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## EDITORIAL

**Agricultural Propaganda.** Agricultural Research gives us the means for plentiful production, but the problem is not solved till the social organization is taught the use of these new means.

Agricultural propaganda work involves salesmanship of ideas; the ideas may cost nothing, but their execution requires either some outlay, initial or recurring, or expenditure of some physical energy. The ideas, like goods, must be saleable, i. e., they must confer unquestionable benefits. Every item of propaganda to be catchy must produce visible and perceivable effects. There may be agricultural methods, the adoption of which may show benefits after three or four years; but such methods often fail to impress the farmer, as sustained interest spread over a period of years is difficult. It is for this reason that primary importance is given to those items, the effects of which can be perceived within a cropping season. After fully gaining the confidence of the farmer, other items which lead to slow improvement of the land may be tackled.

The correct approach is as important as the selling value of the idea. A successful demonstrator knows when, where, how and whom to approach. If a score or two farmers are personally invited to visit a demonstration plot and if the owner of the plot is permitted to show off a bit, the pride of the visiting farmers is kindled, and the improvement spreads rapidly. An indirect and subtle appeal to the pride and prestige of man rarely fails; and as a matter of fact pride and prestige have always acted as the custodian of good social behaviour. Effective speech is also a valuable adjunct for a successful demonstrator.

There is considerable room for research in the methods of agricultural propaganda. The use of an ineffective method leads us nowhere. Of the two equally costly methods, the one that gets results quickly, must be preferred. It is in this sphere that the supervising authorities should be alert and helpful. They are in a position to evaluate the efficacy of different methods and rectify faulty technique.

For every village there must be a definite practicable plan of agricultural improvement based on the needs of the village. For executing a particular item of the programme, a suitable method, should be pre-determined in the light of previous experience. Agricultural propaganda work is likely to be haphazard unless properly organized and well thought out in all details. It is obvious that two demonstration plots within a furlong are not as useful as two plots a mile apart. Demonstration plots with improved seed serve greater purpose when shifted from field to field than when they are in the same field year after year.

Propaganda is an art, and therefore the personal predilection and aptitude of men play an important part in this work. Nevertheless, there is

always room for improving the efficiency of those who fail to achieve the desired object. The progress that a demonstrator has made during the year may be reviewed and his work may be compared with that of another. Allowances should be made for the differences in the conditions in different tracts and the experiences and the abilities of the demonstrators. Even after making these allowances, it may be found that the progress of one man is not comparable with the progress of another. If the methods followed are the same, there is clearly scope for improvement.

Unfortunately we have no system which rewards suitably the enterprising and enthusiastic men. The absence of punishment is not by itself a suitable reward. Lack of encouragement often breeds indifference.

Even though in the programme of national reconstruction the place of the agricultural demonstrator is a paramount one, he often has legitimate grounds to feel that he is relegated to a secondary place. This calls for a general change in attitude. If the agricultural demonstrator is to rise to the occasion he should be allowed to assert his legitimate place. The importance of the man must be judged by his usefulness to the nation and not by the amount of authority he has to exercise.

In dealing with the masses we have to learn a great deal from the organization in dictatorial countries and totalitarian states. Those states utilize the study of mass psychology in concentrating the attention of the public to particular issues. Special days and weeks such as the "Farmers' day", "Tree planting day" or the "Honey week" go a long way in focussing the attention of the public and creating a sense of awakening. The inauguration of the "Agricultural Improvement Week" is long overdue. Much could be achieved even during a week, if full energy is mobilized with the co-operation of the press and public platform. Above all it will create a suitable atmosphere for the demonstrators' work.

Elsewhere in this issue appears an interesting article entitled "A much needed link in Agricultural Dissemination work". There is much force in what the author has said. To establish permanent interest in the village reconstruction work and sustained effort, village rural reconstruction committees appear to be necessary. There are obvious advantages in having a single multi-purpose organization in a village, instead of several single-purpose organizations. All the developmental departments of Government can then work through a single rural agency. These committees will provide a useful link between the villages and the Government agent. It will also be possible to have a complete rural uplift plan based on the needs of the village as a whole. In such a scheme we may have competitions among the villages instead of competitions among the individual villagers. In Bombay, shields are presented to the villages which show the maximum improvement. It is feared that the present method of dealing with separate individuals is costly and time-consuming, and the improvements do not last long. When work is carried out through the village committees, public opinion is more fully harnessed and utilized.

# A MUCH NEEDED LINK IN AGRICULTURAL DISSEMINATION WORK \*

BY N. C. TIRUMALACHARY, B. Sc. (Ag.)

**Introduction.** In an agricultural country like ours the affluence of the nation is synonymous with the welfare of the cultivators who form the major component. Hence, any scheme for the advancement of this country must take them into consideration and outline ways and means to improve their knowledge and intellect, their customs and habits and their agricultural methods and machinery. It is well known that there is not much money in farming and even if the income is doubled the income may not be large. Still, agriculture, being the main industry of India, should form the foremost problem to be tackled by a sincere economist who has the welfare of the country at heart. The remission of land revenue, the formation of debt conciliation boards, the establishment of land-mortgage banks, the enactment of the Debt relief and Tenancy bills and the introduction of the Prohibition Act are but a few attempts to relieve the distress among farmers. Concentration should be made more towards the enhancement of their agricultural income. The proverbial conservatism of the ryot and his obstinate tendency to tread along his age-old path has to be broken and he must be persuaded to move with the times, study the present conditions of the markets and adopt the various improved and economic methods of cropping advocated by the Agricultural Department. The establishment of Agricultural Colleges and Research Institutes, the patient and sincere toils of the Scientists and the results of all successful investigations are but only half the task, the other and perhaps the greatest task is to disseminate these results in villages. And no results of agricultural research, however important in themselves, can be considered of any value unless and until it is carried to the door of the individual cultivator:

This can be accomplished only by an active campaign against illiteracy and a well planned and intensive programme of propaganda work. But the task is not so easy as it appears to be. The experiences of our agricultural propagandists stare us in the face. The utter disregard displayed towards the Demonstrators, the disheartening caused by the empty chairs in a meeting of farmers and the farmers' antipathy for and distrust of anything new are some of the woeful stories described by the officers. The establishment of a more systematised organisation and a new method of approach seems, therefore, essential.

A review of the steps taken in various countries will, perhaps, give a proper perspective of the subject. The usual methods adopted in all countries consist in the establishment of Agricultural schools and colleges and sending out trained people for propaganda work. The demonstration methods adopted by one and all of these trained men is to approach the villagers,

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\* Paper read at the Twenty-seventh College Day and Conference.

give them agricultural talks, demonstrate to them the improved methods, educate them by lantern slides and exhibitions and distribute to them leaflets and bulletins. But there are details regarding the method of organisation and approach which are worthy of emulation.

In Great Britain an advisory centre is established in each of the fourteen provinces. The advisory officers keep in close touch with the work of the Research Institutes and communicate the results to the farmers through the County Agricultural Organisers. There is one agricultural adviser for each subject for each province and one county organiser for each county. The different subjects are handled by the different advisory officers. The county organisers acting in collaboration with a number of non-official organisations like the National Farmers' Union and special associations like Wheat association, Swine association etc., disperse the news to the farmers.

In the Irish Free State the Department of Agriculture employ itinerant instructors in agriculture, poultry keeping etc. and they carry on the propaganda work.

In Japan the work is pushed through by the establishment of various types of agricultural associations and by giving an agricultural bias to the school curriculum.

In the dictatorial states like Russia and Germany the object is accomplished more by compulsory legislation than by persuasion. In the former country the uneconomic system of small holdings was rectified and more than 18,000,000 peasant holdings or 89 % of the total were collectivized in less than 250,000 collective farms in the course of a few years. By this, the introduction of modern agricultural technique was made possible. In Germany a four year plan was formulated by which efforts towards the expansion of agricultural outputs were intensified.

But by far the most well organised system is in the United States of America where work of an intensive nature is being carried out. The work is broadly divided under two main heads.

1. Adult Education in agriculture through evening schools conducted by the United States Department of Agriculture and

2. The Agricultural Extension work administered by the Federal Board.

The agricultural evening schools are required to have a systematic instruction of less than College grade in regular classes which meet at frequent intervals viz. once or twice a week at given centres and usually in the village school, either in the mornings or evenings. A consecutive series of lessons involving lectures, laboratory work, conferences, discussions and occasional field trips is given to the adults who have entered upon a particular farming occupation. Many teachers have found it expedient to close their evening classes with a dinner or picnic. The Conference method of teaching, viz., assembling farmers, in a village, discussing with them their problems, clearing their doubts, and formulating a programme acceptable to them is found more effective.

The extension work consists of practical demonstration and the dissemination of information among men and women through the personal work of county agents, home demonstration agents and technical specialists. Finding that, by sending a few members to lecture to the farmers and by distributing bulletins and leaflets, the propaganda work did not progress, an Act called the Co-operative Extension Act (Smith Lever Act) was passed which provided funds for starting a new organisation to conduct and intensify the programme of extension work. The general plan of organisation is as follows:—

The agricultural extension service is worked by a separate director known as National Extension Director. Under him work federal organisers and subject matter specialists whose functions are to organise the extension service in the several states and study the special problems of the state. These are helped by state extension directors and assistant directors. These are, in their turn, assisted by state supervisors who control the work of a number of county agents.

The county agent who is equivalent to the agricultural demonstrator, organizer or inspector of our country is by far the most important limb of the whole organisation. He lives in the county, studies local problems and gives the farmers necessary advice. When difficulties arise and when new problems crop up he refers to the subject matter specialists and seeks their opinion. He learns the methods and practices of the neighbouring successful farmers and teaches the less competent ones. The best kind of work is done by the 'Farm Improvement programme' under which each farm is separately tackled and the various aspects of cultivation, manuring and suitable cropping advocated. To facilitate his work he organises a number of agricultural societies under the auspices of which meetings are often held for a free exchange of views. A number of special clubs like calf-club, swine club, grain club, poultry club and so on are also started to deal with special subjects.

The extension work does not stop with the fields. It takes up home economics as well. A number of home demonstration agents, who are usually women, are appointed to teach women the proper maintenance of the house and to encourage thrift and economy. Their instruction includes house-planning, dietetics, care of children, needle work, cooking, menu-planning, gardening, knitting and garment-making.

The organisation takes up the education of youths also. A number of boys' and girls' clubs known popularly as 4-H-clubs (4H representing the head, heart, hand and health) are started. The object of the clubs is to arouse in boys and girls during the impressionable age a desire and a liking for agriculture. Special methods are adopted to suit peculiar local conditions. For example the Negro extension scheme is worked with the help of an autotruck movable school fitted with a motion picture outfit and manned by four to six Negro extension specialists.

Thus one of the most efficient and largest organisations manned by over 5700 federal states and county employers, co-operating approximately with

250,000 volunteer local leaders and 1,500,000 Farm and home demonstrators is working in U. S. A. for the emancipation of the village folk; and it is estimated that every year nearly three million farmers and farm houses are being influenced to change their practice for the better. This has been made possible by the introduction of the Agricultural Extension Act which provided more than \$ 23,000,000 a year. In 1937, it rose to nearly 30 millions. The funds are provided mostly by the Federal Government and partly by the states, counties and farm organisations.

In India the work is carried on more by the official block which consists of a Director of Agriculture, assisted by a number of Deputy and Assistant Directors and Agricultural Demonstrators or Inspectors. The usual lines of propaganda work are field demonstrations, lantern slide lectures, exhibitions in fairs and festivals, formation of a few agricultural associations and distribution of seeds and manures. Recently, the touring motor exhibition vans, cinemas and radios have come to their aid in a few provinces.

In Bengal, thanks to the initiative of Mr. Whittikar, the ex-Collector of Chittagong, much help is being rendered by the District Boards, the Courts of Wards, and private agencies who have provided funds for the maintenance of more demonstrators and for starting agricultural institutes. Some of the Boards maintain Demonstration Farms and at times distribute seeds free to ryots. The Government utilised the whole of the rural uplift grant of the India Government for propaganda purposes in 1936-37 and thus intensified the programme.

In Sind a touring propaganda party is formed in addition to the permanent staff which works for six months in a year. Government auxiliary farms are established to demonstrate the usefulness of large scale farming. A new feature is the holding of Farmers' Week. These are held at the agricultural farms where people from different parts of the country gather and get themselves acquainted with the improved methods of farming. The N. W. Ry. grants concessions to the agriculturists and students who attend these weeks.

In Behar and Orissa the work is carried on in the usual lines with the help of agricultural overseers and *kamdars* or *maistries*. Recently the Government has proposed to intensify the work by starting subsidised farms.

In the Punjab, the work of non-official agencies is much in evidence. As many as 2000 village Farmers' Associations are functioning and cultivation is being carried on enthusiastically on improved methods in thousands of acres. The Agricultural colonisation scheme similar to the one started recently at Annamalai University but on a more intensive scale is reported to be a great success in spreading the improved methods of agriculture. To encourage better cultivation prizes are offered to the best cultivator.

Very intensive work is being done in the United Provinces. The villages are made to conduct "Rural knowledge and agricultural schools". Night schools are also held. Much attention is being paid towards displays and exhibitions. Kiosks fitted with seed exhibits, models, photographs and charts

are displayed at railway stations. Agricultural sign-boards giving information on important crops, implements and fruit culture are fitted in railway platforms. This attracts much attention and the department is contemplating to extend it to the busy markets and public offices. Organisations like the "Better Farming Societies" are formed and are given grants-in-aid by the Government. Under the "State Tube-well Scheme" attempts are being made to remodel the holdings, so as to adopt the economic large scale farming, without affecting any change in the ownership. Recently some 500 trained rural reconstruction organisers were appointed to organise panchayats, set up reading rooms, encourage cottage industries and devote themselves to cultural developments of agriculturists and artisans.

In our own province, Madras, the work is fairly advanced though there is a great deal still to be done. The Madras Presidency comprises 26 districts and 221 taluks with a gross area of 91 million acres of which the available cultivable area is 35 million acres. The total population is  $41\frac{1}{2}$  millions. The whole area is being managed at present, by about 150 demonstrators. The amount spent on this department works out to nearly 10 pies per head of population while it is 10 as. per head in U. S. A. This clearly shows the huge difference between the organisations in U. S. A. and Madras.

Before 1930 the work of the Demonstrator was a bit dissipated being extended to more than 200 villages lying under his jurisdiction. This method was changed in 1930 when concentrated work in a few selected centres was begun. Three or four central villages were selected and the work was confined to these and the surrounding hamlets with the object of extending it slowly to other centres. This led to the neglect of a number of other villages and the progress was found to be too slow. In 1934 the activities of the demonstrator were extended to 8 to 10 centres at a time. The effect of this change was clearly seen in the huge increase in the number of demonstration plots which rose from 1746 in 1933-34 to 7554 in 1936-37. As a further step, the Vizag scheme of providing a demonstration maistry for every 5 or 6 villages and intensifying the propaganda work was started in 1935. Under this scheme 63 maistries were appointed to work in the Vizag district as a trial. After a short training at Anakapalle Farm they were posted, seven to each taluk. Each maistry was to live in a central village and look after a group of five villages round about. When appreciable work was done he would turn his attention to another group of villages. In addition, the maistry was instructed to improve sanitation, cottage industries, village cleaning etc. This is the fourth year of its trial and the results are watched with interest.

It is disappointing to note that in spite of the various methods handled by the different provinces Agricultural India is still in a very backward state and the improvements advocated by the Department have not yet penetrated into the interior. There are still millions of ryots unaware of the researches made by the Departments and treading along the same old path. It is evident that there is something lacking in the methods of approach and that

something I conceive to be the human touch. An ex-Director of the Madras Agricultural Department Sri. S. V. Ramamoorthy rightly pointed out in his address to the students of this college that the man should be developed first and foremost. Once the mind is awakened it does not stop there but thinks of newer things.

How is this to be achieved and how can the propaganda work be made more effective? The less intimate the personal contact the less effective the education will be. Lectures, broadcasts, films, bulletins and journals all suffer from this disability. A judicious combination, therefore, of the methods adopted in the various countries so as to suit the local conditions will bring about the desired change.

**Organisation.** A purely non-official body but with an official bias given to it, functioning as *liaison* between the official and the public should be formed. To get this a central club known as the *Farmers' club* should be started in each village with its own president and secretary. The village munsiff should be the ex-officio president. These clubs should be affiliated to the taluk club which should be situated at the Taluk headquarters and the Agricultural Demonstrator should be its ex-officio president. The taluk clubs should be attached to the District club of which the Assistant Director of Agriculture should be the president. These clubs are co-ordinated with the regional farm club situated at the Deputy Director's headquarters and the Deputy Director should be its president. The whole system is then linked on to the Provincial club whose head quarters will be the provincial centre and whose president will be the Agricultural Propaganda and Publicity Officer. Thus a net work of farmer's clubs should be established throughout the whole of the province. Each of these farm clubs should have a *youths' club* attached to it and the village teacher should be made to look after the junior clubs.

The official organisation of the Department should be put to work under a separate officer known as "Agricultural Propaganda and Publicity Officer." A man of agricultural training with experience in propaganda and publicity work is essential. The regional Deputy Directors, the Assistant Directors and the Agricultural Demonstrators will work directly under the officer. The number of Demonstrators should be increased so that one demonstrator is provided for each taluk. The Vizag experiment of posting one demonstration maistry for every 30 villages and which system is being followed in a less intensive scale in Bihar may with advantage be extended to other districts.

**Equipment.** The propaganda officers should be men who not only know their subject well but who feel confident of themselves and their work. A better kind of education is, therefore, necessary for the propagandist. Cottage industries and rural propaganda should form part of the College curriculum. After graduation every prospective extension agent should invariably be posted to an agricultural farm for at least a year before handling any propaganda work. He should then undergo an apprentice course in association with successful extension agents or a post graduate

course in an institution organised for the purpose. The Wardha Rural Reconstruction Centre, the Marthandam Rural Development Association and the American Arcot Mission Agricultural Institute at Katpadi are said to be good centres for such training. Recently the Cochin Government has started a Rural Reconstruction School. The *Kamdars* or maistries should also receive training. The short courses instituted in our province and the Punjab can be utilised for the purpose.

The rural agents should also be men who sympathise with the farmers and their problems and who develop a love for the people and for farm work in their hearts. They should possess a fund of patience and perseverance. Such agents should consider the work more as an opportunity to serve his fellow men rather than as a job.

**Method of Work.** The Farmers' Club should form the central pivot round which all the activities are co-ordinated. The Department of Agriculture should carry out the extension work through these clubs only. The functions of the clubs should be diverse, social, educational, agricultural, and industrial activities, home economics and should be taken up side by side.

Social amenities should form one of the main programmes of the club. The local school building or a small shed attached to it may form the meeting place of such clubs. The distribution of radio sets to villages as started by the Madras Government will greatly help in the efficient functioning of these clubs. Rural sports scheme as inaugurated by the Premier of Madras is a step in the right direction not only to attract more people to the clubs but also to serve as deviation from the monotonous toil in the fields. Attempts should also be made to attach a free reading room to the clubs and obtain a few dailies and monthlies for widening the general knowledge of the villagers.

Adult mass education should be taken as one of next importance and night schools should be held often. The local teacher and agricultural officers should take an active part in this. Bihar and United Provinces are going ahead of us in starting "the mass adult education scheme".

Then comes agriculture and cottage industries. Each village or a group of four or five adjoining villages should be tackled at a time. The agricultural extension officer should with the help of his maistry, first of all, make a thorough study of the cultivation and practices in the locality. A country man, if a slow thinker, has, as a rule, profound understanding and a more balanced outlook on life. His daily work involves initiative, responsibility and constructive action and encourages constant thinking the absence of which is so conspicuous a defect of our civilisation. There are still a number of inefficient cultivators but undoubtedly our leading farmers are men of exceptional energy and ability and have, for generations, been leaders in the agricultural world. There is a monumental example of this in the Ceded District ryots whose ingenious and cheap machinery employed in the dry land farming is still unbeaten. The farmers are to be approached

not with a set of predetermined ideas but with a free mind and with the definite knowledge that the farmers are experimenters in their own way and have much to contribute to the up building of the farming and rural life. And the farmers should be made to feel that they are also given a part in determining what the problems are.

The best method, to achieve this, is to adopt the conference method of teaching by which the leading cultivators of the locality should be assembled in the club premises to have a free discussion on the local problems. Generally such conferences should be held once a month or at least once a quarter. It is better if these conferences are ended with a picnic, a musical party or a village drama so that the monotony of the meetings may be broken. The agricultural officer, in consultation with the superior officers should then formulate a programme for which he should get the approval of the farmers themselves. He should, then, start what are called subsidised farms similar to those recently started in Bihar and conduct demonstrations. Two or three "Key farmers" of the village should be approached and persuaded to give a portion of their land for holding the demonstration plots with the assurance that the loss, if any, will be made good by the Government. "Seeing is believing" and if such rural demonstrations are convincing enough the farmer will take them up immediately.

Special subjects should be tackled by the formation of special clubs which will however form the branch clubs of the Farmers' club. This is to develop a concentrated attention on them. In England and America there are swine clubs, calf clubs, poultry clubs, grain clubs, hay clubs and so on. In our own country fodder clubs, poultry clubs, cotton clubs, etc., can be started. The tree planting day initiated by the Minister for Agriculture and Rural Development, is one such means to bring about a concentrated action on a particular problem.

The youths' club attached to the central farmers' club should also be made to function side by side. These clubs should not only form the centres for evening sports and recreation but also as a meeting place for all the children of the village encouraging an *esprit-de-corps* in them. Slowly these youths should be given an agricultural outlook from the beginning such that they may easily take up to newer methods when old. The club life will also promote a certain amount of discipline which will form a strong background for the future citizenship.

Problems other than agriculture should also be tackled by the club. As in U. S. A. the home economy work, cottage industries and rural sanitation should form part of their work. The agricultural officer should be the villager's "friend, philosopher and guide". He should help him in getting financial help from the Government and private sources, in getting the necessary water supply for his fields and in the settlement of village disputes and thus try to assist him in all matters such that he may infuse confidence and trust in the farmer's mind.

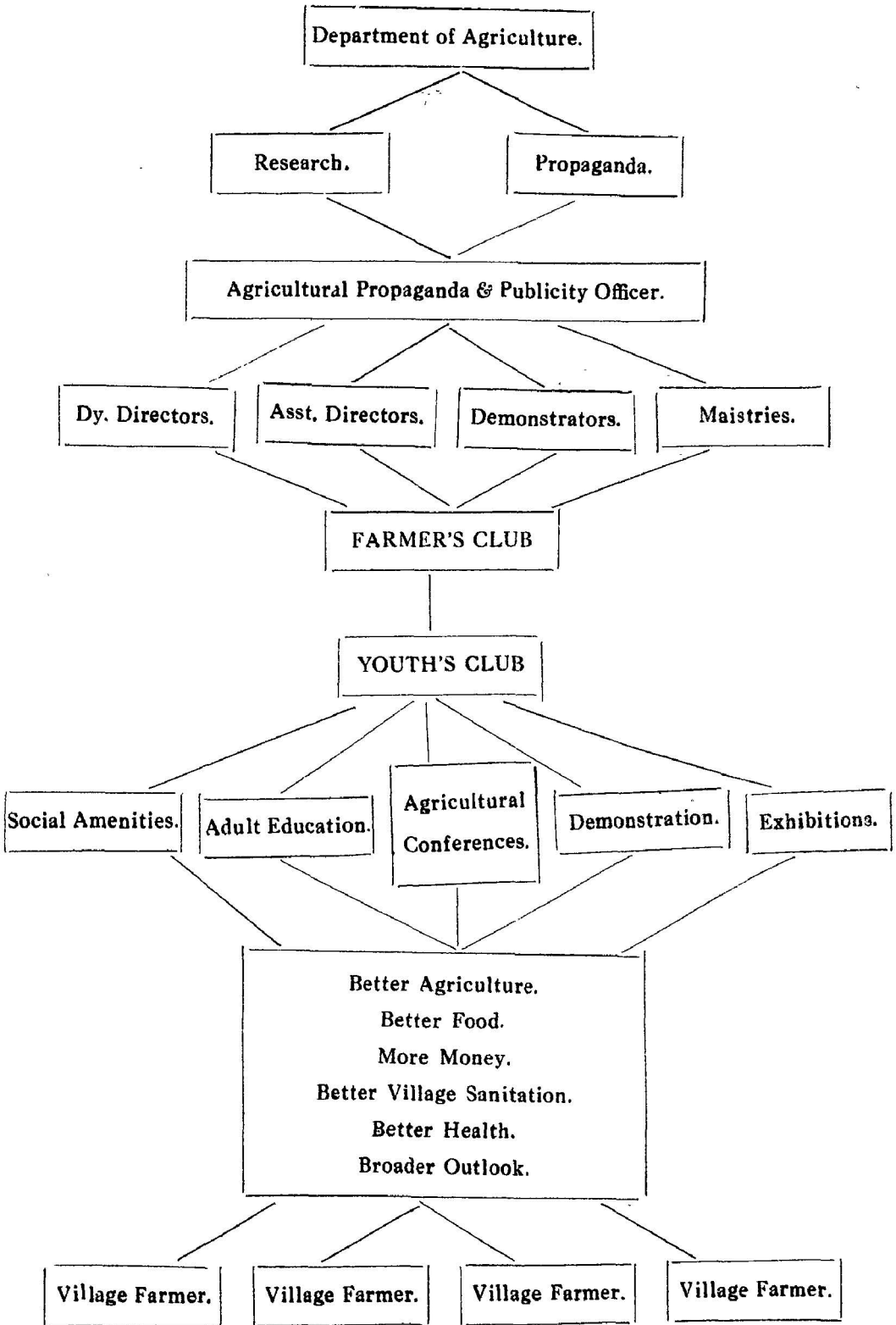
Thus, the object of these clubs should be to stimulate better endeavour in not only farming and home making but also in bringing rural people together in groups for social intercourse and study, solving community problems, bringing recreation, debate, pageantry and the dramatic art into the rural community, developing co-operation, enriching the life and broadening the vision of rural men, women and children.

But the propaganda work will not be complete with the starting of these farm clubs alone. It should take other shapes as well. The holding of the Farmers' week in the agricultural farms as in Sind, establishing field crop competitions as in U. S. A.; making the motor exhibition vans more attractive by fitting up a movie or a talkie unit to exhibit films on various agricultural subjects with a rural background given to it; making it compulsory for cinema owners to display a short film on agriculture and rural uplift on their screen before their daily shows; preparing gramophone records dealing with agricultural practices or encouraging private companies like the one in Bombay to prepare these records; and exhibiting kiosks fitted up with posters in railway stations and public offices as in U. P. are the other methods worth trying. In these days of cinema fad the film is the best means of propaganda work. In Africa the film has served a very good purpose in making propaganda work easy.

But there is no end to this propaganda work. It cannot be stopped as soon as a few problems are tackled. For newer problems crop up and fresh things come to light every day. To quote an example, Sir John Russell experimenting on wheat, barley and sugar-beet reports that "deeper ploughing has produced no increased yield" and that no advantage is gained in ploughing deeper than 4 inches; that the effect of cross ploughing, sub soiling, or heavy rolling of seeds for spring sown crops was without effect on yield; that intensive hoeing of sugar beet or kale is detrimental and that two or three hoeings appear to be ample; and concludes that yields are not greatly dependent on cultivation methods. Nearer home, it has been found on the Cotton Breeding Station, Coimbatore "that plots where weeding alone was done recorded the highest weight of kapas. On the other hand stirring the soil with bullock power tended to lower the yield. From the results obtained for the past three seasons it is plain that intercultivation does not help much in conservation of soil moisture as is often thought to be" under Coimbatore conditions. Alway and others opine that intercultivation does not help to prevent evaporation. Thus the age long theories and notions are blown up by modern experimenters. It is for this a continuity in the propaganda work is essential and the organisation should be on a permanent basis. It is for this also refresher courses should be opened and the agricultural officers made to undergo the course once in ten years such that they may be well equipped with new researches and results. A few people should also be sent abroad to obtain a closer knowledge of the progress of research and advisory work in other countries.

All these mean money, and ways and means should be found to provide funds for this most useful work. In addition to Government grants, the District and Local Boards, the Court of Wards and private magnates should be persuaded to give their monetary help as in Bengal. The India Government grant for rural development should be completely utilised for this work. Small subscriptions levied in the numerous farmers' clubs will also add to the fund. The agricultural income tax which is proposed to be introduced in the various provinces can also, with advantage be utilised for this work, as in that case, the farmers will never grumble to have their income taxed. The organisation and its work, as I visualise, is shown in the accompanying chart and I am sure, given a fair trial the scheme is bound to succeed. In these days of despondency any amount spent on agricultural improvements is money well spent. Till now the national policy was consciously or unconsciously anti-rural. The results became manifest in widespread unemployment amongst the agricultural workers followed by a steady drift from the country side to the towns and making unemployment more keen. It is the under development of agriculture that is responsible for a large part of unemployment and a main cause of national impoverishment. A prosperous agriculture for which this country is so well adapted is as essential in times of prosperity as in periods of adversity and a fair share of the national income benefits all. Hence, a more pointed attention should be paid towards the development of this industry.

The organisation which I have recommended will not only help the farmers to increase their income but will bring to them an enrichment of mind and spirit. "A man's wealth lies not so much in his land and his goods as in his hopes and aspirations, his ambitions and dreams. We enrich men when we help them to see and understand the world in which we live. We enrich men when we give them courage and faith in themselves and the work they are doing." All these I conceive, will be the achievements of this organisation and I warmly recommend it to the authorities for early adoption. For "How can he get wisdom that holdeth the plough and that glorieth in the God, that driveth oxen and is occupied in their labours and whose talk is of bullocks", if a helping hand is not stretched out by way of such an organisation.



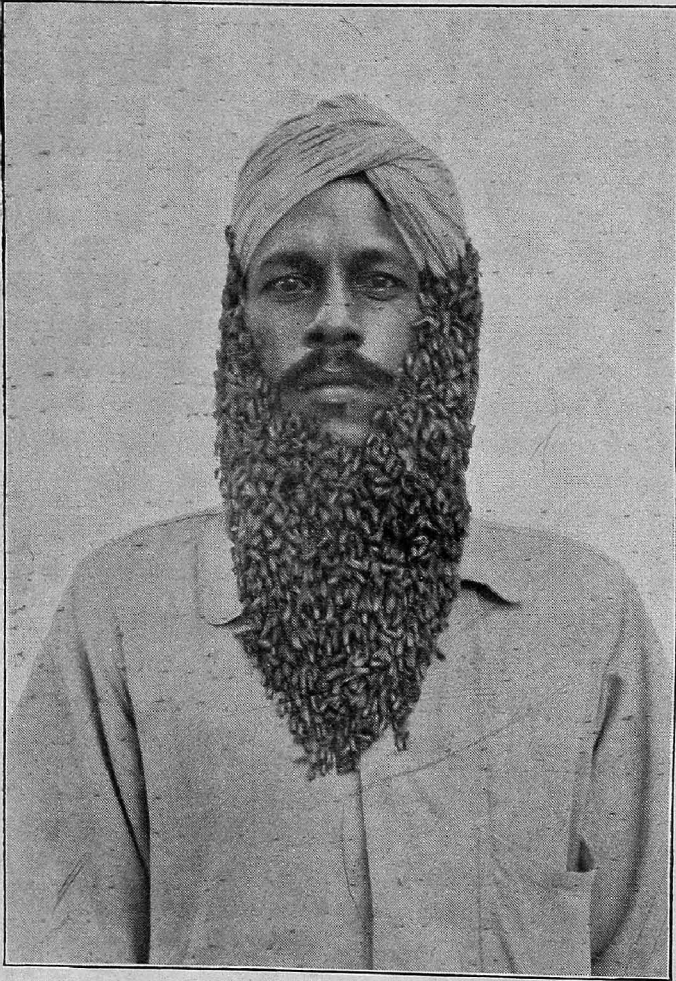
# THE PRESENT STATUS OF BEEKEEPING IN MADRAS AND SUGGESTIONS FOR ITS DEVELOPMENT

BY M. C. CHERIAN, B.A., B. Sc., D. I. C. & S. RAMACHANDRAN, L. Ag.

**Introduction.** The uplift of the rural population from their poverty and ignorance and the ways and means of providing sufficient employment for the ryot during his spare time have, of late, been engaging the attention of the Government. It is also well known that numerous private rural reconstruction centres have been organised with a view to ameliorate the condition of the masses, their main programme of work being hand spinning, temperance, education, sanitation, etc. Along with these, beekeeping is being advocated as a cottage industry.

Apart from being a source of profit and pleasure the presence of bees in a particular locality indirectly enhances the agricultural wealth of that locality by the invaluable service rendered by them in bringing about cross pollination in plants. Our presidency is not lacking in the natural facilities that favour the development of the industry. The very fact that about 45,000 lbs. of honey are being collected by the Madras Forest Department, not to speak of the considerable quantities that are collected locally in the villages, indicates the great possibilities of this industry. Most of the honey is collected by the jungle tribes and it is needless to emphasize here the enormous destruction of life during the crude process of squeezing out the honey and the rapid deterioration of the produce on account of the imperfect method of collection and preservation. In spite of the ignorance about the natural history of the honey bee and of the chemistry of honey, the article has been used as a medicine from time immemorial. The quality of honey that is being used is hardly worth the name and it is only during recent years that the public have been apprised of the availability of pure honey collected in India. But the supply is not at all proportionate to the demand. The enlightened public, due to the non-availability of cheap and pure Indian material have often to purchase imported honey which is being sold, in some cases even up to Rs. 2-5-0 per lb. Though we have no idea about the actual quantities imported, it is evident that large quantities find their way into the Indian market. The expansion of the industry would not only provide us with wholesome honey made in our own homes but also make the country self supporting in this respect.

**The Present Status of the Industry.** The Agricultural Department and agencies such as the Gandhi Ashram, Pudupalayam, the Y. M. C. A. Rural Reconstruction Centre, Ramanathapuram, have all been trying to popularise this industry. The work of the department consists of taking part in all the important Exhibitions, holding demonstrations, supplying hives and other appliances, training students every year and occasionally training departmental officers. In addition to these, a "Honey Week" is being organised on a Presidency basis during the past two years when the department



A Beardful of Bees.

concentrates its attention towards popularising the industry. Two publications—one a priced bulletin (Beekeeping in South India) and the other a small pamphlet (Practical hints on beekeeping) have been issued. Along with propaganda work, intensive research work is being carried out at Coimbatore with a view to simplify the art and make it more remunerative. Among the tangible results achieved so far, mention may be made of the evolution of simplified honey extractors, cheap appliances such as the drone trap, queen excluder, methods of control for the bee enemies, etc., and besides these a fund of general knowledge has been collected on the peculiar habits of the Indian honey bee. As a result of the work of the department and agencies mentioned above, there are at present over 3000 hives distributed all over the Presidency. The industry is gaining a firm footing in most of the favourable localities. While this growing popularity is to be viewed with satisfaction it is felt that there are greater possibilities for the spread of this industry.

**Factors that stand against the Spread of the Industry.** At the time of the Honey Week in April last a questionnaire was sent by the Entomologist to all the district staff. This, among other topics, asked for information regarding the factors that stood against the spread of the industry in their respective localities. The replies received together with the information gained by the authors during their tours in the various parts of the Presidency have revealed the following factors as standing against the spread of the industry— (1) lack of adequate trained staff to popularise the work, (2) use of non-standardised bee appliances, (3) lack of facilities for marketing the produce, (4) limited bee pasturage in certain localities, and (5) a few inherent habits of the bees that render them unmanageable for the beginners such as the proverbial fear of bee sting, desertions of newly hived colonies and swarming.

The items mentioned under No. 5 are not so very serious at present since the Entomology Section is able to offer some definite advice to overcome these drawbacks. Fear of the bee's sting is but natural for the amateur, but after one gets to know the habits of these interesting insects he may wonder whether they are capable of stinging at all (*vide photo*). The desertion of newly hived colonies in Malabar appears to be a common feature. The provision of a piece of queen excluder at the entrance or the removal of the queen and allowing the bees to rear a new queen has been found to mitigate the trouble. Swarming in bees is another serious handicap. It is Nature's method of dispersal of the species. The impulse is very strong and the strength of the colonies gets reduced considerably if the bees are allowed to have their own way. Some of the methods which are given below may be tried. The first swarm, if it occurs early in the season, may be allowed to issue and hived separately. The issue of "after—swarms" from the parent colony should be prevented by cutting away the queen cells. The other alternative is to divide the colony when it evinces the swarming impulse. The reigning queen with one or two combs of brood and bees is taken out

and kept separately. The bees get over their swarming fever by the time the fresh queen emerges and gets ready for egg-laying. The wax moth is another serious menace to the progress of beekeeping. Very easy and simple methods of control such as scraping the egg-masses from the crevices of the hive, frequent changing of the hive body, sun drying the stored combs that have been infested have been evolved and these can be adopted with advantage.

Districts such as Vizagapatam, Godavari, Kistna, Tanjore, Trichinopoly, Tinnevely, Coimbatore, etc., have been found to be very favourable for beekeeping whereas conditions in the drier districts of Cuddapah, Bellary, Guntur, etc., are not very encouraging and the main reason for such variation is the availability or otherwise of bee pasturage. Even in favourable localities variations in the progress of the colonies, kept within a range of few furlongs, have been noted, thereby indicating the limited range of flight of the Indian bee. It is therefore necessary, even in favourable localities, to start apiaries, as near the available pasturage as possible.

As regards the disposal of the produce, apiarists especially in some of the out of the way places are not able to find a ready sale for their honey, though there is a consistent demand for the pure stuff even at fancy prices, near towns. This may purely be due to the absence of reliable central agencies to stock and sell the produce and partly due to the market being, of late, flooded with spurious qualities.

It is also a regrettable fact that a number of enthusiasts have not sufficiently realised the importance of the prescribed standard sizes for hives. The standardization of the hive and its parts, apart from giving the maximum comfort to the bees, facilitates the easy interchange of the various parts and also the use of a uniform type of honey extractor.

**Suggestions for the improvement of the Industry.** The following are some of the suggestions for the improvement of the industry :—

1. More insistent and more effective propaganda is necessary for the furtherance of the work to effect which additional qualified staff is required. In this connection mention may be made about the elaborate staff provided in the western countries exclusively for this work. Almost every state or county is equipped with a Bee Expert together with a number of Bee Inspectors to travel through the country and render advice. Such a development may not be possible in the near future in this presidency but, under the existing circumstances, the Agricultural Demonstrators working in favourable localities may be trained and made to include beekeeping as one of the items of propaganda. Since the inclusion of this line of work is likely to interfere with the existing items a trained worker of the status of a Fieldman may be provided for each district. Again rural schools would be a good media for disseminating the knowledge in beekeeping. In this connection mention may be made of a recent resolution of the Malabar District Board to introduce the subject in all the schools under its management. The idea is

commendable and we wish it all success. The inclusion of Rural Broadcasting in the programme of the All-India Radio at Madras may also be taken advantage of for approaching the villagers.

2. Co-operative Societies and Beekeepers Associations as those at Tenkasi and Namakkal can attend to the sale of honey and the distribution of standardised appliances.

3. Arrangements may be made to translate the departmental bulletin and the pamphlet into the various languages so as to make them useful to the villagers.

4. The Government have recently sanctioned a temporary scheme for the introduction of the industry in Chittoor Dt. It is hoped that similar schemes will be provided for all the districts where facilities for the development of the industry exist.

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## GROWING, CURING AND MARKETING OF VIRGINIA TOBACCO IN GUNTUR \*

FY K. S. SANKARAM PILLAI, L. Ag.

From time immemorial Guntur was an outstanding centre for the production of tobacco in India and in recent years it accounts for the major portion of the total export of cigarette tobacco. Guntur with its good retentive black soil and an average rainfall of 35 inches a year is the most suitable tract for the cultivation of cigarette tobacco which should be grown only as a dry crop in order that the leaves may be of mild flavour. For long, India produced and exported nothing but pipe tobacco and very low grade cigarette tobacco. Up to 1920, only country tobacco leaf of narrow body, with a thick and stout stem, with practically no colour, was produced and exported in leaf form to England, pressed into bales of 250 lbs. nett each. After 1920 owing to the imposition of heavy import duty on tobacco in England, the London market wanted the tobacco to be in the form of strips i. e., with the major portion of the thick mid-rib removed. The saving in terms of money can easily be appreciated when one considers the fact that the stems that are removed weigh as much as 25% of the whole leaf. After 1920, Virginia tobacco cultivation spread gradually in Guntur district and by 1924 large areas were grown. This Virginia variety contained less wood than the country, and the leaf was broad and silky. In the country variety the percentage of bright coloured leaf was between 1 to 2 of the total yield and the rest was a mixture of light brown, brown and dark leaves. In the Virginia tobacco the yield of bright coloured leaf is found to range from 5 to 10%. The introduction of flue curing improved the colour of the cured leaf and the percentage of bright coloured leaf increased from 5 to 10% in the case of sun cured, and to 40 to 50% in

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\* Paper which won the Ramasastrulu-Munagala Prize, 1938.

the case of flue cured tobacco. The foreign market appreciated the improvement in quality and good prices were paid for Guntur bright flue cured virginia strips, which gave a good impetus to the cultivators and the development of flue curing was very rapid. In 1930 there were only about 200 barns in Guntur but by 1934 the number of barns in Guntur increased to 2500. On account of great demand for bright virginia flue cured tobacco in London market from 1936, the number of barns in Guntur tract increased rapidly to nearly 5000 in number during 1938 season. The manufacturing buyers in the United Kingdom commenced to blend larger quantities of this improved Indian Tobacco with the more costly American tobacco.

In 1934 the Imperial Council of Agricultural Research took up the question of improvement of the cigarette types of tobacco and formed a committee of both officials and non-officials to discuss and chalk out lines of work for the development of the bright cigarette tobacco. As a result of the recommendations of this committee on which I had the privilege to serve, an experimental station was started in 1936 at Guntur. In the meanwhile, in October 1936 a conference of tobacco growers, manufacturers and exporters was held at Guntur at the initiative of the central marketing staff. An association was formed to improve the marketing of cigarette tobacco. The work of the association is progressing slowly.

From Guntur the cultivation and flue curing of cigarette tobacco has spread to some portions of the neighbouring Hyderabad state and parts of Kistna District. The most striking feature of this development is, that it has not only spread round about Guntur, but it has taken a deep root in Mysore State. In 1937 a limited liability company was started with a capital of Rs. 10,000,00 of which 10% was subscribed by the Mysore Government and the balance 90% by the public. The progress that this company has made within the short time is remarkable. During 1937 the company had 2200 acres under tobacco and in the ensuing season arrangements have been made to place 5000 acres under tobacco. The quality of the Virginia tobacco produced in Mysore is of a very high standard. In a few years I am sure this crop will spread throughout the state of Mysore which badly needs a money crop.

**Growing.** The following types of soils are considered good for the production of bright Virginia tobacco suitable for cigarette manufacture:—

1. Good retentive black soils of Guntur district in which tobacco can be grown under dry conditions and which imparts a mild flavour to the crop.

2. Fine whitish clay the physical condition of which imparts good colour to the tobacco.

3. Red loam with good, even, and regular distribution of rain during the growing period as in Mysore.

4. Silty soils, *Badava* lands or *Padugai* lands on both sides of rivers which are subject to floods every year or occasionally. Floods deposit fine rich silt; and if the virginia tobacco is grown on such soils, best tobacco in

point of growth, texture and colour is obtained. This is the experience gained after many years of trial.

Virginia tobacco grows well under moderate climate having a temperature of 85° to 95° during the growing season. The best season in Guntur tract is found to be soon after the heavy monsoons are over i. e., about first of October of every year, when seedlings can be transplanted with advantage. Seedlings are to be raised between the August 15th and 20th and only seedlings of 45 days or 50 days growth should be transplanted. Older seedlings are found to give bad results in point of growth of the crop. Want of rain arrests growth of the crop, and heavy rains spoil the crop completely, especially in heavy retentive black soil tracts of Guntur where the roots of plants rot. This heavy rain is less dangerous in red loamy soils of Mysore. Another havoc that the heavy rains play with the Virginia tobacco is the production of spots on the leaf. Spots are not liked by the manufacturers of cigarette for the reason that after cutting the leaves, the cut-tobacco from spotted leaves will be composed of broken threads, whilst the cut tobacco from the spot free tobacco will be of long uniform threads. These broken threads from spotted leaves will impede the uniform good working of the cigarette machine and will give less out-turn, say about 50% only. Only long threads of tobacco will work uniformly in a cigarette machine and give the maximum out-turn.

In the red loamy soils of Mysore where there is even distribution of rain the planting season is different. With the starting of the first rains in June the Mysore planting season commences. Seedlings are raised during the middle of April with the help of well water and when 45 days old, the seedlings are transplanted. The late season i. e., October or November, is not suitable for Mysore soil conditions. But however this is being tried now, in some tracts where there is protracted water supply from irrigation schemes and it may prove successful.

Proper rotation of the crop is an important factor affecting the colour of tobacco. The excess of nitrogen in soil completely spoils the colour of the tobacco. In the rotations of crops for the tobacco belts, all nitrogen fixing crops, like legumes, must be completely avoided, and crops like cereals that feed on nitrogen and eliminate the excess nitrogen from the soil must be introduced. This fact has been amply demonstrated in the Guntur district. Invariably a tobacco crop after maize, dry paddy or *Jonna* gives the best results in respect of colour.

**Manuring.** In tracts where the soils are found to contain more nitrogen the colour is found to be affected adversely. Nitrogen imparts good growth but in the case of bright cigarette tobacco it is not the quantity produced that counts for a good crop but the quality i. e., the colour. However, the question must be considered from the economic point of view also. What is the good of producing a very low quantity of the finest quality tobacco if the cost of production is prohibitive? Hence the aim must be to maintain a fair quantity of nitrogen that is necessary for the good growth of tobacco

without injuring its colour. Potash must be applied in addition, as tobacco is a potash feeder. 60 to 75 lbs. of nitrogen per acre and 2 cwts. of potassium sulphate are found by experience to yield a good crop of bright tobacco. The potassic salt imparts good burning quality and silky texture to the leaf.

**Topping.** In fields where the growth is rank, topping should not be done. If the plants are not topped in such fields, the sap enters the flowers and makes the plant produce a large number of seed capsules. Thus there will be less flow of sap into the leaves, resulting in the leaves being smooth and silky with the good colour which is ideal for cigarette making. In case by mistake the topping is done in fields having rank growth the sap which would otherwise go to form seeds will enter the leaves making them coarse and rough resulting in bad coloured leaves with rough and leathery texture of no commercial value. In case of tobacco fields of poor growth, topping is absolutely necessary. If the plants are not topped, the sap in the plant will be wasted in the formation of seeds and the leaves will become very thin, and will not develop in size and the result will be a poor leaf both in point of quality and quantity. Hence in such fields topping must be done; if this is done the sap that would otherwise go to the formation of seeds will enter the leaves and develop the size and make the leaf fairly thick so that when it is cured, it will have fair colour and texture without becoming papery. This judicious application of topping as, mentioned above should, be observed in order to obtain a good commercially paying crop.

**Flue Curing.** Curing is not merely drying, but it is a life-process due to the activity of the cells of the leaf. Curing is an art and will require the closest attention, good judgment, and most painstaking experience to attain perfect results. No one will succeed in curing without long practical experience, however minute the details of instructions regarding curing he may possess. Only long practical experience will make a good curer. As bright colour is the chief determining factor in getting the best price for the crop, great care must be bestowed in curing. The first and most important point in curing is the picking of the leaves. Only the leaves ready for harvesting should be picked and the time of picking must be determined only by an experienced man in the line. Over-ripe leaves when cured in barns become brown and spongy and immature leaves when cured in barns, dry green; and both are unfit for the manufacture of cigarettes. Generally 20 days after the crop flowers, the leaf turns light green with an yellowish tinge and this is the best time to pick the leaves and cure. Such leaves will give the best results in every respect when cured in barns. Now regarding the process of curing the usual courses are as follows: - Yellowing process takes 24 hours. During this process the green leaves are made to become yellow in the barns with the ventilators shut and maintaining the temperature at 90°F. The second stage is fixing the colour and this is done by raising the temperature slowly from 90° to 120°F by one or two degrees every hour and allowing air to enter by regulating the ventilators as and when necessary. This process takes about 16 to 20 hours. Then the third stage is the curing

process which generally takes nearly 30 hours at a temperature range of 120°F to 140°F. It is only at this stage that plenty of dry air is allowed into the barn since there is rapid oxidation going on in the leaves. If plenty of dry air is not allowed the leaves become spongy and lose colour. If this stage is carefully attended to, good results are assured. Then the fourth and last stage of curing is drying the stalk and is a simple matter. It is done in 20 hours at 140° to 170°F.

This system of curing, takes nearly 100 hours and in certain extraordinary cases where thick leaves are housed in barns, more than 130 or even 150 hours. This long period for a single curing is a source of trouble to the cultivator, and limits the number of curings that can be carried out in a given time. Though, theoretically, a 20 acre crop is expected to be cured in a single barn, only a portion of the crop can be normally cured at the proper stage of ripening; in other words, a portion of the crop has to be cured in an overmature stage resulting in a product that is poor in all respects. To avoid this, Mr. Ragland's revised formula can be applied with great success, and the barn owner can cure *within the proper time* all the 20 acres crop. In this new formula the number of hours for curing is reduced considerably and it will be possible to save nearly 20 to 24 hours for every charge. Instead of nearly 100 hours spent in a charge according to the old method, a curing can be completed in about 72 to 75 hours. This saving of twenty-four hours for every charge means a great deal for the cultivator who will be able to house all his crop in proper time and cure the whole lot with the best results. The new formula is as follows:— As soon as the tobacco is harvested and housed in the barn the temperature is kept at 90° for three hours and then advanced rapidly to 125° or as high as the tobacco will bear without scalding. Allowing the heat to remain at this temperature for only a few minutes, it is reduced to 90° again. This process is called "Sapping", for in this process the sap cells are opened and water comes to the surface of the leaves, and the yellowing process is hastened requiring only from 4 to 8 hours instead of from 24 to 30 hours by the old formula. Then the rest of the stages of curing are carried out according to the old method. Though this method is not generally followed in Guntur tract, I have adopted this method when thick leaves were housed in the barns; and it has given good results. This year the same process was tried very successfully in Mysore and good results were obtained.

Another important point in curing is humidity. The atmosphere in Guntur has natural correct humidity and hence the cured leaves can be removed from the barns, handled nicely and stored properly. But in Mysore during the late curing season the humidity was very low and as a result the curing process was hindered. Unless artificial methods are adopted and proper humidity is maintained in barns, it will be difficult to cure in Mysore as in the last season. In Mysore, the handling of the cured stuff is very difficult from January to June when the humidity is very low. From June till the end of December the humidity in Mysore is fairly high and suitable for

curing and handling of tobacco. After 1930 when this flue cured tobacco was shipped on a commercial scale, improved methods of grading, reconditioning, and packing in deal wood cases or hogsheads also simultaneously followed. Well graded, well conditioned and well packed stuff fetched high prices in London markets. By 1936 the grading system reconditioning and packing in deal wood cases and hogsheads all developed fairly well and the marketing system also improved considerably. Though a fair progress has been made in Guntur during the past 7 or 8 years in the matter of grading, reconditioning, packing, etc., yet the progress is neither very rapid nor has it come any where near the standards of America or Africa. Since 1936 there are distinct signs of growing interest in Indian tobacco on the part of the buyers in London Market. As it is, the flue cured Virginia strips that are being shipped to London are not well graded and they are classified as trash. Only a few exporters have some sort of rough grading of their own and the grades vary with different business houses. No. 1 grade of one merchant is not the No. 1 of another. Every exporter adopts his own grades. There are many small merchants who without understanding the real requirements of the London market, ship trash and nondescript grade of tobacco and flood the London market. The flue cured Indian strip tobacco now sold in London is classified as mere trash and the good Indian strips of No. 1 and No. 2 are only equal to No. 4 grade of American or Rhodesian crop. This adversely affects the reputation of Indian tobacco and the huge shipments of nondescript tobacco even pull down the price of good and medium tobacco.

In point of quantity India is the second largest producer of the tobacco in the world but in quality it stands last. As England is the producer of the finest cigarettes in the world, she requires high class tobacco and is prepared to pay high prices for such fine tobacco. Under such circumstances ways and means must be adopted in the interests of all concerned, i. e., growers, curers, exporters and manufacturers to improve the marketing of this valuable crop. First, an association comprised of all the above interests must be formed and standard average grades established for every season. The association must be controlled by the Director of Agriculture of the Province. The head of the association must be an experienced man of very high repute possessing a knowledge of foreign and local markets and should be *persona grata* with the tobacco cultivators of the Guntur district. He must be paid adequate salary to preclude temptations and salary must be met by the government wholly or partly. The head of the association must be helped by two gentlemen, one elected by the exporters and the other elected by cultivators. These three are to be invested with full powers and the majority decision of the three will be final in all matters. The function of the association must be (a) to classify the tobacco produce in Guntur into certain standard grades and send such type samples to the trade commissioner in London for exhibition in London market, (b) to get reports of the opinion about the standard grades from London buyers through the trade

commissioner in respect of prices obtainable for different grade, quantity required to meet the London market demand in each grade and to immediately publish the same for the information and benefit of the members of the association. In order to protect the interest of all connected with this tobacco business, tobacco should be shipped by license holders only to foreign markets. Such licences will be issued by the Director of Agriculture with the provincial government on the recommendation of the association to exporters who undertake to abide by the rules and regulations of the association. Those who disobey these and export without licence must be penalised heavily. After ascertaining the views of the trade commissioner at London the association will fix the standard grades to be shipped to London, and lower grades should not be allowed by the association to be shipped. The association after the examination of the actual lots to be shipped will affix the *association mark and its grade number* either in hogsheads, cases or bales as the cases may be and also issue a certificate mentioning that it fixed such marks and grades on particular lots of tobacco. These marks and grade numbers will be of high value in the London market, and the buyers can safely give high prices and will be in a position to buy whatever grades that suit their requirements and will be absolutely sure of the quantity that they purchase. The nondescript tobacco will no longer enter London market and the existing fear among the honest shippers that the adulterated stuff will drive out the well graded stuff from the market, and any man who grades well his produce is bound to lose, etc., will vanish. The association will not be a purchasing and selling body but will be purely an advisory body. When any disputes arise, the association will arrange to settle such disputes and their decision will be final and will be binding on both parties i. e. buyer and seller. In case of disputes at London the decision of the trade commissioner will be final.

The association will fix the method of packing the different grades of tobacco. The higher grades will have to be packed in hogsheads or in deal wood cases and the lower grades in bales and the method of packing fixed by the association will have to be strictly adhered to by the licensed exporters. Regarding packing in dry condition, the association will issue a certificate and the exporters will be forced to pack in good dry condition; and only lots with a certificate issued by the association regarding the right condition of packing should be allowed to be exported to London.

All tobacco cultivators should be allowed to sell tobacco at the place of production. All tobacco produced either by the cultivators or barn owners must be allowed to be sold only in one of the half-a-dozen market places located by the association in suitable centres within the Guntur district. Those licence holders who sell their tobacco or those who buy the tobacco outside these markets will have to be penalised *very heavily*. The association authorities will publish market prices daily for ungraded tobacco based on London market for the guidance of both buyers and sellers. These

will be useful for both buyers and sellers and such prices will not on any account be binding on the buyer or seller. With the aid of the Government grants or loan the association will construct protected sheds for storing the tobacco in different centres and will charge the cultivator a small rent, say, at the rate of 4 annas a candy brought into the market. The association may on the request of the cultivators fix prices for ungraded bulks of the individual cultivators after careful consideration of the London markets. The association will issue certificates of the price fixed for each individual cultivator's produce and it will be a guide to both cultivators and exporters. As regards the price for a particular lot when there is any dispute between the cultivators who sell and exporters who purchase, the association will arbitrate and their decision will be final. The association will undertake the weighing of the produce and it will be binding on both buyer and seller.

The members of the association will have to pay an annual fee to the association. Apart from that, the exporters will have to pay the license fee which will be a fairly big sum in order to prevent undesirable exporters from the business. The cultivators must be made to pay a small cess on every acre they cultivate, say 4 annas per acre. This must be levied in the form of a cess by the Government and the money thus collected will go to the association. All these forms of revenue will meet the annual expenditure of the association, and in case there is deficit and the association is to run at a loss, then the provincial government must meet any such loss completely by making grants. If the above system is worked, then it will be a great boon to the manufacturers, exporters, and the cultivators and the tobacco business will develop by leaps and bounds.

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# AN ANNOTATED CONSPECTUS OF THE INSECTS AFFECTING FRUIT CROPS IN S. INDIA\*

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**Introduction.** With the spread of knowledge regarding the value of fruits in our dietics, there is nowadays a greater demand for fruits and consequently a tendency on the part of land-owners for an extension of fruit culture all over India. Among the various problems which the fruit grower has to pay particular attention to, the role played by insects of different kinds on fruit trees is of very great importance. The writer, has attempted in this paper to give some information on the entomological aspect of fruit growing in S. India. It does not, pretend to be in any way a complete or final account of the fruit insects of the province. It is only an annotated conspectus of all the important fruit insects so far noted in S. India with very brief notes on their bionomics and economic importance with some very general suggestions towards their control.

**South Indian Fruit Crops and their pests in general.** Though numerous varieties of tropical fruit trees are found grown in the different parts of the Madras Presidency very few of them are cultivated on any extensive scale. The only fruit crops which are cultivated on a fairly large scale in different tracts of this province are the *Mango*, the various varieties of *Citrus* and the *Banana*. The others which rank next to these include Guava, Sapodilla, Melon, Grape, Pomegranate, Fig, Jujub, Jak, Pine apple, etc. Crops like Apples, Peaches, Plums, etc. are mostly confined to the hill areas like the Nilgiris, Shevaroy, Pulneys, and parts of the Mysore plateau. Fruit crops in S. India are as much subject to insect pests as are the various field or garden crops. They, however, differ from the latter in that, their hosts being perennial plants they afford permanent footings to insect pests. The more important categories of pests which affect fruit crops in South India are the *stem borers*, *leaf, shoot and bark caterpillars*, which come under biting insects and the *mealy bugs, plant lice, leaf hoppers, fruit flies* and the *fruit sucking moths* which are sucking forms. Some of the worst foreign pests of fruit crops like the Sanjose scale (*Aspidiotus perniciosus*, G.) and the Codling moth (*Laspeyresia pomonella*, L.) which are very serious in other countries have not as yet appeared in S. India though they are reported to have come to Kashmir and Baluchistan. The cottony cushion scale (*Icerya purchasi*, M.) has appeared on the Nilgiris. In the following paragraphs is given an account of the different fruit pests arranged according to crops.

**Mango.** (*Mangifera indica*). Among insect pests of mango in S. India the most important are the mango hopper bug, the stem borer beetle, fruit flies and some scales and mealy bugs. Of lesser importance are the

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various leaf eating caterpillars, beetles, etc., and the mango nut weevil; some of them however appear occasionally as sporadic local pests causing some appreciable damage.

*The Mango Hopper*—(*Idiocerus niveosparus*, L.) Jassidae. This insect has a wide distribution all over the presidency especially in the chief mango areas like Salem, Chittoor, Mysore and Vizagapatam. It is a small greenish brown creature about  $\frac{1}{8}$  inch in length with a wedge shaped body, is very active and can both fly and hop. It feeds by sucking up the sap from the tender flower spikes and shoots in all its stages and secretes a sweet liquid known as 'Honey dew' (Telugu: *Theni manzu*) which is found very often wetting the whole soil around infested trees. In bad attacks the blossoms drop and no fruits develop. Very serious loss is sustained by mango gardeners in certain years. The life history and habits of the insect are detailed by Ayyar (2) and Ramachandra Rao (10). Two methods can be adopted against this pest—trapping the hoppers by nets or sticky screens and spraying the trees with a contact insecticide like fish oil rosin soap or crude oil emulsion.

*Mango stem borer beetle*, (*Batocera rubus*, L) Cerambycidae. The stout fleshy grub of this beetle often reaching 3" in length bores through the stem or main branches of mango trees and often kills them outright. The adult beetle is a dull brown stout insect with long feelers and strong mouth parts, and measures about 2 inches in length. The grub grows to a length of about 3 or 4 inches and remains as a grub for several months. This creature attacks other plants also such as rubber, jak, fig, etc. The presence of the pest on the tree is known by the gradual drying up of the attacked branch and also by the holes on the stem plugged with dust and excretions of the grub. The control measures consist in killing the adult beetle when found in the gardens, extracting the grub through holes found plugged with fibrous material by means of a hook or wire or injecting the holes with dilute kerosene emulsion, tar water or petrol, to kill the grub *in situ*.

*Fruit flies*. In almost all mango areas a very good percentage of ripening fruits get infested with fruit fly maggots of different kinds. Though similar in fundamental characters to the common housefly, fruit flies have spotted wings with often yellow and dark brown body spots. These thrust their eggs into ripening fruits of different kinds and the hatching maggots damage the fruit pulp from inside and drop to the soil when fully fed to pupate. Fruit flies attack many kinds of fruits such as guava, melons, peaches, citrus, etc. The species noted so far belong chiefly to the genus *Chaetodaeus*, *C. ferugineus*, being the commonest on mango in S. India. Further particulars on fruit flies are given in the author's paper on these insects (4). Prophylactic methods such as destruction of infested and fallen fruits, trapping adult flies with poison sprays and traps may be adopted.

*Leaf caterpillars*. Several species of caterpillars are now and then noted feeding on mango foliage in different tracts though very few of them

cause any very appreciable damage. The more important and well known of these are the castor slug *Parasa lepida* G. Limacodidae the Tussock caterpillar (*Euproctis scintillans* W) Lymantriade—the striped and spotted leaf caterpillar *Bombotelia jocosatrix* G, the shoot webber *Orthaga exvinacea*, M. Noctuidae—the small shoot boring worm *Chlumetia transversa* W. Noctuidae, and a slender leaf mining caterpillar causing blister marks on the tender foliage (*Acrocercops syngramma* M). When any of these appear in pest form both mechanical and insecticidal measures may have to be adopted, the insecticide used being a stomach poison like Lead arsenate or Paris green.

*Leaf beetles.* Among these there are four with different habits of their own:— 1. the leaf twister weevil (*Apoderus tranquebaricus* F) Curculionidae; the grubs of this remain and feed inside characteristic knots of tender mango leaves, 2. a slender pale green weevil which cuts the tender leaf tips (*Eugnamptus marginatus*, P) Curculionidae; 3. a minute leaf mining weevil (*Rhynchaenus mangiferae* M) Curculionidae; 4. ordinary leaf eating cock chafers and weevils—the latter chiefly belonging to the genus *Myllocerus* common on many cultivated plants, and the former belonging to species *Holotrichia* etc. which are night feeders. The beetle pests especially cockchafers can be easily checked by mechanical measures such as light traps, and by the process of jarring infested branches over a sheet or basket. The short stout built dark brown mango nut weevil *Cryptorhynchus mangiferae* M) Curculionidae though found in S. India has not as yet become very important as a pest; it is usually noted attacking only certain varieties of mangoes, especially the long fruited *Kilimooku* or *Bangaloora* variety in S. India (see ref. No. 12).

*Scales and mealy bugs.* Scales and mealy bugs occasionally affect our fruit crops seriously. About eighteen species of these insects (Coccidae) have been so far recorded on mango alone in S. India, see (Ayyar, 3). Of these the commoner and more important are the scales 1. *Chionaspis vitis* Gr. 2. *Aspidiotus rossi* M. 3. *Aspidiotus ficus*, A. 4. *Pulvinaria psidii* M, 5. *Lecanium adersi* N. and the mealy bugs—6. *Phenacoccus iceryoides* G. and 7. *P. mangiferae* G. Of these numbers 1, 2, 4 and 6 are often troublesome. Scales and mealy bugs are perennial and often persistent, and as such might require some special attention. Since ants of different kinds also help in the increase of these Coccid pests attention should also be paid to the control of those species of ants which transmit the scale pests from tree to tree and from garden to garden. The red tree ant *Oecopylla smaragdina* F. is notorious in this respect and can be noted on almost all tropical fruit trees.

*Citrus.* (*Citrus* spp.) Just as in the case of mango all the varieties of citrus found in different parts of the province such as oranges lemons, pomelos, sour limes, etc. are all subject chiefly to the same categories of insect pests such as leaf caterpillars, borers and coccidae, though there are a few forms specific to citrus plants in the different tracts of the province.

An account of the chief insects affecting oranges in the northern circars is given by Margabandhu (9).

Among leaf caterpillars the important ones are the different familiar smooth greenish larve of species of swallow tail (*Papilionid*) butterflies of the genus *Papilio* (*P. demoleus*, *P. polytes* and *P. polymnestor*); these cause more damage to younger plants than to well grown ones. The citrus leaf miner caterpillar (*Phyllocnistis citrella* S.)—Phyllocnistidae, is a small pale brown worm which almost exclusively confines its attacks to tender foliage and in young plants often causing appreciable injury; due to the mining habit of the larvae the attacked leaves develop glistening blistered patches and curl up. Of minor importance are two other caterpillars the leaf roller (*Tonica zizyphi* S.)—Oecophoridae—and the blue butterfly larva (*Chilades laius*, G) Lycaenidae. For these leaf caterpillars hand picking alone will be found effective except in bad infestations in extensive areas which might call for insecticidal methods.

The borers attacking citrus include both beetle grubs and caterpillars. As in mango, the former are larvae of longicorn beetles boring into the stem and branches of citrus trees; these beetles are especially found in parts along the Western Ghats, and two species have been noted in South India viz. *Chloridolum alcemene*, T. and *Chelidonium cinctum*, G. shining dark bluish beetles. These have the same habits as the mango stem borer.

The caterpillar borer (*Arbela tetraonis*, M.) (Arbelidae) bores also into the shoots and the bark of grown up trees showing winding irregular galleries of frass on the attacked tree. This insect is found everywhere and is occasionally serious in parts of the Ceded Districts. It is also seen now and then to affect different species of shade and avenue trees very badly.

Of the typical sucking insects affecting citrus plants we have the different scale insects, mealy bugs, aphids and mealy wings. In South India we occasionally find the scales *Aspidiotus ficus*, *A. aurantii*, *Parlatoria zizyphus*, *Lecanium viridae*, *Saissetia hemisphaericus*, *L. hesperidum* and the mealy bugs *Pseudococcus corymbatus*, G. and *Phenacoccus iceryoides*, G.

The recently introduced cottony cushion scale (*Icerya purchasi*, M.) though more evident on wattle trees on the Nilgiris has also been occasionally found on Citrus plants in the same district. This insect being an insect *K. D.* its behaviour and further progress have to be carefully watched by citrus growers in S. India. The mealy wings found on citrus include *Aleuracanthus spiniferus*, Q. and *Dialeurodes citri*, A. These are often found in company with the citrus plant louse *Aphis taverasi* Dg. which is often a bad pest of young plants. In addition to the above well known sucking insects, citrus is now and then found subject to the attentions of two or three heteropterous bugs puncturing the ripening fruits but rarely causing any appreciable damage; these are the two Pentatomids—the green *Vitellus orientalis*, D., the spotted *Cappaea taprobanes*, D. and the greenish brown Coreid *Dasynnus antennatus*, K. Attention to plant sanitation and

regular periodical spray programme will keep away these pests from citrus orchards. In dealing with scales and mealy bugs, of course, attention has to be paid to ants of different species (especially *Oecophylla* and *Camponotus*) and their role in spreading the bugs.

The fruit sucking moth *Ophideras fullonica*, L. Noctuidae—is one of the very few examples of adult lepidopterous insects (moths) directly injuring a cultivated plant in the adult stage. This and allied species (such as *O. materna*, L., *O. ancilla*, Cr.) which are stout built moths with long and sharp tipped sucking tubes puncture the ripening fruits and suck the juice during night. Fruits so affected usually rot and drop down. Very serious damage in this way is often reported from the Ceded Districts and N. Circars (11). Hand netting or baiting the moths over traps of ripe mangoes or syrup set here and there in orchards, and spraying as a preventive against the moths approaching the trees will check the pest considerably. Destruction of some wild plants chiefly the wild *Tinospora* on which the caterpillars of these moths breed in the vicinity of the gardens will also help to check pest multiplication. In the case of valuable varieties, covering the ripening fruits with wicker baskets or paper envelopes is also found effective and economic to some extent as is done in parts of the N. Circars.

**Banana** (*Musa spp.*) In South India though different species of Banana or plantain (*Musa spp.*) are grown extensively, even more than mangoes or citrus, this plant, unlike the latter is not grown exclusively for fruit purposes but for vegetable as well. Compared to mangoes and citrus the banana is subject to fewer insect pests. The pests include leaf caterpillars which occasionally defoliate the plants; the chief ones are the castor slug (*Parasa lepida*, C.), the omniverous tobacco caterpillar (*Prodenia litoralis*, F) the black hairy caterpillar (*Pericallia ricini*, F) and a bag worm (*Kophene cuprea*, M.) A species of thrips (*Heliothrips kadaliphilo*, R.) was noted to do some serious harm to young foliage in S. Malabar in 1931. Hundreds of these minute insects swarm on the tender foliage and suck up the leaf sap causing the leaf to turn brown and dry. The notorious and widely distributed banana root and stem weevil (*Cosmopolitius sordidus* G)—Curculionid—though noted in the province in two or three areas such as Ganjam, Godavari and Malabar, has not yet become so serious as in other tropical areas like Fiji, Queensland or Philippines where it is found to cause appreciable harm. When a number of grubs of the weevil attack the banana stem the central shoot fades and the plant is gradually killed. Minor pests of banana include sucking spittle insects the commonest being the red and blue *Phymatostetha deschampis* L, the lace wing bug (*Stephanitis typicus* D) and a few scale insects *Lecanium descrepans*, *Asp. destructor*, S. and *A. cyanophylli*. Some of these scales occasionally cover fruits also. Excepting the borer weevil which may be found difficult to control in widespread cases except by prompt prophylactic methods, all the other insects of banana can be easily checked by prompt pruning of early infested leaves and if necessary by insecticidal washes in very serious cases.

**Guava** (*Psidium guava*). The important pests of the guava plant are scales, fruit flies and the fruit moth. The scale pests include the guava mealy scale (*Pulvinaria psidii*, G.) which is a specific pest of this plant and a few others including the red and green bugs of coffee (*Saissetia hemispherica*, T.) and (*Lacanium viride*, G.); all these have been referred to under mango. Prompt pruning of badly infested parts and spraying the rest with a contact poison will check these insects effectively. The fruit flies attacking this fruit chiefly belong to a darkish brown species (*Chaetodacus incisus*, W.). The fruit moth *Ophideres fullonica* and sometimes the caterpillar of the castor capsule borer (*Dichocrocis*) also attack this fruit. A reddish brown capsid bug (*Helopeltis antonii*, S.) which is a specific pest of tea in the hill plantations, is occasionally found damaging guava shoots in Coimbatore but has not been noted as serious.

**Pomegranate** (*Punica granatum*). The most important and specific pest of this plant is the fruit boring blue butterfly (*Virachola isocrates*, F.)—Lycaenidae; others include a few leaf eating caterpillars. The dirty brown caterpillar of this bluish brown butterfly emerging from shining eggs laid on the tender parts of the plant bores into the ripening fruit, feeds on the seeds and allows the fruit to rot and fall down. Infested fruits generally show holes on the fruit surface often plugged by the anal segment of the caterpillar or its excreta. The insect is found everywhere and serious loss of fruits is caused in some places like Coimbatore, N. Circars, Mysore, etc. The control measures generally adopted are: covering the developing fruits with paper or muslin bags to prevent egg laying by the butterfly, destruction of all badly damaged fruits and collection of the butterfly when possible. The castor capsule borer (*Dichocrocis*) is also occasionally found boring this fruit. The chief leaf eating pests are some of the caterpillars affecting castor, viz. the castor slug (*Parasa lepida*, C.) the red tussock caterpillar (*Euproctis fraterna*, M.) and the semilooper (*Achoea janata*, L.); the last is not so common as the first two. Minor pests include one or two mealy bugs which affect the fruit stalks and cover the fruit also *Pecudococcus lilacinus*, C.) and a mealy wing (*Siphonimus finitimus*, S.) the bluish black nymphs of which are often found in numbers on the foliage. The mealy bugs and mealy wings can be easily controlled if serious by contact spraying. In Kurnool, a fruit sucking plant bug (*Jartina indica*, D.) has been noted doing some harm on one or two occasions. The red borer caterpillar of coffee (*Zeuzera coffeae*, N.) has been noted on one or two occasions attacking pomegranate stem in the Malabar district.

**Grape** (*Vitis vinifera*). The insect pests of this crop in the important grape growing areas like Krishnagiri, Penukonda and Dindigul include some beetles, leaf eating caterpillars, thrips, white ants and scales. The most important of all grape pests in S. India is the small copper brown flea beetle (*Sceledonta strigicollis*, M.) a specific pest of this crop in many parts of India. In bad infestations numbers of the beetle are found feeding on the tender shoots and leaves and causing substantial damage to the foliage.

They may be collected with nets and others traps and, in bad cases, a stomach insecticide may be sprayed. In some cases, the vines are badly defoliated by night feeding cockchafer beetles also, the chief species noted so far in S. India are medium sized brown ones (*Adoretus lasiopygus*, B. and *A. versutus*, H.). Such beetles can be trapped by lights at night and also by stomach sprays. Another beetle pest found on grape vine is the vine girdler (*Sthenias grisator*, F.) a medium sized strong built longicorn beetle. It has the peculiar habit of ringing the vines and often killing the same; in some gardens very serious damage is often caused by the beetle cutting off some of the main vines. The early stages of the insect are passed on the girdled branches in which the eggs are laid by the beetle after ringing the bark. Control measures include destruction of the ringed branches and the collection of the beetles when found. In parts of Mysore and Coimbatore, the common dark brown ground beetle (*Gonocephalum depressum*, F.) is sometimes found doing damage to tender vines. Grape caterpillars include one or two species of horn worms—*Hippotion celerio*, L. and *H. oldenlandiae*, F. being the commonest. A leaf rolling pale green caterpillar (*Sylepta lunalis*, G.) and a very small leaf mining caterpillar (*Phyllocnistis toparcha*, L.) are also occasionally found as minor pests. None of these insects generally assumes serious proportions. They can be easily handpicked or controlled by stomach sprays when necessary. The tender foliage of grape is in many places affected by thrips which lacerate the tissues suck up the juice and make the leaves fade and dry. The grape thrips (*Phipiphorothrips cruentatus*, H.) is specific to grape though found on other plants like roses, country almond etc. The pest can be easily checked by tobacco dusting. White ants—*Odontotermes* sp.—cause damage to newly planted setts of grape vine in notoriously white ant infested areas. Dipping of setts in crude oil emulsion or tar water and mixing crude oil emulsion in the irrigation water will give relief. Attention to termite nests in the vicinity will also be found preventive. Occasionally the vines are covered by small pale grey hard scales (like *Aspidiotus laticorniae*, S) and (*A. cydoniae*, C.) and soft scales (like *Lecanium longulum*, D. and *Pulvinaria maxima*, G.). These can be easily checked by contact washes and careful pruning.

**Melons.** The chief insects on melons of different kinds are the same as those found on Cucurbitaceae, especially pumpkins, cucumbers and gourds; the commonest are the pumpkin beetles (*Aulacophora* spp.), the pumpkin leaf caterpillar (*Margaronia indica*) and fruit flies—*Chaetodacus* spp.

**Fig** (*Ficus* spp.). The important pests of cultivated fig which is not found on any large scale anywhere in S. India are: (1) the stem boring grub of a longicorn beetle (*Olenecamptus bilobus*, F.) a slender pale whitish brown insect with long antennae with same habits as the borer on mango; (2) leaf eating caterpillars of different kinds including (a) a small whitish wild silkworm (*Ocinara varians*, W.) the larva of a pale whitish moth, (b) the hairy caterpillars (*Perina nuda*, F. and *Hypsa ficus*, F.) and (c) other leaf eating

forms (*Phycodes raaiata*, O., *Margaronia stolalis*, G. and *Plothea celtis*, M.). These can be checked by mechanical methods or stomach sprays. Some scale insects and mealy bugs (*Saissetia cleae*, B.) (*Aspidiotus cydoniae*, C.) (*Pseudococcus lilacinus*, C.) and (*Lecanium ramakrishnae*, G.) are occasionally found on the shoots and stems, but very rarely in serious form. A dark giant thrips (*Gigantothrips elegans*, Z.) is usually found on the tender foliage causing the leaves to curl and fade. In some species of figs especially *Ficus glomerata* the leaves are often badly galled by two or three species of jumping bugs Psyllidae (*Psuropsylla depress*, *Dynopsylla grandis*, etc.) some of these galls taking peculiar shapes.

**Jak** (*Artocarpus integrifolia*) and bread fruit (*A. incisa*). Of these two species of Jak in S. India, it is the common Jak (*A. integrifolia*) which is more subject to important pests. These include (1) the shoot and fruit boring caterpillar (*Margaronia caesalis*, W.) the larva of a whitish brown moth with greyish pattern on the wings. The reddish brown caterpillar bores into the tender shoots and developing fruits and causes substantial damage in many localities such as Malabar, Godavari, etc. (2) A small grey brown weevil, the Jak bud weevil (*Ochyromera artocarpi*, M.) the small whitish grubs of which bore into the tender buds and fruits. This insect is also common all along the western coastal areas and in parts of Mysore. In these cases only preventive measures such as the destruction of all infested and fallen buds and fruits and collection of weevils when found appear practicable. (3) Scales and mealy bugs—the tender shoots and buds of both Jak and bread fruit tree are often found covered with thick white masses of mealy bugs, chiefly (*Icerya aegyptiaca*, D. and *Pseudococcus corymbatus*, G.). In parts of Mysore and Coorg, a small dark scale (*Aspidiotus triglandulosus*, G.) covers the foliage but does not cause appreciable harm. In all bad cases, prompt pruning and spraying of contact insecticides may be adopted. One or two species of spittle insects occasionally appear on the tender shoots and foliage and cause the leaves to curl up. The common forms noted are small creatures (species of *Ptyelus* and *Glovina*) but in Coorg and parts of S. Mysore a fairly large sized spittle bug reddish in colour (*Cosmoscrata relata*, D.) has been noted on jak in swarms covering whole branches with its frothy secretion. (5) A beautiful aphid (*Greenidea artocarpi*, W.) with long hairy cornicles is specific on jak and causes some harm to the tender leaves and buds.

**Sapodilla** (*Achras sapota*). Very rarely have insects caused any serious damage to this crop so far though mealy bugs (*Phenacoccus iceryoides*, GR. and (*Pseudococcus lilacinus*) are occasionally noted in small numbers.

**Wood apple** (*Feronia elephantum*). The castor slug (*Parasa lepida*, C.) occasionally attacks the foliage of this tree and a slender brown caterpillar (*Euzophera plumbeifasciella*, H.) attacks the fruits as a borer.

**Jujub** (*Zizyphus jujuba*). Both the wild and cultivated varieties of this fruit tree are subject to a few important pests. A grey hairy caterpillar

(*Thiacidas postica*, W.) is often found in swarms on the foliage. Leaf beetles like *Myloccerus* and *Platypria*, scales like *Ceroplastodes cajani* and *Pulvinaria maxina*, C. and a tube building spittle bug *Macherota* are also found on the trees as minor pests. The really important ones are the reddish fruit boring caterpillar (*Meridarches sycrodes*, M.) the larva of a small brownish moth and the jujub fruit fly (*Carpomyia vesuviana*, B.); these bore into the ripening fruits and often cause severe damage.

**Custard apple** (*Anona squamosa*). Only the fruits of this plant have been found attacked by any insects and the chief ones are the mealy bug (*Pseudococcus virgatus*) which often covers the fruits, the fruit boring caterpillar (*Heterographa bengalensis*, H.) and fruit flies (*Chaetodacus* spp.).

**Jambu** (*Eugenia jambolana*). No insects of a serious nature affect this plant though leaf weevils, caterpillars, mealy wings, jumping bugs, etc. are occasionally found breeding. Fruit flies (*Chaetodacus* sp.) attack the fruits. The greenish caterpillar of a purple winged moth (*Carea subtilis*, W.) attacking the leaves is a specific insect of this tree; this caterpillar is peculiar in that it has the anterior part of the body conspicuously swollen. The mealy wings (*D. ialeurodes eugeniae*, M.) and the Psyllid jumping bug (*Trioza jambolanae*, G.), though they cause malformation of the shoots and foliage, hardly bring about any serious harm. The rose apple *Eugenia jambos* a tree grown here and there in the province is also subject to these same insects.

**Tamarind** (*Tamarindus indicus*). Scale insects and mealy bugs of different kinds often cause some damage to this tree—especially to the tender shoots and fruits which are literally covered with these insects during certain years. These include both hard scales (*Aspidiotus orientalis*, N) (*A. tamarindi*, G.) and (*Saissetia oleae*, B.) and mealy bugs (*Pseudococcus lilacinus*, C.) and (*P. corymbatus*, G.). The curious crab caterpillar found on redgram (*Stauropus alternus*, W.)—Notodontidae—is sometimes noted on tamarind foliage but only as a minor pest. Bag worms (chiefly *Chaliodes vitrea*, H. and *P. teroma plagiophleps*, H.) are occasionally found damaging the foliage also. Sometimes the pomegranate butterfly (*Virachola isocrates*, F.) is also found on the fruit. The beetle *Caryoborus gonagra*, F. is generally found breeding on stored tamarind in provision stores feeding on the seeds.

**Cashew** (*Anacardium occidentale*). Insects visiting this plant have been so far found to do harm only to the different parts other than fruits and these are mostly sap sucking forms. These include (1) the small dark brown thrips (*Selenothrips rubrocinctus*, G.) which is the notorious Cacao thrips of Ceylon and other tropical regions; in parts of N. Malabar it is occasionally found doing damage to tender leaves and flowers by sucking the sap and allowing them to fade and dry up; (2) the active reddish brown mosquito bug (*Helopeltis antonii*, S.) the well known pest of tea and which attacks the tender shoots, and (3) scale insects (chiefly the wax scale *Ceroplastes floridensis*, C.) which are rarely serious. Of other pests, the leaf eating caterpillar of the wild silk moth (*Cricula trifenestrata*, H.) a stout reddish brown hairy caterpillar, is occasionally found in swarms on these trees in different

areas along the west coast; the golden yellow hairy and spiny silken cocoons of these caterpillars are sometimes found in masses on the tree branches. Occasionally a pretty little long snouted dark weevil (*Apion amplum*, F.) is also found nibbling the shoots.

**Country almond** (*Terminalia catappa*). This tree is not subject to any serious pests. Among insects noted on it are 1. the leaf twisting reddish brown weevil (*Apoderus tranquebaricus*, F.); noted under mango, 2. The grape thrips (*Rhipiphorothrips cruentatus*, H.) is found on the tender foliage, 3. Scale insects (chiefly *Saissetia nigra*, B. and *S. hemispherica*, T.).

**Nelli** (*Phyllanthus emblica*). The insects found in this tree include 1. mealy bugs of different kinds (*Pseudococcus* spp.) covering the tender parts 2. a bluish metallic green pentatomid bug (*Scutellera nobilis*, F.) which sucks the fruit—noted only in parts of N. Circars; 3. a small leaf rolling caterpillar of very minor importance 4. a species of aphid (*Setaphis bouganvilliae*, H.) noted on this tree in Coimbatore. The garden Phyllanthus (*P. dishicus*) often suffers badly from the attacks of a mealy wing (*Aleurodes*) which covers the undersurface of leaves in masses.

**Pine apple**. (*Ananas sativus*). No insect pests of any importance have been noted on this crop in S. India, though the pine apple mealy bug (*Pseudococcus bromeliae*, B) was noted on one or two occasions in Malabar on the Kew variety.

**Mulberry** (*Morus* sp.). The only important pest of this crop, which is generally grown only for its foliage to feed silk-worms in parts of Mysore and Kollegal, is the stem girdling beetle (*Sthenias grisator*, F.) already noted under grape vine. The mealy bug pest causing *Tukra* disease of N. India has not yet been noted as a pest on mulberry in S. India

**Bael or Bilwa** (*Aegle marmelos*). In S. India this plant is utilised more for its foliage for use in religious functions than for its fruits. The leaves and shoots are very often badly infested by the green coffee scale (*Lecanium viride*, G.). In some places a small black shining flea beetle (*Clitea indica*, J.) and its yellowish white grubs seriously defoliate this tree. The citrus butterfly (*Papilio demoleus*, F.) is also found breeding on this plant but does not affect it seriously.

**Papaya** (*Carica papaya*). No pests have been noted on this plant till now in S. India.

**Apples, Pears, Peaches, Plums, Etc.** These fruits are found subject chiefly to the attacks of plant lice, scales and fruit flies. The plant lice include two forms: 1. the notorious 'wooly blight' (*Eriosoma lanigerum*, H.) which is apparently an introduced pest and which is often serious on apples on the hills, and 2. (*Dilahunus krishni*, G.). Hard scales (especially *Aspidiotus cydoniae*, C.) are sometimes found on introduced stalks of apples peaches, etc. Leaf weevils generally (*Mylloceris subfasciata*, G.) are found occasionally, but are of minor importance. Of some importance are the fruit flies (*Chaetodacus* spp.) which attack peaches, plums, perismmon, etc. The wooly blight and fruit flies should receive prompt attention in the case of these exotic fruit plants and in importing stocks from outside the country,

very great care should be taken to see that only pest free material is brought into the country. In fact the import of foreign fruits and fruit plants, unless done under very careful quarantine supervision, is one important channel for undesirable foreign insects to enter our country as already noted in the author's two papers (Nos. 6 & 7).

**Control measures.** Before concluding this brief account of S. Indian fruit insects a word or two may be added regarding control measures against them in general. Unlike as in the case of ordinary field crops like paddy, sorghum, etc. where, methods like spraying, dusting etc. for pests are out of question, in the case of paying crops like fruits all modern methods whether mechanical or insecticidal are well worth introduction in orchards; in fact such methods should be included in the routine of fruit cultivation just in the same way as cultural methods like manuring, irrigation hoeing, pruning, etc., etc. It will also be quite economic and practicable for orchardists in extensive areas to equip themselves with the necessary pest controlling apparatus and insecticides for their periodical use; else they can even arrange for stocking all such materials on a co-operative basis for the use of all fruit growers in any area. If modern methods of spraying, etc., have any definite chances of success in India, paying crops like fruits and industrial crops like cotton, tobacco, etc. are the ideal ones for such trials. Biological control may be very effective in some cases but the same will have to be always supplemented by the ordinary prophylactic and curative measures like spraying, dusting, etc.

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## EXTRACTS

**The Super-Sheep of Dr. Bell.** Scientists, taking preposterous liberties with the animal kingdom have achieved feats in a few generations that would have taken ordinary evolutionary processes tens of thousands of years. One of these experimental ventures is now drawing near a close. For sheer audacity it has few equals. It may mean cheaper suits and dresses, blankets and carpets—and more plentiful chops and legs of lamb. From a scientific point of view, it is one of the fine, unsung research stories of our day.

The aim is to create a breed of sheep which will normally produce twins and be capable of sustaining their lives until they are old enough to be weaned—thus making possible enormous increases in the 50,000,000 sheep that graze the nation's fields. It's a story of work that began 49 years ago on a bleak Nova Scotian hillside under the direction of Alexander Graham B. II, inventor of the telephone; and that is nearing completion today in a prim little frame building on the University of New Hampshire campus.

During the summer of 1886, Dr. Bell took his family to Baddeck, Nova Scotia, for peace and seclusion. To supply his children with some amusement, Bell bought a sheep which he intended to sell in the fall when they returned to Washington. But the children would not hear of selling their pet, and the animal was boarded with a farmer for the winter.

When the family returned the following spring there were two sheep—the original and a lamb born in the spring. For the children it was a delightful surprise. The inventor had a different reaction. Why only one baby? A hog produced a dozen or so young at one time, and half a dozen kittens or pups often arrived together. So why only one lamb?

The great inventor looked at his Nova Scotian neighbours. They were undeniably poor. They had to subsist largely on the earnings from their flocks of sheep. If one could only induce those sheep to have twins most of the time, wouldn't one proportionately increase the income of the Nova Scotians?

Bell began collecting sheep facts. One point stood out particularly. Sheep, as a rule, had only two functional nipples—two that would supply milk to the young. That militated against production of a race of normally twin-bearing animals, because when twins were born the stronger crowded the weaker away from food, and it starved. The first problem was to produce, by selective breeding, a herd of sheep with extra mammae capable of producing milk.

To neighbouring farmers Bell passed the word that he would pay high prices for those occasional, freakish sheep that were equipped with more than two functional nipples. That first year they brought him 16 animals, and Bell began a long, painstaking experiment in breeding. He invented a system of ear punching as a key to the ancestry of each animal, and in his own study he kept the voluminous records of the work.

Despite disappointments and handicaps, progress was made, and the experiment became the venerable scientist's consuming passion. If he could not be on hand for the spring lambing season, results were wired to him. By 1903 the flock averaged 4.44 functional nipples each, and later the average reached 5.32. In 1914—27 years after the work began—it had progressed far enough for Bell to concentrate entirely on twinning characteristics. The flock was now producing twins half the time.

Then the death of Dr. Bell stopped the work short. His heirs looked about for someone to carry on. Finally they selected Professor Ernest G. Ritzman,

who is now in charge of the laboratory at the University of New Hampshire. He had a rich background of accomplishment in the improvement of domestic animals, and had for half a dozen years conducted a series of striking sheep-breeding experiments. He had crossed good wool-producing Rambouillets with good mutton-producing Southdowns to achieve a superior animal with the best characteristics of both stocks.

When the Bell flock arrived in 1923, Ritzman began imposing the characteristics of his sheep on them. This was necessary, since the Bell had paid little attention to the wool or mutton their flock produced—with the result that both were low grade. This step is now very largely completed, and Ritzman has lately concentrated almost entirely on developing the twinning characteristic. The flock now drop twins slightly less than 70 per cent. of the time. Occasional triplets occur.

Ritzman's work, now heading toward a successful conclusion, has attracted scientists from Czechoslovakia, Germany, Japan, China, Russia, France. It is work that one day will mean better clothes for everyone, and more food. And, above all, it may bring realization of the ideal which first set Dr. Bell out on the project—more prosperity for farmers. *The Reader's Digest*, May 1938, Page 85.

## Agricultural Jottings.

### 'MOLASCAKE:' A CATTLE FOOD

(From the Director of Agriculture, Madras).

The problem of the utilisation of molasses, a waste product of the sugar industry has been engaging the attention of scientists in all parts of the world. This problem has assumed noticeable proportions in this Presidency, owing to the recent growth of the sugar industry. Molasses, by nature a sticky liquid, is not easy to dispose of. It contains a certain quantity of sugar, and is a valuable waste of the sugar industry.

Various methods have been suggested for its use as a soil improver, a source for power alcohol, a binder for road making, and as a food for cattle. This note describes a method of using it for making a type of cattle food not known till now, in a handy brick form by an inexpensive method within the reach of everybody.

It is well known that molasses can be fed as such to cattle to a limited extent, and its viscous and sticky nature is against its general use in feeding cattle. Recent researches by the Government Agricultural Chemist, at Coimbatore, have resulted in the making of a form of cattle food, by compounding powdered oil-seed cake or cotton seed, and molasses into a solid brick form which can be stored for any time up to six months without deterioration and which when broken up by hand and put into water immediately goes into suspension and is relished by cattle. This product was called "Molascake".

Molascake can be made easily by mixing molasses and powdered oilcake, crushed cotton seed, rice bran or wheat bran in a hand mortar, adding the constituents in such proportions as will give a thick stiff paste after thorough mixing. This paste is now put into moulds as commonly used for moulding jaggery and beating it into the mould by a wooden hammer. A convenient size is a mould having holes 6" x 3" x 3", a cake of this size will weigh approximately one pound.

Molascake as made at Coimbatore was intended to contain 120 grams of protein and was made with and without mineral mixture. Such a cake was made by mixing  $\frac{1}{2}$  lb. of molasses with  $\frac{1}{2}$  lb. of groundnut cake. When mineral mixture was added the quantity required was 1 ounce mixture of steamed bonemeal and

shell lime both ground very fine, mixed in equal proportions. Each cake weighed 1 lb. Molascake can be made in any desired proportion to increase the quantity of protein if so desired, by making cakes of larger size.

The advantages of molascake over the ordinary molasses for feeding to cattle are obvious.

Molascake is easily handled and stored and convenient for feeding to cattle. One cake weighing 1 lb. per day, will supply sufficient nutrient to a bullock at rest while two cakes will be sufficient for a bullock having light work and three for one doing fairly heavy work. The mineral mixture when added will enhance the value of Molascake by supplying calcium and phosphorus also, two mineral substances essential to milch cows specially.

The Government Agricultural Chemist will be glad to supply any further details about Molascake if so required.

### THE NEED TO PUT UP BUNDS IN THE DRY-LAND OF THE BELLARY BLACK SOILS

*(From The Director of Agriculture, Madras).*

The Bellary black soil tract has a poor and precarious rainfall. Normally it receives 20 inches of rain in about 50 instalments. Nearly half of it is obtained between August and October. The precipitations before August are light and at long intervals, consequently of little use for cropping. Rainfall later than October is rare. The staple crops of cotton and sorghum have to depend mainly upon the rainfall received in their intitial stages of growth.

2. When it rains, the duration is generally short. The soil having a high proportion of clay is slow to take in rain water. Further, the land is not level and is mostly undulating. All these contribute to a good amount of rain water being lost as run-off and not useful to cropping. In an experiment at the Dry Farming Station, Hagari it has been noted that besides 6 tons or besides 12 cart-loads of fine top soil and 4 inches of rain have been lost as run-off out of a rainfall of 9.2 inches received in a particular period of last year. This shows the enormous loss of soil and rain water in a slopy land having a gradient of 1 in 80.

3. The fields of the Dry Farming Station, Hagari may be said to be fairly level as the average slope is only 1 in 300. Even in such fields there have been instances of only 10 per cent, of rain having soaked in during September--October months when the staple crops are sown. A large area of this tract owned by cultivators has a steeper slope and obviously one should expect in such soils a greater loss of rain water without being absorbed by the soil.

4. As a first attempt to increase the moisture and also lessen the loss of fine soil of the black soils at Hagari, bunds about 7 inches high were formed along the contour. A few similar bunds were also put up along the slope creating banded compartments of about 5 cents each. It is roughly estimated that the bunds have caused about 28 per cent. of the rain water to soak into the soil, i. e., 18 per cent. more than in the unbanded field. The bunds act as brakes on the run-off water gaining speed as it flows down the slope; consequently less fine soil is lost besides making more water stand in the field to soak in.

Besides the forming of bunds it will be an advantage if the crops are sown along the contour. If there is rain when the crop is standing, the crop rows arrest to a certain extent the free flow of run off and resultant soil erosion.

Bunds may be formed by the use of an implement known as the bund-former having blades five feet long. Bunds can also be formed by gathering with a mould board plough.

In pages 124 and 125 of the Villagers' Calendar for 1938 a summary of the results of an experiment on bunding during the years 1934 to 1937 are given. The

further results of 1938 of the same experiment are incorporated in the figures given below:—

**Economics of Bunding Experiment.**

Year.	Crop.	Yield per acre. in lbs.		Percent increase over control.	Extra ex- penses due to bunding over control.	Extra in- come due to bunding over control.	Nett Profit due to bunding over control.	
		Bunded.	Control.					
1934-35	Cotton	217	143	51	Rs. a. p. 3-12-0	Rs. a. p. 6-3-0	Rs. a. p. 2-7-0	
1935-36	Sorghum	Grain	711	525	35	2-11-0	7-8-0	4-13-0
		Straw	149½	1148	30			
1936-37	Cotton	323	162	100	2-6-0	13-7-0	11-1-0	
1937-38	Sorghum	Grain	186	33	464	1-7-0	7-2-0	5-11-0
		Straw	960	536	79			
Total for 4 years.					10-4-0	34-4-0	24-0-0	
Average per year.					2-9-0	8-9-0	6-0-0	

It is shown above that the expenditure on the maintenance of the bunds is progressively less and less, while the usefulness of the bunds has been on the increase. Thus if a cultivator spends Rs. 3 more per acre on bunding he can reasonably expect a nett extra return of Rs. 6 not to speak of a greater chance of something to reap in a year of scarcity.

**MARKETING SURVEY OF WOOL AND HAIR IN MADRAS PRESIDENCY**

*(From the Director of Agriculture, Madras).*

Among the livestock products of Madras, wool and hair occupy only a minor place both qualitatively and quantitatively. Though sheep of most districts of Madras Presidency yield hair rather than wool, they go under the common name 'wool' as it is not possible to estimate them separately. When viewed under the microscope, the individual fibres of wool show finely serrated scales with pointed hooks, the scales being loosely arranged round the fibre causing wool to felt and full. The scales of the cortex of the hair, on the other hand, are less numerous than those of wool, less pointed and more smooth giving no chance to the hair to shrink or swell.

The production of wool and hair in this province is estimated at 5.14 million lbs. valued at Rs. 9.64 lakhs as compared to 23½ million lbs. for the whole of India. Among the wool producing countries, Australia ranks first with about 1,000 million lbs. or 25% of the total world production which comes to nearly 4,000 million lbs. Other important producers are South Africa, South America and New Zealand.

The output of Madras may be classified into two main types—(1) cut wool or the clip obtained from the living animals, and (2) the tannery wool, a by-product of the tanning industry - the respective production of each being 3.17 million and 1.97 million lbs.

Out of a total sheep population of 11.72 millions in the presidency, 3.66 million or 31% are esteemed to yield wool. The average production of wool is estimated at 14 oz. per head per annum. The largest producing district is Anantapur (6.44 lakhs lbs) closely followed by Coimbatore (5.48 lakhs lbs) and Salem (5.10 lakhs lbs.).

In respect of tannery wool, North Arcot ranks first with a production of 8.40 lakhs lbs. and Chingleput second with 6.20 lakhs.

The maximum production of cut wool is in the two main clipping seasons, January and July. Tannery wool is got in all months, being lowest in the rainy months, September to November.

Imports of wool into the province amount to 14.09 lakhs lbs. of which 10.38 lakhs or 74% arrive by rail from Hyderabad, Mysore and Bombay, and the rest by sea from foreign countries.

The export trade is of the order of 40.82 lakhs of which 29.34 lakhs go by rail to Bombay for re-export to Europe. Exports to foreign countries in recent years rose to high proportions as is evident from the figures given below.

Year.	Quantity exported to foreign countries in million lbs.	Value in lakhs of rupees.
1932-33	0.39	0.77
1933-34	1.07	1.92
1934-35	1.11	2.05
1935-36	1.19	2.16
1936-37	1.79	4.09
1937-38	1.76	4.99

The United Kingdom our largest purchaser in Europe, took 87% of the foreign exports in 1936-37. The United States of America, France, Belgium and Turkey in Asia are other buyers in the order of importance.

In world trade, the largest consuming markets for wool are Japan, United Kingdom, United States of America, Germany, Italy, France and Belgium.

**Demand.** Allowing for import and export trade, the net available supply for internal consumption comes to 24.68 lakhs lbs. of which the cottage industry of *cumbli* weaving absorbs 18 lakhs or nearly 75% leaving a balance of 6.68 lakhs for the manufacture of carpets and druggets. Previously the export demand of foreign market was for tannery wool, but in recent years, the increasing demand has been met by the supply of cut wool.

**Prices.** The prices of wool at Madras since 1935 are increasing, reaching the highest level during March to July 1937, since when a decline has been in evidence. The increase in prices are attributed to increased activity connected with war preparations in European countries. The prices of Madras wool realised at Liverpool auction on November 2nd, 1937 were: White—10 d.; Yellow—9 d.; Black—8½ d.; and grey—6 d. per pound.

For his wool, a producer in Madras gets nearly a third of the price paid in England.

**Stocks and storage.** Adoni (Bellary district) is one of the biggest centres for stocking tannery wool not only from tanneries of the district, but also from those at Raichur, Vaniambady, Vellore, Coimbatore and Salem. The arrivals of tannery wool at Adoni and Madras in 1936-37 were respectively 18,350 maunds and 27,296 maunds.

**Manufactured products.** *Cumblies* (country blankets) and carpets constitute the two main products manufactured in this province. *Cumbli* weaving as a cottage industry is carried on in many villages though the evidence collected indicates that the industry is on the decline as a result of increased export of wool from the country.

The carpet manufacture is confined to a few centres like Wallajapet, Ellore, Salem and Masulipatam. The annual outturn is estimated at 150,000 sq. yards of which over 90 per cent. are exported.

The export trade in manufactured goods (cumblies, carpets and druggets) has in recent years made rapid strides as detailed below :

Year.	Quantity exported in million lbs.	Value in lakhs of rupees.
1932—33	1.02	6.69
1933—34	1.25	7.52
1934—35	1.51	8.80
1935—36	1.63	9.76
1936—37	1.64	9.70
1937—38	1.89	11.88

The United States of America is the largest buyer followed by Ceylon and United Kingdom, their respective share of imports in 1936—37 being 67%, 10% and 9%. Other countries that take our goods in smaller quantities are Java, Straits Settlements, Australia, Netherlands and Federated Malay States. Ceylon's import demand is for cumblies for the use of plantation coolies.

**Improvements suggested.** There is scope for saving a substantial amount in the transport of tannery wool from the producing areas to the exporting centre (city of Madras) by establishing washeries at the former to remove the lime sticking on to the wool.

Proper feeding of sheep no less than their systematic breeding appears to be the main line of action to effect a general improvement in the wool production of the province. Sheep like most other livestock in this country have to subsist entirely on pasture and little effort on the part of the shepherds is ever made to provide animals with food in summer when pastures get dry.

Promiscuous breeding now obtaining in the country is also responsible for low wool yields. Diseases like sheep pox, liver rot etc., have also their toll. Selective breeding would go a long way in improving wool output as well as quality as at present, Madras exports mainly inferior wool. Proper shearing methods can be introduced to advantage in producing centres while the fixation of grade standards at the exporting centre will help to check adulteration of sheep wool and goat hair and also improve the quality generally.

## Crop and Trade Reports.

**Sugarcane—1938—Intermediate condition report.** The condition of the sugarcane crop is generally satisfactory and normal yield can be expected if the season continues to be favourable.

The wholesale price of jaggery per imperial maund of 82½ lbs. (equivalent to 3,200 tolas) as reported from important markets on 5th September 1938 was Rs. 7-12-0 in Mangalore, Rs. 6-14-0 in Chittoor, Rs. 6-7-0 in Vellore, Rs. 6-5-0 in Adoni, Rs. 5-9-0 in Trichinopoly, Rs. 5-8-0 in Vizagapatam, Rs. 5-7-0 in Rajahmundry, Rs. 5-4-0 in Cocanada and Erode, Rs. 5-0-0 in Vizianagaram, Rs. 4-15-0 in Salem, Rs. 4-2-0 in Cuddalore and Rs. 3-15-0 in Bellary. When compared with the prices published in the last report, i. e. those which prevailed on 8th August 1938, these prices reveal a rise of 12 per cent. in Cuddalore, 11 per cent. in Vizagapatam, 5 per cent. in Trichinopoly and Mangalore, 4 per cent. in Vizianagaram and 1 per cent. in Erode and a fall of 9 per cent. in Rajahmundry and 3 per cent. in Cocanada, the prices remaining stationary in Adoni, Bellary, Vellore, Salem and Chittoor.

**Pepper—1938—First Report.** The area under pepper up to 25th August 1938 in the districts of Malabar and South Kanara is estimated at 103,400 acres (94,600 acres in Malabar and 8,800 acres in South Kanara) as against 104,150 acres (95,500 acres in Malabar and 8,650 acres in South Kanara) estimated for the corresponding period of last year. The flowering of the crop is reported to be not very

satisfactory. It is also reported that many gardens are being neglected owing to the low price of pepper. The yield is therefore expected to be below normal.

2. The wholesale price of pepper per imperial maund of 82½ lb. as reported from important markets on 5th September 1938 was Rs. 12-8-0 in Calicut, Rs. 11-12-0 in Tellicherry and Rs. 12-5-0 in Mangalore. When compared with the prices in the beginning of January 1938, these prices reveal a fall of about one per cent. in Tellicherry, and of about four per cent. in Mangalore, the prices remaining stationary in Calicut.

**Ginger—1938—First Forecast Report.** The area under ginger up to the 25th August 1938 in the Malabar district is estimated at 11,300 acres as against 11,000 acres estimated for the corresponding period of the previous year. In parts of the taluks of Ernad, Walluvanad, Kurumbranad and Ponnani, the crop is reported to have been affected by "soft-rot" disease to some extent. The condition of the crop is satisfactory in the other taluks of the district.

**Cotton—1938-39—First Forecast Report.** The average of the areas under cotton in the Madras Province during the five years ending 1936-37 has represented 9.6 per cent. of the total area under cotton in India.

2. The area under cotton up to the 25th July 1938 is estimated at 284,300 acres. When compared with the area of 227,000 acres estimated for the corresponding period of last year, it reveals an increase of 25.2 per cent.

3. *Central districts and South--Mainly Cambodia tract*—The area in the Central districts and the South represents generally the last year's crop left on the ground for second pickings before the plants are removed in September in compliance with the provisions of the Pest Act. The area in these districts fell from 161,000 acres to 135,100 acres. The yield is expected to be generally below normal due to insufficient rains in the summer season.

4. *Northerns and Westerns tract*—The area under Northerns and Westerns rose from 46,600 acres to 127,100 acres owing to timely and sufficient rains in Kurnool and Bellary districts. The crop has been damaged to some extent by an attack of red hairy caterpillar in parts of the taluks of Alur and Siruguppa in the Bellary district.

5. *Cocanadas tract*—The area under Cocanadas cotton rose from 13,200 areas to 15,900 acres, i. e., by 20.5 per cent.

6. The wholesale price of cotton lint per imperial maund of 82½ lb. as reported from important markets on 1st August 1938 was about Rs. 14-13-0 for Cocanadas, Rs. 16-7-0 for red Northerns, Rs. 14-4-0 for white Northerns, Rs. 11-10-0 for Westerns (Mungari crop), Rs. 13-7-0 for Westerns (Jowari crop), Rs. 22-2-0 for Coimbatore Cambodia, Rs. 17-5-0 for Southern Cambodia, Rs. 20-1-0 for Coimbatore Karunganni, Rs. 16-15-0 for Tinnevelly Karunganni, Rs. 15-11-0 for Tinnevellies, and Rs. 15-4-0 for Nadam cotton

7. Figures by districts are given in the statement below :—

(Area in hundreds of acres, i. e., 00 being omitted).

District and tract.	Estimate of area sown up to the end of July.		Increase (+) or decrease (-) of the area in column (3) as compared with the area in column (2).
	1937.	1938.	
(1)	(2)	(3)	(4)
	Acs.	Acs.	Acs.
Madura ... ..	385	340	- 45
Ramnad ... ..	120	100	- 20
Tinnevelly ... ..	130	120	- 10
Chingleput ... ..	—	—	...
South Arcot ... ..	55	40	- 15

Chittoor	...	...	...	...	...
North Arcot	...	...	2	3	+ 1
Salem	...	...	350	290	- 60
Coimbatore	...	...	440	330	- 110
Trichinopoly	...	...	125	125	...
Tanjore	...	...	...	...	...
Malabar	...	...	1	1	...
South Kanara	...	...	2	2	...
Total, mainly Cambodia including Nadam and Bourbon			1,610	1,351	- 259
Kurnool	...	...	160	470	+ 310
Bellary	...	...	250	750	+ 500
Anantapur	...	...	55	45	- 10
Cuddapah	...	...	1	6	+ 5
Total, Northern and Westerns			466	1,271	+ 805
Vizagapatam (Golgonda taluk)	...	...	18	18	...
East Godavari	...	...	4	5	+ 1
West Godavari	...	...	6	5	- 1
Kistna	...	...	3	10	+ 7
Guntur	...	...	100	120	+ 20
Nellore	...	...	1	1	...
Total, Cocanadas...			132	159	+ 27
Vizagapatam (except Golgonda taluk)			62	62	...
Presidency			2,270	2,843	+ 573

**Cotton—1938-39—Intermediate forecast report.** *Last year's crop.* The yield of the second or summer pickings of the 1937-38 crop is estimated to be generally below normal.

2. *Current year's crop.* The main season for sowing is not yet over in most parts of the Province. The good rains of August have benefited the standing crop of Mungari or early sown cotton in the districts of Bellary and Anantapur.

3. The wholesale price of cotton lint per imperial maund of 82½ lb. as reported from important markets on 5th September 1938 was Rs. 13-11-0 for Cocanadas, Rs. 16-7-0 for red Northern, Rs. 14-4-0 for white Northern, Rs. 11-5-0 for Westerns (Mungari crop), Rs. 13-2-0 for Westerns (Jowari crop), Rs. 22-0-0 for Coimbatore Cambodia, Rs. 16-12-0 for Southern Cambodia, Rs. 20-0-0 for Coimbatore Karunganni, Rs. 16-3-0 for Tinnevelly Karunganni, Rs. 14-10-0 for Tinnevelly and Rs. 15-4-0 for Nadam cotton. When compared with the prices published in the last report, i. e., those which prevailed on 1st August 1938, the prices reveal a fall of eight per cent. in the case of Cocanadas, seven per cent. in the case of Tinnevelly, five per cent. in the case of Tinnevelly Karunganni, three per cent. in the case of Westerns (Mungari) and Southern Cambodia, two per cent. in the case of Westerns (Jowari) and one per cent. in the case of Coimbatore Cambodia, the prices of Northern (Red and white varieties) Coimbatore—Karunganni and Nadam remaining stationary.

(Director of Industries, Madras).

**Cotton Raw in the Madras Presidency.** The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1938 to 2nd September 1938 amounted to 412,993 bales of 400 lb. lint as against an estimate of 488,600 bales of the total crop of 1937-38. The receipts in the corresponding period of the previous year were 433,544 bales. 333,327 bales mainly of pressed cotton were received at spinning mills and 61,334 bales were exported by sea while 63,227 bales were imported by sea mainly from Karachi and Bombay.

(Director of Agriculture, Madras).

# College News and Notes.

**Students' Corner.** *Terminal Examinations.* The terminal examinations were conducted early this month and most of the students have left home for their Michaelmas holidays.

**Cricket.** Inter-Collegiate tournament. Our college played the local Government College on Saturday, the 27th August, on our grounds in the Inter-collegiate Cricket Tournament of the Coimbatore Zone and won the match by a comfortable margin of 98 runs. The scores were :-- Government College : 44; Srinivasan 18 (K. Dinker Rao 4 for 12, Monappa Hegde 3 for 16 and K. S. Ramaswami 2 for 4) Agricultural College : 142; K. K. R. Menon 34, M. R. Nagaraja Rao 30, K. S. Ramaswami 24, (K. A. Natarajan 5 for 51, Srinivasan 2 for 38 and Varadarajan 2 for 15).

In the Second match of the above tournament played on 4-9-38 against the Government Victoria College, Palghat, our College won by four wickets. Batting honours were shared by Madhavan for the Victoria College and Somanna for the Agricultural College, by scoring 41 and 53 runs respectively.

Palghat Victoria College; 109 :-- A. K. Madhavan 42, Govindakrishnan 18, (Dinker Rao 5 for 34, Srinivasan 3 for 12).

Agricultural College 136 for 6 wickets and declared: Srinivasan 22, K. M. Shetty 18, Rama Iyengar 22, (not out) K. M. Somanna 58 (A. K. Madhavan 1 for 39, Bhaskaran 1 for 18, Ramachandran 2 for 32).

**Hockey.** In the Inter-Collegiate hockey match conducted on 25-8-38 on our grounds, between the Government College, Coimbatore and our College, the former was defeated by 2 goals to nil, the outstanding players on our side being Kesava Reddy and Somanna.

There was a friendly Hockey match between our College and the Madras Engineering College Students (on tour) on 11-9-38 on our grounds, in which our College won by 5 goals to nil.

A friendly hockey match was played on 15-9-'38 between our College and the Police Recruits School, Coimbatore in which our College won by five goals to three

**Officers' Club.** At a general body meeting of the Officers' Club, it was decided to celebrate the Annual Club Day on the penultimate Saturday in October 1938.

**Visitors.** The members of the University Inspection Commission, consisting of Dewan Bahadur S. E. Runganathan, Vice-Chancellor of the Madras University and Mr. Maclean, Registrar, visited the Agricultural College on Monday the 5th instant. The Principal, Mr. R. C. Broadfoot, took the members round the various teaching sections of the College. They also saw the students at work.

Mr. P. V. Isaac, B. A., M. Sc., D. I. C., I. A. S., Second Entomologist, (Dipterist) Imperial Agricultural Research Institute was here during the last week of August to inspect the work carried out at the cane pests substation.

Mr. I. S. Akhilandam Pillai, of Ilangi, Hony. visitor to the Agricultural College, arrived here on the 13th instant. He visited the College and the Institute and left this on the 16th instant.

**Personal.** On the eve of his departure on transfer to Siruguppa, his friends and colleagues met Mr. M. R. Balakrishnan at a dinner party on Sunday the 4th instant. Mr. M. R. Balakrishnan was an active resident member of the Union and we hope he will continue to remain active as a mofussil member even in distant Siruguppa.

A farewell dinner party was arranged on the 1st instant at the Officers' Club, in honour of Mr. KunhIRaman Nair, by his friends and well wishers, on the eve of his departure prior to retirement.

# Weather Review—AUGUST 1938.

## RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since January 1st
Circars	Gopalpore	2.8	-5.0	20.0	South	Negapatam	6.0	+2.4	23.6
	Calingapatam	3.5	-4.4	17.3		Aduthurai *	2.5	-0.4	12.7
	Vizagapatam	4.6	-0.8	19.8		Madura	2.5	-1.8	16.8
	Anakapalli *	7.2	+1.8	23.1		Pamban	0.3	-0.4	12.3
	Samalkota *	0.0	0.0	0.0		Koilpatti *	3.1	+1.3	19.4
	Maruteru *	5.9	-1.5	28.3		Palamkottah	1.0	+0.4	14.7
	Cocanada	5.9	+0.4	24.5					
	Masulipatam	7.4	+0.5	22.3					
	Guntur *	14.2	+9.5	24.8					
Ceded Dists.	Kurnool	6.9	+1.9	16.3	West Coast	Trivandrum	9.2	+5.1	40.3
	Nandyal *	10.0	+5.3	21.6		Cochin	9.2	-3.7	18.4
	Hagari *	9.3	+6.9	15.0		Calicut	23.8	+8.2	114.7
	Siruguppa †	7.9	+4.6	17.1		Pattambi *	6.7	-8.2	74.3
	Bellary	11.2	+8.9	15.2		Taliparamba *	00.0	0.0	00.0
	Anantapur	19.3	+17.1	23.4		Kasargode *	13.4	-10.2	117.7
	Rentachintala	6.1	0.0	18.8		Nileshwar *	12.4	-12.4	125.6
	Cuddapah	10.3	+4.5	21.4		Mangalore	17.4	-5.1	126.0
	Anantharajupet *	6.6	+5.2	15.5					
	Carnatic	Nellore	6.0	+2.7		10.9	Mysore and Coorg	Chitaldrug	8.9
Madras		4.3	-0.3	10.2	Bangalore	12.2		+6.7	23.5
Palur *		8.0	+2.8	25.6	Mysore	5.7		+2.3	11.6
Tindivanam *		5.2	+0.1	18.6	Mercara	19.7		-5.8	111.4
Cuddalore		4.0	-1.0	14.0					
Central	Vellore	6.9	+0.3	19.4	Hills	Kodaikanal	9.0	+2.0	29.3
	Salem	9.2	+2.4	24.3		Coonoor	0.0	...	...
	Coimbatore	2.0	+0.9	7.1		Ootacamund *	7.5	+4.2	26.9
	Coimbatore					Nanjanad *	8.6	+1.7	24.3
	A. C. & R. I. *	2.2	+1.2	6.7					
Trichinopoly	6.0	+2.2	15.1						

\* Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated upto 1935 published in the Fort St. George Gazette.

**General.** Both the Bay of Bengal and the Arabian Sea branches of the monsoon were generally active throughout the month. The monsoon was vigorous in and around South East Madras, and active in Hyderabad and Orissa.

**Depressions.** Four depressions in the Bay of Bengal and one depression in the Arabian Sea were responsible for the wide spread rainfall.

**Rainfall.** The rainfall was in large excess throughout the presidency excepting in parts of Malabar, and South and South east Madras.

**Humidity.** Skies were moderately to heavily clouded, and the humidity was in excess in South East Madras, while it was in defect in South Hyderabad.

**Temperature.** The maximum temperature in shade was above normal in Bombay Deccan and North Hyderabad; it was below normal in South East Madras, East United Province and Madras, Deccan; and normal elsewhere.

*Chief amounts of rainfall.*

Salem	4.4" on 18th.
Calicut	5.5" on 22nd.
Bellary	3.5" on 22nd.
Hagari	2.4" on 22nd.

**Weather report for the Research Institute Observatory.**

Report No. 8/38.

Absolute maximum in shade	92.0°F.
Absolute minimum in shade	68.3°F.
Mean maximum in shade	88.2°F.
Departure from normal	+1.3°F.
Mean minimum in shade	71.1°F.
Departure from normal	Nil.
Total rainfall	2.2"
Departure from normal	+1.0
Heaviest fall in 24 hours	0.94" on 22nd.
Total number of rainy days	4
Mean daily wind velocity	3 M. P. H.
Mean humidity at 8 hours	74%
Departure from normal	+0.2%

**Summary.** The monsoon was active during the 1st, 3rd and 4th weeks of the month. The rainfall was not uniformly distributed throughout the month. The mean maximum temperature was slightly above normal while the mean minimum temperature and the mean humidity at 8 hours remained practically normal.

P. V. R. &amp; F. L. D.

## Departmental Notifications.

### Transfers.

Name of officers.	From.	To
Sri. K. Hanumanth Rao,	Asst. in Paddy Section, Coimbatore.	Asst. in Oil Seeds Section, Kasargode.
„ P. C. Sahadevan,	A. R. S., Aduturai.	Asst. in Paddy, Coimbatore.
„ S. D. S. Albuquerque,	F. M., Coconut Section, Nileswar.	Asst. at Coconut Station, Kasargode.
„ B. G. Narayana Menon,	F. M., A. R. S., Nanjanad.	F. M., Coconut Station.
„ P. M. Sayeed Sahib,	A. D., Saidapet.	A. R. S., Kasargode.
„ C. T. Ittyachan,	Asst. in Entomology, Coimbatore.	Chemical Asst. Coconut Section, Kasargode.
„ A. Ramadoss,	Agri. Section, II Circle.	F. M., A. R. S., Aduturai.
„ P. Gopalakrishnan,	Assistant in Paddy, Coimbatore.	F. M., A. R. S., Nanjanad.
„ K. V. Seshagiri Rao.	Asst. A. D. (on leave).	Assistant A. D., Handikottukur.
„ V. D. Dhanakoti Raju,	A. D. (on leave).	A. D., Sankaran Koil.
„ D. Hanumantha Rao.	A. D., Nellore.	A. D., Kovur.
„ S. V. Parthasarathy,	A. D., I Circle.	A. D., Nellore Divn.
„ M. Rami Reddi,	F. M., A. R. S., Siruguppa.	A. D., II Circle.
„ G. Narasimhamurthy,	A. D., Kurnool.	F. M., A. R. S., Siruguppa

Sri. G. C. Balanna,	Millets Assistant, A. R. S., Nandyal.	A. D. Cuddaph divn.
„ C. Krishnamurthy,	A. D., Tadpatri.	Asst. in Millets, A. R. S., Nandyal.
„ N. Sobonadri,		A. D., Nellore.
„ A. K. Ramasubba Ayyar,	A. D. in charge of Motor Van.	A. D., Gobichetti- palayam.
„ K. Ramaswami Ayyar,	A. D., Gobichettipalayam.	A. D., Pollachi.

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### Leave.

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Name of officers.	Period of leave.
Sri. R. Balasubramanya Ayyar, Asst. in Cotton, A. R. S. Guntur.	L. a. p. on m. c. for 2 months from 22-8-38.
„ E. K. Govindan Nambiar, F. M., A. R. S., Taliparamba.	L. a. p. on m. c. for 1 month from 8-9-38.
„ V. K. Appaji, F. M., A. R. S., Palur.	L. a. p. for 20 days from 15-8-38.
„ G. Rajagopal Mal, A. D. (on leave).	Extension of l. a. p. on m. c. for 4 months from 9-6-38.
„ L. Krishnan, A. D., Tanjore.	L. a. p. for 1 month from 5-10-38.
„ S. Bhimaraju, Assistant A. D., Sankarankoil.	L. a. p. for 2 months from the date of relief.
„ P. N. Krishnaswami Rao, Mungari Cotton Scheme, Adoni.	L. a. p. for 1 month and 5 days from 27-8-38.
„ S. Rajaratnam, F. M. A. R. S., Nanjanad.	L. a. p. for 1 month from 5-9-38.
„ K. V. Reddy Naidu, A. D., Guntur.	L. a. p. for 20 days from
„ P. V. Hariharan, Millets Assistant, A. R. S., Palur.	Extension of l. a. p. for 2 months from 11-8-38.
„ E. Achutha Nair, A. D., Kallakuruchi.	L. a. p. for 1 month from 15-9-38.
„ K. Saptha Rishi, Assistant Chemist, Pemppheres' Physiological Scheme.	L. a. p. for 20 days from 24-9-38.
„ A. Ramadoos, A. D. (on leave),	Extension of l. a. p. for 1 month from 24-9-38.
„ K. Govinda Kurup, A. D. (on leave),	Extension of l. a. p. for 31 days from 22-8-38.

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