rubio", all of which vary greatly in size, colour and flavour.

The Pear. There is an old saying that if you plant pears, you plant for your heirs, and this saying is especially applicable to the Nilgiris, for I know of no tree which takes longer to bear fruit than the pear, ten to fifteen years being the usual period. There are one or two very good pear orchards on the Nilgiris, the one known as Misquith's Farm being the best. This Farm is situated at an elevation of 7,500' above sea-level. The variety grown is the "Jargonelle", which is the only kind grown to any extent, excepting the common China pear, which can hardly be classed as a pear at all. This latter kind, however, makes an excellent "stock" on which to graft the better varieties, and I anticipate some good results from the several varieties of dessert pears grafted on this stock, which are now being distributed from the Pomological Station. The variety known as "Keiffer's Hybrid" grows well at Mr. George Oakes' Farm. This is said to be a cross between the China pear and Williams' Bon Chretien and is of excellent flavour when properly ripened. It is used largely, I believe, in America for canning purposes. The method of propagation is as follows:—

Cuttings of the China pear are made from year old growths about the thickness of a pencil and a foot in length. These are inserted into sandy soil close together and when rooted are planted out a foot or so apart in the ordinary way, and the stronger shoots only allowed to grow, the others being removed. In January, or February, when the plants are about a year old, they are cut back to within 6" of the ground and grafted in the same way as that recommended for apples, viz., "Tongue grafting". The great fault with the China pear, as a "stock" is its tendency to produce a long tap root only, and when the grafted tree is transplanted to its permanent quarters this root must be shortened to induce lateral roots to grow. This naturally gives the plant a great check, from which it takes a year or so to recover. Pruning and after-cultivation are similar to that recommended for apples, but the growths should not be cut back so severely. The varieties recommended are few, as only one or two are grown at present. They are "Jargonelle", "Keiffer's Hybrid", "Le Conte", "Capiamont", "Gansell's Bergamot" and "Beurre Giffard".

The pear suffers from few insect pests or diseases. A large black Aphis is the only insect I have seen attacking it, and is easily kept down by spraying. The pear is not very susceptible to root disease.

The Peach.—This likes a warmer climate than any of the foregoing, and one would think that it would thrive better in consequence, but for some reason or another, a really good peach I have never seen on the Nilgiris. The reason may be because it is usually grown

from seed, and of course good varieties cannot be propagated in this way. Also the European varieties do not thrive well and all those to be seen on the Nilgiris come from what is called the China strain. Apparently the peach originated in Central Asia many thousands of years ago and spread by the aid of man to Europe and into China, where varieties to suit the different climatic conditions have been evolved. The South China type grows fairly well on the Nilgiris because, I suppose, the climates are more or less similar. Those who have seen a good English peach, which is round in shape and of a beautiful flavour and colour, well know its superiority to the pointed, badly coloured and flavoured peach to be met with on the Nilgiris. However, during the past few years one or two fairly good Australian varieties have been imported. They are "Bell's November", "Watt's Early Champion", "Shanghai seedling" and "Red Shanghai" and Mr. George Oakes has produced some very good specimens of the latter. The method of propagation is simple, buds being taken from good varieties and grafted on to seedlings. The trees should be planted about 12' apart in fairly rich soil to which lime has been added. The trees do not require much pruning other than thinning out superfluous growths. The peach produces its fruits on the previous year's wood, and not on spurs as is generally the case with the plum. The life of the peach tree is a comparatively short one, and the best fruits are obtained from trees from 3 to 10 years of age. The seedling peach appears to live much longer than the grafted tree and continues to bear large crops of inferior fruits for 20 years or so.

The Quince.—I mention this because so very few people seem to know it, and although I have seldom seen the Quince outside the Pomological Station, it should soon become widely known, on account of its adaptability to the Nilgiri climate. The Quince is not a dessert fruit, but is extensively used in America and elsewhere for Jams and Jellies and for mixing with apple jam for flavouring purposes. I have brought a few fruits with me, and any one is welcome to try to eat them raw. Those bold enough to taste this fruit will understand why it is used for flavouring Jams, for there is no stronger flavoured fruit in existence.

The Quince is nearly related to the pear and apple, but is placed under another genus by some Botanists, its generic name being *Cydonia*. This fruit has many peculiarities, one of which is that it fruits on the young wood, unlike any other temperate fruit tree, excepting the Walnut. When a fruit forms the shoot ceases to grow and another bud starts on the old wood below. This gives the tree a peculiar appearance. The Quince is propagated by cuttings or layers, but we have not been successful in propagating it in Coonoor and our

trees are all grown from imported stock. Pruning consists in shortening back the branches and thinning out superfluous wood. The Quince requires a rich warm soil in which to thrive. It does not like a wet soil as some growers imagine. The varieties grown in the Pomological Station are "Bereckzi", "Portugal", "Fuller", "Champion", "Bourgeat" and "Apple-shaped". The former is fruiting best at present.

I strongly recommend planters and others living in the Hills to grow a few trees around their houses, as, for stewing and jam, this fruit cannot be equalled.

This exhausts the common fruits of temperate regions grown on the Nilgiris to any extent at present, and as I fear I have already taken up too much of your time I will conclude my paper and show you a few specimens which I have brought with me from Coonoor.

Discussion.

Mr. C. Tadulinga Mudaliar—in expressing his appreciation of the numerous practical hints conveyed in the paper to the Horticulturist, wished to know whether the writer had done any experiments to find out the length of time taken for the complete union of the scion and the stock in bud-grafting as compared with inarching. As to root pruning, he cited his own experience some years ago in the Botanic Garden, Coimbatore with a *China Guava* which yielded profusely after the treatment. He also wished to know if he had tried grafting different genera of plants.

Mr. C. S. Gopalswami Rao—*Assistant in Mycology*—detailed his experience as regards root pruning for the Grape Vine. He stated that Vines are generally subjected to this treatment once in 3 years and that in the first year the value of the produce per acre rose to Rs. 1000/—, the second year it was Rs. 750/— and that the third year it dropped to Rs. 250/—. He wished to know if there was any difference in the susceptibility to disease between the scion and the graft.

Mr. G. Rajagopal Nayudu—remarked that it was a pity that the Government was confining its attentions only to one district for the study of fruit culture and added that Fruit-culture deserved a serious study as much as agriculture. In his opinion there ought to be a station devoted to the study of the mango in one of the mango districts of South India.

Mr. T. V. Ramakrishna Aiyar—while appreciating the wealth of information conveyed in the paper regarding Fruit trees and their culture, remarked that in the past numerous foreign insectpests had been introduced along with the imported stock and said enthusiasts in horticulture should beware of introducing serious pests such as the Mediterranean Fruitfly.

Mr. R. D. Anstead—*Dir. of Agriculture* stated for the information of the audience that there were three different gardens on the Nilgiris one at Coonoor for temperate fruits, the second at Burliar for sub-tropical ones and the third at Kallar for tropical species. There was in addition the Botanical garden at Coimbatore where a few fruits were being tried and the Orchard at Taliparamba Farm where fruit-culture was under trial. He stated further with reference to the remarks of the last speaker that the introduction of foreign insects had been of late sufficiently safeguarded against by legal enactment subjecting all entries to compulsory fumigation at the port of entry.

Rao Bahadur J. Chelvaranga Raju—mentioned the success he had achieved in grafting mango on to a stock of *Odina odayar*. He also gave his experience as to the usefulness of the provision of concrete bases in places where the sub-soil was of an undesirable nature and declared that the establishment of a separate station for studying indigenous fruits such as the mango was very necessary, since the stations on the Nilgiris were useful mostly to the European population.

Mr. M. Govinda Kidaru—remarked that he was in possession of definite information as to the export of a lakh of rupees worth of the ordinary variety of Malabar mangoes from Malabar to Calcutta, which showed that there was no lack of demand for any fruit in this country. Pine-apples, he said, had proved a success at Taliparamba, where he had hopes also of making fruit culture profitable.

Mr. Sivarajan—suggested that a study might be made of improving the celebrated Hill plantain of Sirumalais.

Mr. Seshagiri Aiyer—referred to the importance of studying bacterial disease of Plantain found in the Salem District.

Mr. Butcher—in reply stated that he could not speak of the relative merits of the two grafting methods, since bud grafting was the only method followed at Coonoor, and added that root-pruning was on the whole successful on the Nilgiris. Referring to the risks of importing pests, he said, there were practically none now, since the passing of the Pests and diseases Act.