The Madras Agricultural Journal

1959 - April

VOL. 46. NO. 4

Regd. No. M. 5155

THE
Madras Agricultural Journal

Vol. XLVI April 1959 No. 4

93

(Estd: 1911)

Published by

THE MADRAS AGRICULTURAL STUDENTS' UNION,

(M. A. S. U.)

AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE,

COIMBATORE, S. INDIA.

Annual Subscription:

Inland Rs. 6·00

Foreign Rs. 7·00

Single Copy

Re. 0·50

THE MADRAS AGRICULTURAL STUDENTS' UNION.

OFFICE-BEARERS FOR 1958—'59.

Dr. A. M. Kulandai, President (ex-officio)
Resident Vice-President (Vacant)
T. Nataraj, Editor
V. Subbiah, Secretary

Council (16 Members)
President
Resident Vice-President
Editor
Secretary

Mofussil Members
K. M. Sundaram
M. J. David
T. Srinivasan
K. H. Subramanyam
E. G. Sivaswamy

Resident Members
A. H. S. Sarma
T. Sivasubramaniam
A. Maharaja (Student)
K. S. Sundaresan (Club Secretary)

Managing Committee (10 Members)
Resident Vice-President
Editor
Secretary
G. Thulasidas (Manager)
M. Dinakaran (Treasurer)
F. L. Daniel
C. M. Bhakthavathsalu
A. Subramaniam
A. Abdul Ravoof (Student)
K. S. Sundaresan (Club Secretary)

Editorial Board (10 Members)
Editor
Secretary
Manager
Dr. S. K. David
C. Balasubramania Mudaliar
C. V. Govindaswamy
A. Maharaja (Editor, Tatler)
K. S. Sundaresan (Club Secretary)

SPECIAL REQUEST

Members are requested to kindly clear all their arrears of subscription and help the management.

Members are also requested to intimate any change in address to the Secretary as early as possible.

Non-receipt of a particular issue should be intimated before the end of the month.

Secretary, M. A. S. U.,
COIMBATORE-3.

CONTENTS

The Madras Agricultural Journal

Vol. XLVI April 1959 No. 4

Editorial

Nalagarh Committee Report: We publish elsewhere in this issue a summary of the recommendations of the Agricultural Administration Committee (Nalagarh Committee). The report of the committee, we believe, is under the active consideration of the Central and State Governments. The recommendations are comprehensive dealing with growth and service conditions in the Agricultural Departments of the States, training and assessment of personnel, coordination of work, evaluation of development work, programme planning, delegation of powers to avoid delay in administration, organisation of Agricultural Research and education and a host of similar important topics. We hope to comment in these columns on the several recommendations, on appropriate occasions.

The Committee started their recommendations with the personnel and their service conditions. The Agricultural Department is as yet to be recognised as a major and important one. The service conditions and pay scales do not attract the best talents in the country. The disparity in pay scales of Agricultural Officers and Officers of other departments of comparable responsibility and importance has lowered the status of Agricultural Service in the country. The Joint Indo-American team in their report (1953) on Agricultural Research, reiterates this view, at considerable length. We hope, the pay Commission recently set up in the Madras State will go into this question deeply and set right the anomalies. The Association of Upper Subordinates of the Madras Agricultural Department, time and again, has been representing about the low salaries paid to them compared with the subordinates of other departments of comparable training and subsequent gloomy prospects of promotion and prosperity. Though recently there was some response, still much remains yet to be done to improve their lot. To attract the best brains the pay scale of the Upper Subordinates may be raised to that of the Central Government Scales of pay viz. 160—10—330 and those of the Gazetted Officers suitably raised — the present scale of the latter with biennial increments being totally unsatisfactory, viewed from any angle.

Apart from the scale of pay, which, no doubt, is really important to improve the service, the prospects of the service personnel are also equally important. The Nalagarh Committee rightly points out the large number of temporary posts that exist in the State departments of Agriculture. The policy regarding stabilising the temporary posts has been varying and halting. It is very necessary that the posts over 5 years standing are made permanent. The chances of of promotion of subordinate officers to higher categories are low in the Research wing of the department and lower still in the extension wing. It is necessary to create higher posts not only to improve the prospects of those in service but also to improve the efficiency, which is possible only by close supervision and frequent guidance, by senior men.

The recommendations of the Committee for creation of an All-India Agricultural Service do not seem to have been received with favour by the State Government. While the creation of such a cadre will remarkably and advantageously enhance the prestige of the Agricultural department, it will also enable exchange of the personnel of the different states and the centre for mutual benefits. Though this is possible without the creation of this cadre, yet the acceptance of the recommendation will facilitate matters.

Yet another recommendation of the Committee, which deserves serious consideration, is the one related to promotion based on merit. We are quite in favour of this recommendation being given effect to but at the same time caution is necessary against undue emphasis on merit ignoring seniority. Merit, especially untested, cannot displace experience. In the post war period a large number of posts were created and several persons have been appointed or promoted quite early. These cases require to be examined, to see whether young blood has justified itself, before rushing with direct recruitment and spiral promotions in the hope of improving the efficiency of the service personnel. The view of the Association of the Upper Subordinates of the Madras Agricultural Department in their memorandum to the Madras Pay Commission that seniority of service should be the basis for promotion unless one is totally unfit or otherwise disqualified deserves serious consideration, as direct recruitment invariably weakens the morale of the existing members of the Service, without proportionate advantage in improved efficiency.

Antibiotics in Agriculture * (Part II)

by

Dr. G. RANGASWAMY, B. Sc., (Ag.), Ph. D. (Rutgers),
Head of the Department of Agriculture,
Annamalai University,
Annamalai Nagar

Antibiotics in Plant Disease Control: Attempts have been made by several workers to make use of the phenomenon of antibiosis in plant disease control. In 1912 Fawcett found that canker lesions were not produced when walnut branches were simultaneously inoculated with *Pseudomonas Juglandis* and *Dothiorella gregaria*. Hartley in 1921 found that the inoculation of steamed soil with some soil saprophytes resulted in a decrease of the parasitic activity of *Pythium debaryanum* on conifer seedlings. In 1924 Porter found that the incidence of diseases of wheat and flax caused by *Helminthosporium sativum*, and *Fusarium lini* was much reduced by the antagonistic activity of a bacterium. Machacek in 1928 reported that *Penicillium expansum* and a species of *Cladosporium* completely inhibited the growth of *Sclerotinia fructicola* and *Botrytis* sp., respectively. Sanford and Broadfoot, in 1931, reported that the 'take-all' disease of wheat could be controlled by the activities of some soil inhabiting fungi, bacteria and actinomycetes. In the same year Henry found that soil bacteria and fungi could control the foot-rot problem of wheat caused by *H. sativum* and *F. culmorum* in sterilized soil. Weindling, in 1932—'34, demonstrated that *Trichoderma lignorum* markedly reduced the parasitic activity of *Rhizoctonia solani* and *Phytophthora parasitica* on citrus seedlings. Subsequently Carter, Allen and Haenseler, Weindling and Fawcett, Garett, Millard and Taylor and other workers proved beyond doubt the beneficial effects of saprophytic bacteria and fungi on plant pathogens and the possibilities of using them for controlling diseases.

These investigations lead to the direct use of antagonists as well as their indirect use for controlling soil-borne plant diseases. Millard and Taylor, in 1927, could obtain substantial control of potato scab by the application of green manure to heavily infested soil. A series of pot experiments showed that a saprophytic actinomycete, *Actinomyces praecox*, was responsible for the control. Application of soya-bean to infested soil was found to increase the growth of *Trichoderma* which antagonised the scab organism and reduced the percentage of potato scab to a considerable extent. Weidling and his co-workers, during 1932—36, investigated the effect

of *Trichoderma* which antagonised the scab organism and reduced the percentage of potato scab to a considerable extent. Weidling and his co-workers, during 1932—36, investigated the effect of *Trichoderma viride* on *Rhizoctonia solani* and found that the former organism produced an antibiotic, later named gliotoxin, which was inhibitory to the growth of the pathogenic fungus. They demonstrated in a series of experiments that *T. viride* could be inoculated into the soil to control the group of plant diseases caused by *R. solani*. Subsequent work has shown that certain soil amendments favourably influenced the growth of the antagonist and thus indirectly helped in the disease control. Similarly several soil-borne diseases have been studied in this respect and some limited success reported by various groups of workers in England and U. S. A.

With the isolation and widespread use of antibiotic substances, their use in Agriculture has been taken up by several investigators. During the past 15 years keen interest has developed in this field. This is mainly because of the existing need in agriculture for more effective agents for controlling plant diseases. We do not have any effective remedy for most of the soil-borne fungal diseases except to grow resistant varieties. Because of the nature of their onset and spread, thh control of bacterial diseases offer a great challenge to plant pathologists. Still no remedy is in sight for checking the rapidly spreading virus diseases of plants.

Most chemicals for the control of plant diseases are applied to the aerial parts of the plant and are used primarily against fungal diseases. Their action is usually prophylactic as they form a protective coating over the plant surface and kill or prevent the growth of fungus on the plant. The chemicals in use at present for the above purpose possess low solubility in water and do not enter into the plant sap and are called non-systemic or residual toxicants. In contrast to this type of compounds, some other chemicals exert their action from within the plant, usually at some distance from the point of application. These substances have been called chemotherapeutants or systemic agents. In recent years antibiotics have been tested for use as residual toxicants and as systemic agents and some very encouraging results obtained.

Soil microorganisms are isolated and screened against plant pathogens in cross streak assays. If any promising cultures are isolated, they are studied for antibiotic production in the laboratory under submerged aerated conditions and finally tested in fermentation

tanks. The substance in the broth, if produced in sufficient quantities, is isolated into a crude product and tested for its action on the original test organism and also on other plant pathogenic fungi, bacteria and viruses. Then the antibiotic is tested for phytotoxicity on plants. Also, the effect of the substance on seed germination is tested. If found non-toxic it is subject to extensive test in the laboratory and green house. The systemic action of the antibiotic, the time taken for the antibiotic for being absorbed by the tissues, the translocation and stability of the antibiotics in the host tissues, the effect of the antibiotic on other physiological properties of the plant etc., are studied in detail. Then, if found encouraging, the substance is tested in the field for confirming the results obtained in the laboratory and green house.

The possible uses of antibiotics in plant disease control are by way of (1) seed treatment to eradicate the external and internal seed-borne fungi, bacteria and viruses, (2) foliage spray or dust material, to protect the external surfaces of plants from infection as in the case of copper fungicides, (3) soil applicants to eradicate the pathogens in the soil and (4) systemic agents against fungi, bacteria and viruses. Certain amount of succes has been attained in each of these control methods with antibiotic substances, which will be briefly described below:

1. *Seed Treatment:* The aims of treating the seeds with chemicals are three fold (i) to kill the pathogens on the surface of the seed (ii) to kill the pathogens inside the seed and (iii) to protect the seed and seedlings from attack by soil-borne plant pathogens. Several copper and mercurial fungicides are available in the market, which when used for the seed treatment, eradicate the external seed-borne fungi and bacteria and also, to some extent, protect the seed and seedlings from infection by soil-borne organisms when planted in the soil. But these chemicals are ineffective in killing the organisms present inside the seed. The work carried out so far, with antibiotics has shown that they are capable of penetrating deep into the tissues of the seed and selectively inhibit the growth of the pathogen. Cycloheximide has been found to give good control of deep seated fungus *Ascochyta pisi* in pea seeds. Barley seeds were freed from internal infections of covered smut by soaking the seeds with cycloheximide. Helixin B was reported to be effective against internal infections of *H. sativum* in wheat. Streptomycin has been used for seed treatment purposes, particularly for the control of bacterial diseases. Soaking of cucumber seeds infected with the angular leaf

spot bacterium *(Pseudomonas lachrymans)* in streptomycin solution was effective in controlling the disease. Similarly tomato bacterial canker caused by *Corynebacterium michiganensis* was also controlled. The antibiotic also is reported to control internal infections of bean blight *(Xanthomonas phascoli)* and blackarm disease of cotton caused by *Xanthomonas malvacearum*.

The main draw back in these antibiotics seems to be the toxic effect on the seeds. Most of the antibiotics when used at slightly higher concentrations inhibit the seed germination thus limiting their use for seed treatment.

2. *Foliage spray and dust :* The use of antibiotic for this purpose is relatively less important as a good number of cheap chemicals are already available. However, some antibiotics have been studied for use as protective agents and satisfactory results obtained. Actidione is one of them. This antifungal antibiotic has been found especially effective against powdery mildews and in this respect found superior to Bordeaux mixture and other common spray materials. The antibiotic is also extensively used to control turf diseases where the green colour is desired to be maintained. Bordeaux mixture and other spray materials leave stains on the foliage whereas cycloheximide does not alter the green colour. Similarly streptomycin has been found to protect tomato from bacterial speck. Thiolutin has been found effective against frog-eye disease of apple and late blight of potato.

3. *Soil application :* It is well known to agricultural scientists, for several reasons, that soil-borne plant diseases are the most difficult ones to combat. The organisms may live in the soil as a facultative saprophyte or as a facultative parasite. Any attempt to kill these organisms by the application of chemical agents to the soil may result in drastic changes in the microbial equilibrium thus causing more harm than benefit to the plant growth. There are not many selective agents known which can act only on the plant pathogens when applied to the soil. They are bound to kill other beneficial organisms also. The soil being a complex substratum composing various physical, chemical and biological systems, it is very difficult to successfully apply any chemical substances to the soil for selective activity. Antibiotic substances, being selective agents, have been tested for this purpose, but so far not much encouraging results were obtained. An antibiotic when applied to the soil is inactivated sooner on later for one or more of the following reasons : (i) the substance may be inactivated due to adsorption onto the soil

and clay particles ; (ii) it may be inactivated due to the unsuitable pH or other physical properties of the soil ; (iii) it may be acted upon by other soil micro-organisms which break them down into substances of no antibiotic value ; (iv) the chemicals present in the soil may react with the antibiotic and cause disintegration of the molecule. Of the several antibiotics studied so for, none have been found to be stable enough to act freely on the susceptible microbes present in the soil. Gottlieb and his associates in their studies on the factors involved in the inactivation of antibiotics in the soil, came to the conclusion that they are not produced under natural conditions in the soil. However, recently actidione and gliotoxin were shown to be produced in the soil under certain amended conditions. Wright in her investigations on the production of gliotoxin in the soil found out that *Trichoderma viride* produced, significant concentrations of gliotoxin on the seed coats of legumes buried in the soil. More detailed investigations are required to understand antibiotic production in the soil, especially in and around organic waste particles. Also, the part played by such substances, if at all they are produced, in controlling the plant pathogens and in altering the soil microbial population, is to be evaluated. With our present knowledge we can neither say that it is possible to utilize the phenomenon of antibiosis or antibiotic substances for controlling soil-borne plant pathogens, nor can we reject the idea as an impossible one. It can however be said that at least some of the common soil organisms, like *T. viride*, do play an important role by producing chemical substances on the seed coats, which might result in better germination of the seeds.

4. *Systemic agents :* With our increasing knowledge on the physiology of parasitism of insects, fungi, bacteria, viruses, etc. we are all the time exploring the possibilities of more effectively checking plant diseases and pests. In recent years our attention has been diverted to systemic agents for this purpose. Several chemicals have been tested so far for systemic activity in plants, and a number of them have been selected. Quite a few antibiotics have been found to be systemically translocated in plants. It is this property of the antibiotics that is most important for a plant pathologist who is looking for a chemical to combat fungal, bacterial or virus diseases which are soil-borne or systemic and difficult to combat. Good number of investigations have been carried out in U. S. A., U. S. S. R., U. K. and other places and very encouraging results obtained. Though we have not yet got the ideal antibiotic substance for controlling all the difficult diseases of plants, a few of the substances have been found quite effective in checking important diseases.

Before we go into the details of these substances it is necessary that we should know something about the ways and means of studying the systemic activity of the antibiotic substances, their rate of translocation, stability inside the tissues, phyto-toxicity, etc.

Systemic activity: Several techniques are available to study the systemic translocation of antibiotic substances in plant. The important ones are (i) guttation technique (ii) leaf-disc assay method and (iii) plant-sap assay method.

(i) *Guttation technique:* The plants are fed with aqueous solutions of antibiotics through the root system and, after periodical intervals, guttations are collected in the morning hours. The guttation from the control plants is taken as check and the prevalence of antibiotics in the water examined by the spore germination method. The guttations are placed in grooved slides and spores of the test organism allowed to germinate in them. The percentage and rate of germination are studied. In the studies with bulbiformin the characteristic bulb formation in the germ tubes due to the antibiotic was used to identify the presence of the substance in the guttations of treated plants. The limitations of this technique are that (a) not all plants produce guttation easily, (b) the guttations are to be collected only in the early hours of the day and (c) that in some cases the antibiotics inhibit the formation of guttation itself. Bulbiformin at high concentrations was found to prevent the exudation in tomato plants.

(ii) *Leaf-disc assay method:* In this method, firstly the plants are sprayed or dipped in the antibiotic solutions. After periodical intervals representative samples of the leaf, stem or other parts of the plants are selected and washed thoroughly in running water. Then they are assayed in agar plates impregnated with test organisms. The antibiotics, if present in the tissue, will diffuse into the agar medium and inhibit the growth of the test organism, around the leaf tissues. This is a very useful and easy technique, but the limitation for the technique is that in some cases even the normal plant tissues exert an inhibitory effect on the test organism. Even then, if the inhibition zone is relatively more around in the treated tissues as against the check, it can be taken as an indication of the presence of the antibiotic in the tissues. As an alternative different test organisms can be studied and one which is not sensitive to the normal plant tissue is selected for the study.

(iii) *Leaf-sap assay:* The plants are treated as detailed above, washed thoroughly and the sap extracted, with or without addition of small quantities of water. The sap is then assayed for

the antibiotic by dipping in a paper disc and plating on agar plates impregnated with test organisms, or by pouring into stainless steel cups placed on such agar media. The antibiotic, if present in the sap, would diffuse into the agar medium and cause inhibition of growth leaving a clear ring around the paper disc or the steel cup, as the case may be. The main limitation of this test is that we need a fairly good amount of plant material to obtain the required quantity of sap, thus making it difficult to study the leaf-wise translocation of the antibiotic in a plant.

Phytotoxicity: The antibiotic may by highly useful against fungi, bacteria, viruses etc., and may be systemically translocated in the plants, but it will be of no value to the plant pathologist, if it is toxic to the plants at minimum inhibitory concentrations for the pathogens. It is therefore important that the antibiotics are thoroughly investigated for phytotoxicity before taken up for use in plant disease control. They can be tested by spraying various concentrations or by dipping the in-tact-leaf tissues into aqueous solutions and observing the changes in the plant. The usual toxic symptoms observed are that chlorotic spots develop on the leaf-blade and on other plant parts and also in some cases the tissues are malformed. In some cases it has been reported that this toxicity could be overcome, to some extent, by spraying graded doses of the substance at regular intervals, thus training the plant to withstand the toxicity. This has been observed in the case of streptomycin sulphate on acid lime plants. If the plants are sprayed successively with 250 ppm. 500 ppm. and 1000 ppm. of the antibiotic at an interval of 8 to 10 days, there is relatively low toxic symptom than when sprayed directly with 1000 ppm. of the antibiotic. Also, if the plants are sprayed repeatedly with 1000 ppm. of the antibiotic, the intensity of the chlorotic symptoms fades away slowly and after the fourth or fifth spraying there is practically no toxic symptom on the leaves, the original chlorotic spots disappearing after two to three weeks.

Field Test: When once the antibiotic is found satisfactory in the laboratory and green house studies, it is put for more intensive investigations in the field. It may be that the substance is not stable to heat and light and thus disintegrates when sprayed on the plants in the field. Penicillin is known to be thermolabile and so is not very useful for spraying in the field. Filipin, which was reported to be highly effective under laboratory and green house conditions, was found ineffective in the field, which was mainly because of its instability in the sun light. It is also to be understood that the conditions

of test in one country are not always the same as existing in another and in larger countries, from one region to another, so all attempts should be made to study them in detail and if necessary isolate new antibiotics for use under given set of conditions.

Present Position of Antibiotics in Plant Disease Control: Of the good number of antibiotics tested so far streptomycin and other agricultural preparations containing the antibiotic, viz. Phytomycin, Agrimycin, Agristrep etc. are the most outstanding ones which have come into wide use in U. S. A. for controlling bacterial diseases of plants. They are used for eradicating seed-borne bacterial infections of fruit trees and vegetable crops. Fire blight of pear and apple is one of the serious bacterial diseases caused by *Erwinia amylovora*. It is mainly transmitted from one tree to another by honey bees which visit the fiowers. By placing a small trap containing streptomycin dust at the mouth of the bee-hives, and making the bees pass through the trap, the spread of the disease in the orchards is effectively checked. Of the other antibiotics which have come into use are actidione, an antifungal antibiotic against several fungal diseases, gliotoxin, an antibacterial-cum-antifungal substance against some diseases of fruit trees, and some unnamed substances reported to be used by the Russian Workers for controlling root-rot fungi. The latter antibiotic, when sprayed on the foliage, is said to be translocated mainly to the root region and thus prevent infections by the soil-borne root-rot fungi. Several other substances like mycothricin, helixin, streptothricin, candicidin, thiolution, etc. have been reported to be useful for the plaut disease control. But more detailed investigations are required before they are put into wide use, the main limiting factor being large scale production of the antibiotics at cheap costs for use in agriculture.

Another important aspect of the use of antibiotics in plant disease control is the inhibitory effect of a few of these substances on plant viruses. Streptothricin, terramycin and bulbiformin have been found to be quite effective in checking plant virus infections. When the virus sap was mixed with the antibiotics and inoculated on the respective host, it failed to infect the plants thereby indicating the inactivating power of the chemicals. The conditions leading to the inactivation of the viruses by the antibiotics are to be studied in detail before they are applied for controlling the diseases. Considering that no chemicals are available for effectively checking virus diseases of plants, antibiotics, especially because of their systemic translocation in the plants, appear to be most promising agents for the purpose.

Antibiotics as Plant Growth Promoters: Besides their usefulness for plant disease control, some of them are known to promote growth in plants. Penicillin is known to cause such an effect in tobacco and other plants. Gibberellic acid, which was originally isolated as an antibiotic substance from *Gibberella fujikuroi*, has been found to possess so much of growth promoting effect on many plant species, and such a great interest has been developed in its use as plant growth regulator, that now, it is known more as a plant hormone than as an antibiotic.

Some workers have also studied the production of toxic substances by plant pathogenic organisms *in vivo*. which substances, incidentally happen to possess some antibiotic properties. Because of their nature and physiology of production, these substances are to be designated as plant toxins rather than antibiotic substances. In a recent report Tveit stated that when he inoculated several pathogenic and non-pathogenic species of *Chaetomium* on oat seedlings, he found that some of the non-pathogenic ones produced the antibiotic chetomin *in vivo*. This antibiotic is mainly an antifungal agent which prevented infections of the seedlings by *Helminthosporium victoriae*, *H. avenae*, etc. If such phenomenon are made use of, it would be quite possible to control many of the troublesome plant diseases.

Use in Allied Fields: (1) *Food Preservatives:* It has been reported that some of the antibiotic substances could be used in food preservation and also in the canning industry with great advantage. Streptomycin at 0·1 percent strength could preserve spinach and cole slaw in the frigidaire for a longer duration. Addition of 0·1 per cent aureomycin to the ice blocks helps increasing the keeping quality of fish; the antibiotic present in the ice has been found to arrest the growth of bacteria which usually attack the fish. Injection of aureomycin into beef-animal few days before they are taken to the slaughter house is found to increase the keeping quality of beef.

In the canning industry spore forming bacteria play a devastating role. The food stuff is to be heated to 80°C or above to kill the bacteria contaminating it, but this heat treatment affects the quality and flavour of the food stuff. Addition of subtilin is known to substitute the heat treatment and thus helps in preserving the quality and flavour of the product.

(2) *Fermentation Industry:* Antibiotics have been successfully used in fermentation industries to overcome microbial contaminants. Polymyxin has been found to exert selective action

on gram-positive and gram-negative contaminants of beer industry. In whisky industry the malt is commonly found to be contaminated by bacteria causing sliminess of the mash. This is overcome by adding penicillin or a mixture of penicillin and polymyxin to the medium. Similarly fungal contaminants can be put down by the use of antifungal antibiotics.

(3) *Animal Growth Promoters :* In an attempt to sterilize the intestinal tract of chicks with streptomycin, Moore and his associates discovered in 1946 that the antibiotic actually increased the growth of the birds. Subsequent work by other investigators brought out that penicillin, aureomycin, terramycin, etc. could also induce better growth, upto 15 per cent in the birds. This growth promoting effect was more in the young birds than in the older ones. Crude wastes in penicillin factories which contain small quantities of pencillin is being extensively used for feeding the chickens. It has also been found that some antibiotics could induce better growth, upto 20 per cent, in turkey, swine, young calves, etc., when added on to the feed. This means the birds and animals go to the market sooner than usual and thus help saving labour and cost of production.

Several explanations have been given for this inducement of growth. It is believed that the antibiotics, besides removing the microbial competition with the animal body for food material, also promotes synthesis of essential substances like B-complex vitamin in the tract.

(4) *In Beneficial Insects :* The growth promoting effect is not confined to the birds and animals. It has also been shown in some insects. Honey bees fed with fumigatin are reported to produce 15 to 25 per cent more honey. Likewise aureomycin-fed silk worms produce 10 to 14 per cent more silk than the normal ones.

Besides the above uses for antibiotics, several important utilities have been invented recently. They are successfully used in paints, floor wax, paper mills etc., to cut down the development of moulds and bacteria. In the biological studies in the laboratory it is used to selectively inhibit the growth of unwanted organisms. For isolating bacteria from the soil or water antifungal antibiotics are mixed with the media and for isolating the fungi antibacterial antibiotics are used. It is also used to check the growth of yeasts in sugar media fed to lac insects. Thus it could be seen that the field of antibiotic, though only less than two decades old, has spread its roots into various branches of science, and is at present engaging the attentions of several scientists throughout the world.

A Note on the Germination of Neem Seeds

(Azadirachta indica A. Juss.)

by

S. G. AIYADURAI, B. Sc., Ag ,
Oilseeds Specialist.

The neem tree *(Azadirachta indica)* is economically an important one in that it gives valuable timber and yields good quality seeds containing 35% to 40% oil. Its bark, gum, leaves, oil etc., are put to a variety of uses in medicine. In recent years much emphasis has been laid on the importance of large-scale planting of oil bearing trees such as Iluppai *(Bassia* sp*)*, Neem *(Azadirachta* sp*)*, Pungam *(Pongamia glabra)* and Pinnai *(Calophylum inophylum)*. Of these neem is a very common and quick-growing tree and its planting on a large scale is generally done during *Vanamahotsava* commencing from July–August. The propagation of this tree is only through the seed and as such the seeds are to be preserved carefully and utilised for raising seedlings for planting. Neem trees begin to flower during February–March and fruits ripen and begin to drop down from June. Some birds like Crows, Mynahs and Cuckoos eat the whole fruits and the seeds come out along with their excreta. The seeds that are found shed underneath the trees are collected by poor people in the villages and sold to the oil-crusher.

Neem seeds extracted from freshly picked fruits, dried in sun for 3 to 5 days and stored under ordinary room conditions were found to loss viability within a few weeks. Similar observation was also noted in the case of seeds collected near about the trees. Seedlings raised from fresh seeds available during the months of June and July do not stand transplantation in January as they are overgrown. If the planting of neem seedlings are to be done during July–August when the monsoon rains set in. seedlings of optimum age should become available to the planter. But seedlings of three months age can be supplied only if the seeds are sown in the nursery some time during April—May. This means the seeds require to be stored from the period of harvest in August to April.

The work on neem seeds reported herein was bsgun in 1956 to study the loss of viability under different conditions of humidity, and repeated during 1957.

Materials and Methods: The neem trees commonly grown can be classified into two groups; (a) trees yielding round seeds and (b) trees yielding elongated or oblong seeds. Both round and elongated seeds were used for the study and they were collected during June–July from known trees (more than 10 years old). Depulped white (Prasan, 1941) seeds were taken up for storage under different humidity and temperature levels. The depulped white seeds were dried in the sun for three to five days and stored under four conditions in the first year viz., control (room temperature, 28°C), 0°C, and 25% and 50% humidity levels. Concentrated sulphuric acid was used and its normality was modified as described by Puri (1949) to give the requisite humidity levels. In the second year there were three treatments viz.. control, 40% and 80% humidity levels. Samples were taken monthly and viability assessed by germinating the seeds in sand, in the green house.

Observations and Results: The elongated type of seeds were found to lose their viability less rapidly than the round shaped ones. Storing at 0°C appeared to destroy the viability of the seeds completely. The fall in viability was reduced at 25% and 50% humidity levels. Similar trends were observed in the experiments carried out during the second year as well (Tables I and II).

Discussion: The loss of viability in general is rapid. Storing at 0°C was found to kill the embryo in the seeds completely. Similar observations were made in groundnut (Gopalakrishnan, 1955–56). The round seeds stored in the month of July under most of the conditions of storage lost viability more rapidly than the elongated ones. There is a steep fall up to August–September and a steady level is maintained for a couple of montns thereafter. After November the curve dips down to zero (Graph) under different humidity levels of storage. It is well known that under humidity conditions the longevity of seeds may be prolonged. Similar observations have been reported by Johnson (1946) in *Populus* and *Ulmus*.

Summary and Conclusions: Studies conducted to test the loss of viability of neem seeds under different humidity and temperature levels revealed that humidity treatments tended to delay the rapid loss of viability. Storing at 0°C has been observed to kill the embryo in the seeds.

Acknowledgement: The author acknowledges with thanks the assistance rendered by Sri S.S. Nagarajan of the Groundnut Physiology Scheme, Oilseeds Section in the tabulation of data, preparing graphs etc.

LITERATURE CITED

1. Prasad, J., (1941) Indian Forester **67** : 58.
2. Jhonson, L. P. V., (1946) Canad. J. Res. **24** : 298.
3. Puri, A. N., (1949) Soils their physics and Chemistry Reinhold Publishing Corp. New York (1949) P: 378 Table X.
4. Gopalakrishnan, S., (1955-56) Second Annual Progress report on the Scheme for research on the Physiology of Groundnut in the Madras State.

TABLE I

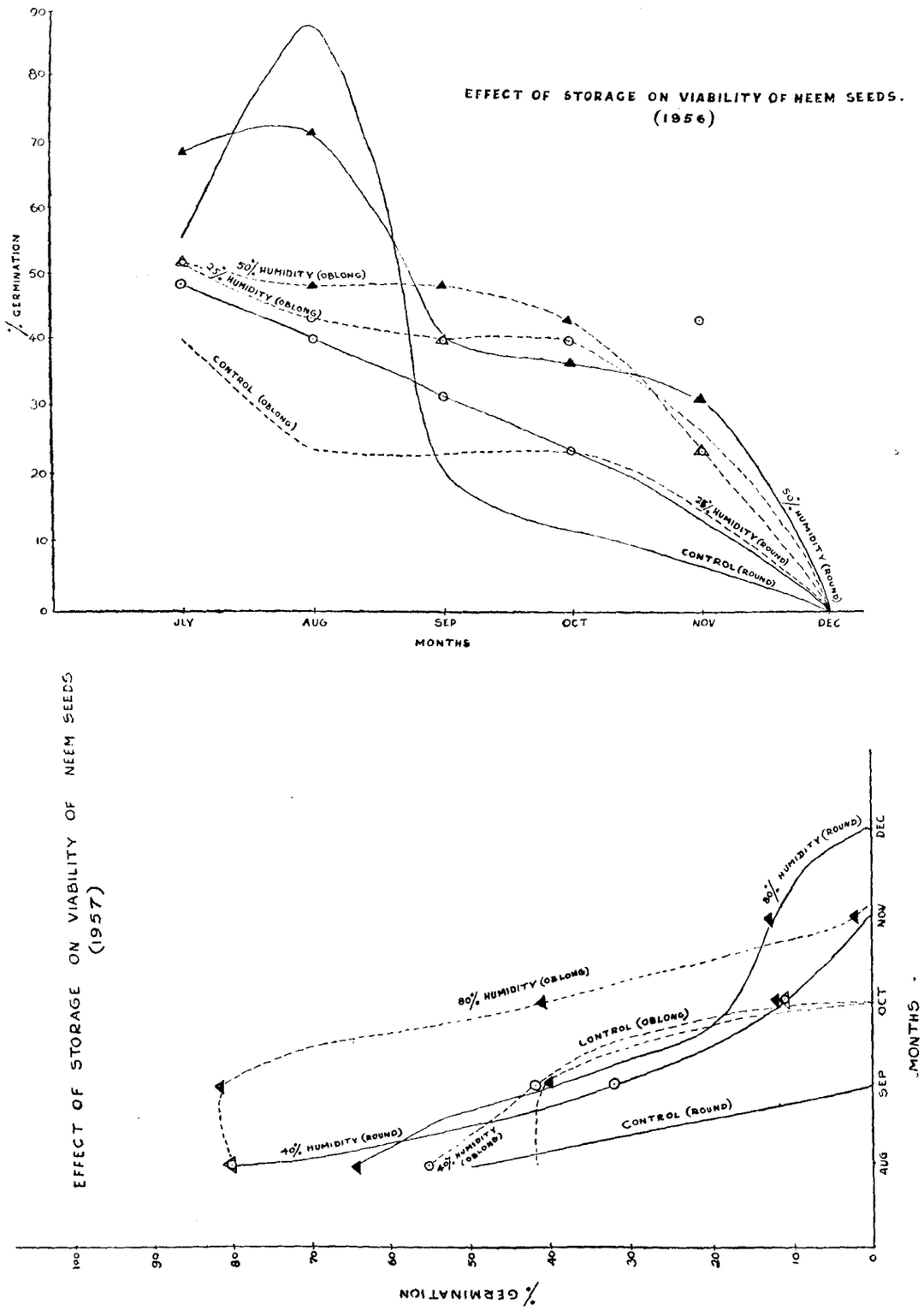
Effect of Humidity on the viability of neem seeds (I year). *Date on Mean percentage of germiuation* (Mean of 5 replications). (1956)

Treatments	Type of seed	July	Aug.	Sep.	Oct.	Nov.
Control	Round	56	88	20	12	16
28°C	Elongated	40	24	24	24	12
0°C	Round	Nil	Nil	Nil	Nil	Nil
	Elongated	Nil	Nil	Nil	Nil	Nil
25% Humidity	Round	48	40	32	24	24
	Elongated	52	44	40	40	44
50% Humidity	Round	68	72	40	36	32
	Elongated	52	48	48	44	24

TABLE II

Date on Mean percentage of germination (Mean of 5 replications). (1957)

Treatments	Type of seed	Aug.	Sep.	Oct.	Nov.
Control	Round	50·0	..	...	...
	Elongated	42·0	41·0	...	...
40% Humidity	Round	80·0	32·0	11·0	...
	Elongated	56·0	42·0	...	...
80% Humidity	Round	65·0	40·0	12·0	13·0
	Elongated	80·0	82·0	41·0	2·0



Rainfall Pattern at Tindivanam (South Arcot District)

by

C. BALASUBRAMANIAN,
Agricultural Meteorologist, Coimbatore.

Introduction: There is an Agricultural Research Station at Tindivanam. The main aim of this station is to improve the yields, by selection and breeding, of three main oilseeds crops, namely Groundnut, Gingelly and Castor. Prior to the opening of this station in May, 1935 similar research work on these three important oilseeds was done at Palakuppam. As major portion of crop cultivation in this station is under rain-fed condition, the study of rainfall pattern was taken up to know all about its variation.

Materials and Methods: The daily rainfall data collected for a period of thirty-three years - 1925 to 1957, both inclusive - were compiled from the Station records.

Methods: The monthly distribution of rainfall in quantity and number of rainy days was computed and its range of variation, extent of contribution to the annual pattern of rainfall and its standard deviation and coefficient of variation were worked out. Likewise for the four main seasons of the year, namely, Dry Weather Period of January and February, Hot Weather Period of March to May, South-west Monsoon Period of June to September and North-east Monsoon Period of October to December, the pattern of rainfall, both in quantity as well as distribution, range of variation, extent of contribution to the annual pattern of rainfall and its standard deviation and cofficient of variation were worked out for each period.

The dates of onset and cessation of the South-west Monsoon, which is the main monsoon and the North-east Monsoon, known otherwise as the retreating monsoon, were culled separately. The duration of activity of each monsoon in days was also worked out. The probable periods of the onest of these two monsoons were also assessed.

The intermonthly and interseasonal correlations were worked out seperately for the total rainfall and number of rainy days. The relationship between the duration of activity of each monsoon and the pattern of rainfall in that particular monsoon was also estimated.

Discussion : (i) The details of the monthly and seasonal pattern of rainfall, the nature of their range of variation and extent of contribution to the annual pattern of rainfall and their respective standard deviations and coefficients of variation are furnished in Table I. The following tentative inferences are drawn from this table.

(a) In regard to monthly rainfall the coefficient of variation is lowest for the months of August, September and October. This means that some rains are sure to be had in these three months. This inference is also supported by the nature of the range of variation of rainfall in these three months. A similar inference is drawn in regard to the number of rainy days. As in the case of rainfall, in the case of rainy days also, the coefficient of variation is lowest for these three months of August, September and October.

(b) Coming to the seasonal rains the coefficient of variation is lowest for the two monsoon periods. This indicates that rains are likely to be in good amount in these two monsoon periods. The nature of the range of variation of rainfall in these two monsoon periods is in unison with this inference. In a similar manner the coefficient of variation is lowest in the case of rainy days also in the two monsoon periods.

(c) From the point of view of the extent of contribution to the annual rainfall by the different monthly rainfalls, the months of October and November seem to be the rainiest months in the year. These two months constitute the major portion of the North-east Monsoon period, in which 50·2% of the annual rainfall is received. Out of this 50·2%, 40·3% of rains are received in these two months of October and November. This connotes that the North-east monsoon is more important than the main South-west Monsoon from the point of view of total rainfall, inspite of its being only the retreating monsoon.

(d) In regard to the number of rainy days the difference is not much between these two monsoons. This clearly shows that the intensity of rainfall in the North-east Monsoon period of October to December is more than that of the South-west Monsoon period of June to September.

(ii) The probable weekly periods of onset of each of the South-west, and North-east, monsoon and the number of years in which the onset has actually occurred in everyone of these weekly periods are given in Table II. The probable period of the onset of

the South-west Monsoon appears to be from 20th May to 30th June, as in 25 out of 32 years this monsoon has actually set in this period. In one year, i. e., in 1926 the onset of the South-west Monsoon was not clear. If some more data are collected, it may be possible to narrow down the duration of the probable period of the onset of the South-west monsoon.

In regard to the onset period of the North-east monsoon, it is fairly well defined. Invariably in the first week of October this monsoon is likely to set in. In 26 out of 33 years the North-east monsoon has actually set in the first week of October.

Another inference from the data compiled in this connection is that the break period between these two monsoons has a wide range of variation from Zero to 34 days. But in 22 out of 33 years this break period is only within nine days. Hence, the tentative inference is that the retreating monsoon is likely to follow in fairly close succession the main monsoon.

As regards the duration of activity of these two monsoons, the duration of the South-west Monsoon varies with a range of 67 to 140 days, as in some years this monsoon sets very early in the month of May itself. The range of variation of active period of the North-east monsoon is from 44 to 91 days.

(iii) The particulars of inter-monthly correlations are presented in Table III. Only three out of the sixtysix correlations worked out in this connection are statistically significant from the point of view of the value of the correlation coefficient (r) being greater than twice the valve of the Standard Error (S. E.).

They are given hereunder :—

(a) February and June
(b) February and October
(c) March and October

The tentative inference is that if the rains are above normal in the month of February, it is fairly an indication of the timely and vigorous onset of both the monsoons. The heavy rains in the month of March may also indicate the vigorous onset of the North-east monsoon in the month of October.

(iv) the details of inter-seasonal correlations of the pattern of rainfall and the nature of their significance are incorporated in TableIV. The following tentative inferences are drawn from this table:

(a) The rains in the Hot Weather Period of March to May is significantly correlated in a positive manner with the annual rainfall. This is explainable, since in some years the South-west monsoon sets in vigorously very early even in the second week of May itself. In the year 1943, for instance, 32·15" of rain were recorded in the month of May due to the very vigorous and early onset of the South-west monsoon in that year.

(b) The number of rainy days in the South-west monsoon period of June to September is significantly and positively correlated with the annual number of rainy days. It should be so since this particular monsoon period covers four months i. e., one third of the year.

(c) As regards the pattern of rainfall in the North-east Monsoon period of October to December, it is very highly correlated in a positive manner with the annual pattern of rainfall. This highly significant correlation may be due to the contribution of rainfall and number of rainy days in this period to the annual rainfall and number of rainy days to the extent of 50·2 and 44·5 per cent respectively.

(v) Pertaining to the duration of activity of each of these two monsoons and its influence on its pattern of rainfall, the inference is that the duration of activity of the South-west monsoon influences the number of rainy days in this monsoon period ($r = + 0·35 \pm 0·17$). With reference to the North-east Monsoon period duration of its active period influences considerably the pattern of rainfall in this period (Rainfall $r = + 0·52 \pm 0·15$; Number of rainy days $r = + 0·56 \pm 0·15$). The broad inference is that greater is the active period of each monsoon, more will be its scope for its normal and satisfactory performance.

Conclusion: The tract, where the Agricultural Research Station, Tindivanam is located, depends for its rain both on South-west Monsoon and North-east Monsoon. The North-east Monsoon is usually heavy and cyclonic in nature and it is in this period that the numerous irrigation tanks, characteristic of the tract, get filled up with water, which is subsequently used for irrigation purposes.

Acknowledgment: The author's thanks are due to Sri M. Stephen Dorairaj and Kumari T. P. Anna for their help in the compilation and computation of the data. His thanks are also due to all those, who have been responsible for the collection of the rainfall data, made use of in this paper.

TABLE I

Monthly and Seasonal Rainfall Pattern

S. No.	Month or Season	Rainfall: Average in inches	Rainfall: Range of variation	Rainfall: Percentage on annual	Rainfall: Standard Deviation	Rainfall: Coefficient of variation %	Number of Rainy Days: Average	Number of Rainy Days: Range of variation	Number of Rainy Days: Percentage on annual	Number of Rainy Days: Standard Deviation	Number of Rainy Days: Coefficient of variation %	Remarks
1.	January ..	1·13	Nil to 6·30	2·8	1·43	126·63	2	Nil to 9	3·7	2·06	103·00	* A day with ten cents and above of rain is taken as a rainy day.
2.	February ..	0·52	Nil to 7·27	1·3	1·40	269·30	1	Nil to 5	1·8	1·55	155·00	
3.	March ..	0·93	Nil to 6·94	2·3	1·65	177·40	1	Nil to 6	1·8	1·39	139·00	
4.	April ..	1·05	Nil to 4·45	2·6	1·20	114·30	1	Nil to 4	1·8	1·32	132·00	
5.	May ..	2·34	Nil to 32·15	5·8	5·60	239·30	2	Nil to 8	3·7	2.06	103·00	
6.	June ..	1 98	0·05 to 5·34	4·9	1·63	82·31	3	Nil to 8	5·6	2·16	72·00	
7.	July ..	2·75	0·30 to 14·07	6 8	2·65	96·36	5	1 to 11	9·3	2·65	53·00	
8.	August ..	4·94	0·49 to 13·72	12·1	2·83	57·29	8	2 to 17	14·8	3·35	41·88	
9.	September ..	4·56	0·13 to 11 48	11·2	2·54	55·69	7	Nil to 12	13·0	2·67	38·14	
10.	October ..	7·79	0·61 to 22·23	19·2	4·51	57·90	10	2 to 18	18·5	4·16	41·60	
11.	November ..	8·59	Nil to 26·04	21·1	5·95	147·20	9	Nil to 20	16·7	4·66	51·78	
12.	December ..	4·04	Nil to 19 77	9 9	4·71	116·60	5	Nil to 14	9·3	3·43	68 60	
13.	Dry Weather Period (January and February) ..	1·65	Nil to 10·32	4·1	4·48	271·50	3	Nil to 9	5·5	2·45	81·67	
14.	Hot Weather Period (March to May) ..	4·32	Nil to 34·18	10·7	5·95	137·73	4	Nil to 12	7·3	2·54	50·80	
15.	South-west Monsoon Period (June to September) ..	14·23	6·13 to 45 50	35·0	6 98	44·15	23	15 to 34	42 7	5·40	23·48	
16.	North-east Monsoon Period (October to December) ..	20·42	4·30 to 41·51	50·2	9·48	46·63	24	9 to 38	44·5	7·23	31·43	

TABLE II

Probable Onset Periods of the South-west and North-east Monsoons 1925 to 1957

S. No.	South West Monsoon: Period	South West Monsoon: No. of onsets	North East Monsoon: Period	North East Monsoon: No. of onsets	Remarks
1.	13th to 19th May	3	1st to 7th October	26	In 1926, the onset of the South-west monsoon was very weak
2.	20th to 26th May	7	8th to 14th October	4	
3.	27th May to 2nd June	3	15th to 21st October	Nil	
4.	3rd to 9th June	3	22nd to 28th October	1	
5.	10th to 16th June	6	29th October to 4th November	2	
6.	17th to 23rd June	1	..	..	
7.	24th to 30th June	5	..	..	
8.	1st July to 7th July	1	..	..	
9.	8th to 14th July	1	..	..	
10.	15th to 21st July	2	..	..	

TABLE

Intermonthly

S. No.	Month	January		February		March		April		May		June	
		r ± S.E	S	r ± S.E	S	r ± S.E	S	r ± S.E	S	r ± S.E	S	r ± S.E	S
1.	Jan. ..			+0·12 ±0·18	Not	−0·09 ±0·18	Not	−0·26 ±0·17	Not	+0·15 ±0·18	Not	−0·10 ±0·18	Not
2.	Feb. ..					+0·28 ±0·17	Not	−0·19 ±0·18	Not	+0·14 ±0 18	Not	+0·37 ±0·17	Yes
3.	Mar. ..							−0·02 ±0·18	Not	−0 05 ±0·18	Not	−0·07 ±0·18	Not
4.	Apr. ..									+0·13 ±0·18	Not	−0·06 ±0·18	Not
5.	May ..											−0·05 ±0·18	Not
6.	June ..												
7.	July ..												
8.	Aug. ..												
9.	Sept. ..												
10.	Oct. ..												
11.	Nov. ..												

No. III

Correlations (1925—1957)

July		August		September		October		November		December	
r ± S.E	S	r ± S.E	S	r ± S.E	S	r ± S.E	S	r ± S.E	S	r ± S.E	S
+0·12 ±0·18	Not	−0·25 ±0·17	Not	+0·14 ±0·18	Not	+0·31 ±0·17	Not	−0·20 ±0·18	Not	−0·12 ±0·18	Not
−0·17 ±0·18	Not	−0·07 ±0·18	Not	−0·18 ±0·18	Not	+0·41 ±0·16	Yes	+0·02 ±0·18	Not	−0·13 ±0·18	Not
+0·16 ±0·18	Not	+0·08 ±0·18	Not	−0·11 ±0·18	Not	+0·34*1 ±0·17	Yes	−0·03 ±0 18	Not	+0·13 ±0·18	Not
−0·14 ±0·18	Not	+0·09 ±0·18	Not	−0·03 ±0·18	Not	−0·09 ±0·18	Not	+0·05 ±0·18	Not	−0·17 ±0·18	Not
−0·11 ±0 18	Not	+0 09 ±0·18	Not	−0·11 ±0·18	Not	+0·07 ±0·18	Not	−0·13 ±0·18	Not	+0·03 ±0·18	Not
−0·12 ±0·18	Not	+0·11 ±0·18	Not	+0·03 ±0·18	Not	+0·09 ±0·18	Not	+0·10 ±0·18	Not	−0·22 ±0·18	Not
+0·05 ±0·18	Not	−0·25 ±0·17	Not	+0·06 ±0·18	Not	−0·26 ±0·17	Not	−0 04 ±0·18	Not		
		+0·01 ±0·18	Not	+0·22 ±0·18	Not	+0·04 ±0·18	Not	+0·05 ±0·18	Not		
				−0·24 ±0·17	Not	−0·09 ±0·18	Not	−0·09 ±0·18	Not		
						+0·12 ±0·18	Not	+0·09 ±0·18	Not		
								+0·00*2 ±0·18	Not		

Note: (1) 0*1 r = +0·3409 ± 0·1688; *2 = r = + 0 0044 ± 0·1796

Note: (2) r = correlation coefficient S. E. = Standard Error S = Significance based on r being greater than 2 S. E. in value.

TABLE IV

Inter Seasonal Correlations (1925 — 1957)

S. No.	Nature of Period.	Hot Weather Period		South-west Monsoon Period		North-east Monsoon Period		Annual		Remarks
		Rainfall	No. of rainy days	Rainfall	No. of rainy days	Rainfall	No. of rainy days	Rainfall	No. of rainy days	
		r ± S. E.	r ± S. E.	r ± S. E.	r ± S. E.	r ± S. E.	r ± S. E.	r ± S. E.	r ± S. E.	
1.	Dry Weather Period	+0·1983 ±0·1760	+0·0594 ±0·1793	+0·0462 ±0·1794	—0·2542 ±0·1737	+0·0732 ±0·1791	—0·1053 ±0·1795	+0·2985 ±0·1714	—0·0499 ±0·1794	
2.	Hot Weather Period			—0·0771 ±0·1791	—0·2023 +0·1759	+0·0152 ±0·1796	No correlation	+0·5093** ±0·1546	+0·1718 ±0·1769	Remarks typed below
3.	South-west Monsoon Period					—0·1271 ±0·1781	+0·0321 ±0·1795	+0·2338 ±0·1746	+0·4693** +0·1586	
4.	North-East Monsoon Period							+0·7584*** ±0·1171	+0·7901*** ±0·1101	

1. A day with ten cents and above of rain is taken as a rainy day
2. r ± S. E. (r = correlation coefficient ; S E. = Standard error)
3. Value of r for the leavels of P=0·01 (**) and P=0·001 (***) are respectively 0·4426 and 0·5471

Research Note

A Note on the occurrence of *Colobodes dolichotis*, Marshall, on Redgram at Coimbatore.

About two dozen insects have been noted to damage Redgram (*Cajanus cajan*) at Coimbatore. The authors, while examining this crop at the farm belonging to Sri G. D. Naidu noticed a large number of plants showing huge galls at the base of stems, which on cutting open showed the presence of all stages of the weevil *Colobodes dolichotis* Marshall. This weevil has been noted so far only on *Dolichos lablab* and it is a new record on this important pulse crop. The damage done was found to be very severe as the attacked plants were stunted in growth possessing less foliage and some plants even succumbed to the attack. The adult is a stout, robust, dark brown beetle with a characteristic, small, V-shaped, whitish mark on the elytra and the larvae are stout, fleshy, white legless grubs, which riddle the tissue of the main stem at the basal portion and make irregular galleries leaving plenty of frass behind as they advance in boring, with the result that a gall-like swelling is formed at the seat of injury. Pupation takes place in the stem and the adult emerges out by making a hole on the sides. Injections of chlorosol, choloroform, pyrocone and folidol solutions were tried for its control and both chlorosol and chloroform effected complete mortality of all the stages inside the stem. But this method was possible only in the case of plants showing emergence-holes of first-generation adults through which the liquid was injected to kill the stages still remaining inside.

The authors are thankful to Sri G. D. Naidu for affording necessary facilities for studying the pest in his farm.

Entomology Division,
Agrl. Coll. & Res. Inst.
Lawley Road, Coimbatore.

T. R. SUBRAMANIAM,
S. VENUGOPAL.

SUMMARY OF RECOMMENDATIONS OF THE NALAGARH COMMITTEE

Growth of Agricultural Departments and the prevailing service conditions :

The growing tendency of depending upon stimulus from the Centre for taking action on subjects which are the responsibility of the States, needs to be discouraged. States should examine periodically, the structure, objectives and policies of the State Department of Agriculture with a view to providing balanced growth and enunciating programmes and policies. This review should be untertaken once in five years by a special Committee of agricultural scientists, administrators and progressive farmers.

2. A similar Committee is recommended at the Centre for examining programmes and policies of the Central Commodity Committees and other Central Institutions dealing with agriculture.

3. The Royal Commission on Agriculture made important recommendations in 1928 with regard to improving service conditions, but unfortunately most of their recommendations have not been implemented. Present day problems of low morale and inefficiency are attributable to non-implementation of these vital recommendations made thirty years ago

4. A very large number of temporary posts — 30% to 80% still exist in State Departments of Agriculture. All temporary posts continuing for more than three years and having reasonable chances of continuing should be added to the State cadre and made permanent. Pensionary and other rights such as annual increments etc., of agricultural workers who have served for many years should be protected.

5. Willingness to recognise the Agriculture Department as a major and important department is still lacking and there is a strong need for planning and distribution of national intellect.

6. Low scales of pay do not attract talent To attract the best talent available in the country to the field of agriculture, they should be paid at par with the administrative services in this country

7. The scales of pay of gazetted, as well as, subordinate agricultural services should not be lower than those for other services, requiring comparable training and subsequent prospects of promotion and prosperity in the service.

8. The District Agricultural Officers and the Regional Deputy Directors who play the role of an adviser, should be up-graded in status. Avenues for promotion should be increased by introducing more senior and selection grade posts.

9. If technical qualities and competence are to be promoted, there should be adequate recognition of merit at all stages and advancement should not depend merely on seniority.

10. Creation of supernumerary posts in superior cadres is necessary for retaining technical personnel of requisite aptitude and competence in their fields of specialisation, without allowing their prospects of promotion to suffer.

11. For raising the morale and prestige of agricultural services and for attracting equally suitable human material and for bringing about uniformity of standard, an All-India Agricultural Service should be created. The scales of pay and prospects should be at par with the I. A. S.

12. Till such time that an All India Service can be created, an 'Agricultural' or 'Technical' Cadre or Pool may be created in the I. A. S., cadre to which 33% of the technical officers of State Class II services and above, should be recruited by the Union Public Service Commission, strictly on the basis of merit and competence.

13. State Departments of Agriculture should frame or revise rules for recruitment, confirmation and promotion. An experienced Administrative Officer from the Appointments Department should be deputed with the Secretary, Agriculture for drafting or revising the rules of Agricultural Services.

14. Only those persons who have an aptitude for agriculture should be recruited in agricultural departments. Suitable tests for aptitude should be devised, especially for research.

15. Qualifications for various posts in the agricultural departments have been suggested.

16. In Extension and Farm Management Branches, 40% of the posts should be filled up by direct recruitment; similarly, 50% of the posts of the Deputy Directors should be filled up by direct recruitment so as to attract bright young men in the services, before they have lost their initiative and drive by serving long periods in subordinate positions. The introduction of fresh blood will tend to tone up the services.

17. Suggestions have been made for grouping of posts, promotion quotas and qualifications required for various branches of the Agriculture Departments.

18. The posts of Principal of Agricultural College and Joint Directors of Agriculture, Research, Education and Extension etc., should be treated as selection grade posts and should not be filled merely on the basis of seniority. In filling these posts, as well as those of Deputy Director and Heads of Sections the need for recruiting officers with merit, initiative and drive is paramount.

Training and Assessment:

1. The fast disappearing concept of taking training of subordinates as an important duty needs to be restored.

2. Fresh agricultural graduates recruited by the Agricultural Departments should be given orientation as well as 'on the job' training Old staff, whether engaged in research, teaching or extension or when transferred from one agro-climatic zone to another should also receive this training.

3. It is important that training courses are conducted by senior, experienced and competent officers.

4. Job training should impart a practical working knowledge of different types of jobs to be entrusted to the trainees. It is necessary that a systematic and regular programme of training is drawn up and the officers expected to fill higher posts given such training.

5. In order to keep agricultural officers abreast of latest developments and researches, arrangements should be made permanently for imparting refresher courses in a systematic and automatic manner. These refresher courses should be followed by examinations and those who fail to pass in these examinations should stand to lose; those who pass should stand to gain in matter of promotion.

6. Short-term intensive courses should also be organised during summer vacations at post-graduate colleges for the benefit of the research, teaching and extension staff. Due weightage should be given to the examinations passed at the time of promotion.

7. Special training facilities need to be organised for imparting training in Farm Management and Farm Planning on a few selected Farms, as it is only through well managed farms, running at a profit, that modern practices can be demonstrated to the cultivator in a convincing manner.

8. The need for foreign training should be assessed on a long term basis and panels of selected candidates should be kept by the State Departments of Agriculture. Ad-hoc selections should be avoided. After receiving training officers should be posted back to the subject of their specialisation.

9. In all cadres of the agricultural departments where there are more than 8 to 10 posts in a subject, a training and deputation reserve should be created. This should be in addition to the normal leave reserve. The need for training is felt more keenly in the case of the extension or the field personnel.

10. Periodical examinations should be prescribed for officers. Those who fail to pass should not be confirmed, promoted or permitted to cross the efficiency bar.

11. The existing system of evaluating officers leaves much to be desired. For proper assessment of subordinates competent Boards should be set up; gazetted officers should be assessed by Boards of Agricultural Scientists and technical men of repute from different parts of India. These reports will enable the Director of Agriculture to assess the work of his departmental officers.

Coordination:

1. Co-ordination of work is a knotty problem and what is urgently required is coordination of mind and action. There is tendency for co-ordinating bodies to function in a routine manner. These bodies do not meet often enough and follow up action is lacking. For coordination to operate successfully, adequate authority and power should be vested in the coordinating bodies at all levels. For this purpose it is suggested that the Development Commissioner should have a status higher than the Secretary to Departments.

2. Field Officers are burdened with too many reports, and returns Multiplicity of returns does not ensure coordination; what is more important is that coordinating bodies should meet frequently on predetermined dates.

3. Research programmes should be examined by working parties, consisting of specialists in concerned subjects and then by a Research Committe consisting of Heads of Research Sections, Professors, Principals and Deputy Directors of Agriculture. For suggesting research problems there should be Regional Advisory Committees, as in some States, consisting of District Agricultural Officers, leading farmers and selected Extension Officers and Farm Managers.

4. There should be a similar Committee at the State level for formulating and coordinating Extension programmes and also Regional Advisory Committees to discuss the district programmes.

5. Similarly, educational programmes should be prepared by the Educational Programme Committee at the State level with representatives from Research, Education, Extension and the Community Development Deparments. Training programmes for Farm Leaders, V.L.W's and farmers drawn up at the divisional level should be considered by this Committee.

6. There is a gross lack of coordination between Irrigation and Agriculture Departments, both in planning and execution. This has resulted in the Irrigation resources of the country not being fully utilised. It is suggested that Irrigation Department should have special Agricultural Officers to serve as a liaison between the Agriculturists and the State Departments of Agriculture, ensuring maximum utilisation of water.

Evaluation and Assessment of Development Work :

1. For evaluating and assessing progress of works and schemes, a small unit has been suggested at the headquarters of the Director of Agriculture. This unit should conduct every year detailed studies of a few schemes. These studies will help in revising procedure and avoid pitfalls.

2. The progress made in extending the recommendations of the Research Sections to field practices, should be evaluated by Heads of Research Sections.

3. The feeling that officers have discharged their duties once they have completed the specified work or distributed aids such as seeds, fertilizers, implements etc., should be discouraged. An intensive drive to promote follow-up work should be built up through intensified supervision.

4. Inspections and supervision seem to have been relegated to the back-ground and deal more with procedures, accounts and irregularities, rather than with technological standards adopted in Demonstrations, Extension etc. Inspections should be purposeful and pre-planned to provide technical guidance and solutions on the spot. It should also be checked up whether earlier advice and instructions given have been acted upon on correct lines.

5. A regular system of oral reports from subordinates is recommended, by which senior officers should remain in continuous touch with the progress of work. Such opportunities should also be utilised by subordinate officers to discuss with their seniors local problems and thus help to keep the work under continuous review.

Programme Planning :

1. It has been noticed that gradually and imperceptibly, the propaganda or the extension branch of State Departments of Agriculture was converted into a machinery for executing land development works and for distributing supplies; the principal task of educating the farmers for adopting new methods of cultivation receded into the background.

2. The important role which the Agriculture Departments should play in framing policies which contribute to production has been indicated. The knowledge gained through experiments has not been translated into practical field application. It is essential that a "technological balance" is maintained in planning programmes for different areas.

3. Adoption of self-help programmes, which benefit the small non-creditworthy farmer is recommended. This constitutes supply of small quantities of nucleus seed to villages and organising the farmers for multiplying the seed and exchanging it locally. This process has the advantage of decentralising the work completely.

4. For building up soil fertility, a programme of green manuring in irrigated areas and the production of compost in non-irrigated areas should be adopted. Planning of fuel trees and shrubs, for eliminating the conversion of cow dung into fuel for cooking purposes, has been neglected. These three basic items are capable of universal adoption, leaving the department of agriculture free for carrying out their educational programmes.

5. Cultivators should be persuaded and helped to own their equipment, individually or co-operatively, for spraying and dusting their crops against insect pests and diseases.

6. The Agricultural Department should evolve plans for increasing agricultural production in every village, rather than for executing the targets for distribution of seeds, fertilizers etc. If integrated plans for increasing the production in a village are prepared and executed, the targets prescribed for the Second Five Year Plan will be taken care of automatically.

7. The present system of fixing targets state-wise and then breaking them district, tehsil and village-wise is defective, as resources are locked up in the slow moving areas. The locking up of resources in the slow moving areas should be avoided and initially only 50% to 60% of the resources should be earmarked for an area for utilisation in 4-6 months; additional amounts being given according to actual performance.

Budgetting, Sanctions, Procedures and Delegation of Powers :

1. Means must be devised urgently to avoid concentration of expenditure during the last quarter of the financial year.

2. The various stages of action from the formulation of schemes to their implementation should be completed more expeditiously and unnecessary references to the Central and State Finance Departments should be eliminated. Personal discussions among officers should be encouraged.

3. Plan schemes should be taken up immediately on the advent of the financial year and no administrative or financial delays should be allowed to stand in the way of execution.

4. The technical and financial scrutiny of schemes should be completed before the financial provision is made in the budget. The schemes should be prepared initially in greater detail and financial authorities should issue standing instructions indicating the minimum data to be furnished in respect of each scheme.

5. A lump sum provision may be made in respect of schemes for which complete and detailed examination cannot be made due to lack of technical data, expenditure sanctions being issued after detailed scrutiny. In respect of schemes spread over a number of years, the issue of administrative and expenditure sanctions during the second and the succeeding years should be regarded as a formality only.

6. Once schemes have been included in the budget after proper scrutiny, a second reference to the Finance Department for expenditure sanction before their implementation should not be necessary.

7. In the case of Union Territories, after the budgets are voted, sanction for the implementation of schemes has to be given by the Administrative Ministries and Finance. This second reference to the Government of India should be dispensed with.

8. Organisational improvements such as the posting of an Internal Financial Adviser with powers to take decisions in the State Departments of Agriculture should be undertaken. The officers of the Finance Department responsible for scrutiny and sanction of the schemes should preferably, have actual experience of formulation and implementation of plan schemes.

9. In case a scheme has been sanctioned as a whole, there should be no need to obtain separate sanction of the various component parts of the scheme such as staff, equipment etc.

10. There should be the greatest delegation of powers at all levels from the Director of Agriculture downwards. The powers that could be exercised only by the senior officers should be specified clearly and in respect of matters not so specified, the officer implementing a scheme should be free to operate on his own. The financial powers of officers at all levels should be examined urgently and wherever necessary, revised, keeping in view the general rise in cost of services and commodities and the changing needs of the expanded development programme. Suggestions have been made by the Committee for financial and administrative powers which may be delegated to officers at various levels in the State Agriculture Departments. Steps should be taken to codify all financial and administrative powers delegated.

11. Officers taking initiative and responsibility should feel that Government trusts them in the exercise of their powers and the delegation of powers should be both in letter and in spirit. Executive instructions which circumscribe normal financial and administrative powers of officers should be issued only after due consideration and for very weighty reasons. A review of all such instructions should be made every six months preferably by a Committee appointed by the State Goverments, with a view to removing them or making them part of the permanent rules where considered absolutely necessary. Temporary restrictions should not be allowed to remain in force for more than six months.

12. Each officer should be given as an ad-hoc measure, powers to execute specified schemes for which budget provision has been made even though the expenditure on a particular item may exceed his normal financial powers.

13. Indenting departments should be authorised to purchase direct, instead of through the State's Purchasing Organisations, technical stores and stores of petty value, after observing codal formalities.

14. Discretionary powers should be given to officers-in.charge of State Transport vehicles engaged on essential food production work to get emergency repair done outside the Departmental workshops, where the interest of the public service justifies it.

Supply Procedure :

1. It is generally felt in the States that not only sufficient fertilisers are not being allotted by the Government of India, but the fertilisers allocated from Sindri and other factories are not received by them regularly and in time for application to the crops.

2. To overcome difficulties and delays in procurement and supply of chemical fertilisers, it is suggested that proper advance planning should be taken up by the Ministry of Food and Agriculture in consultation with the State Governments.

3. Centrally administered godowns, conveniently situated in several parts of the country should be started to receive and store fertilisers for supply to the consuming centres.

4. The payment of interest charges to Government of India on short term loans advanced to the States for fertilisers may be deferred till such time as the fertiliser is actually required for use on the land.

5. Adequate storage facilities for stocking fertilisers are also not available in the States and the number of distributing centres is not sufficient to meet the requirements.

6. Agricultural Departments should confine their attention only to propagation of improved pedigree seeds.

7. The quota of iron and steel for agricultural purposes should be increased substantially according to demand made by the States and placed at the disposal of the State Agricultural Departments, who should organise the manufacture of improved agricultural implements for supply ultimately to the cultivators through the Co-operative organisations.

8. The entire organisation for the supply of fertilisers, improved seeds, insecticides, agricultural implements etc., should be separated from the extension and technical functions of the Agricultural Departments and transferred to the Co-operative organisations. These agencies may be helped financially in the initial stages, if necessary.

9. The present system of providing credit does not fulfil the needs of the non-creditworthy cultivators. Government policies should be moulded to the needs of the small cultivators and credit facilities extended to them despite the greater risk involved.

Model Agricultural Organisation to suit present needs:

1. In order to fulfil the expectations of the people in the field of agriculture, State Departments should be organised to handle the growing demands of the farmers in an efficient manner. Among other things, the Department should provide facilities for educating and training the farmers, demonstrate better methods of cultivation and disseminate knowledge through audio-visual channels, organise farmers for adopting improved techniques of production and for working together, pick up problems of the farmers and pass them for solution to the research sections and transmit their solutions back to the farmers.

2. Agricultural Extension agency should concentrate entirely on educating and organising the farmers to produce more. The Departments of Agriculture should deal with technical knowledge rather than trade in supplies.

3. It is suggested that in States, the feasibility of the portfolio of Agriculture and Irrigation being held by one Minister should be considered. This will ensure rapid progress. There may be two Secretaries under the Minister for Agriculture; one for Agriculture dealing with Agriculture, Land Reclamation, Soil Conservation (in agricultural lands), Animal Husbandry and Veterinary Science and the other for Irrigation, Forests (including soil conservation in forest areas), Co-operation and Agricultural Marketing.

4. Frequent changes in Ministers and Secretaries should be avoided, as these dislocate the execution of work.

5. It is suggested that Minor Irrigation Works, costing not more than Rs. 10,000 should be handled by the Community Development agency; works costing above Rs. 10,000 but not more than Rs. 80,000 may be handled by the Agricultural Department and those costing even more may be handled by the Irrigation Department.

6. It is recommended that a Works Division be set up within the Directorate of Agriculture under a Joint Director of Land Development with full powers of a Superintending Engineer. This will ensure speedy implementation of minor irrigation and building programmes within the Agriculture sector. A Research Division for agricultural implements and machinery should also be added to this circle.

7. Soil Conservation of agricultural lands should be function of the Agriculture Department and in forest areas of the Forest Department and no independent Soil Conservation Department should be allowed to spring up.

8. A separate Land Development Wing is also required in Department of Agriculture to look after land reclamation, minor irrigation, flood control, soil conservation and drainage. As already mentioned, this Wing should be under the charge of the Joint Director for Land Development, and should also deal with agricultural machinery and implements.

9. The Director of Agriculture should be further assisted by Joint Directors in charge of Extension, and Research and Education. A Deputy Director may be necessary to help the Joint Director of Research and Education depending upon the volume of work.

10. There should be Deputy Director (Farm Management) under the Joint Director for Extension who should be fully responsible for running all the Agricultural farms, including a large number of Seed Farms established recently.

11. The Joint Director of Extension should be assisted by, at least, four Extesion Subject Matter Specialists in Agronomy, Plant Protection, Soils and Soil Fertility, and Horticulture and any other subject depending upon local conditions.

12. At the Headquarters of the Director of Agriculture and subordinate to him, there should be an Administrative Officer and a Budget and Accounts Officer to relieve the executive officers from routine administrative and accounts matters. Smaller States may combine the two posts and have one administrative and accounts officer.

13. There should be a Progress and Evaluation Officer, assisted by a small unit of staff for the continuous evaluation of programmes and collection of development statistics. This unit is intended to function as the eyes and ears of the State Department of Agriculture with respect to all schemes.

14. The Extension Specialists at the head-quarters of the Director of Agriculture should be assisted by similar Specialists at the District level and ultimately at the Block level also. These Extension Specialists should belong to the research sections.

15. The work load in districts where there would be more than 12-15 blocks justifies the appointment of Sub-Divisional Agricultural Officers. An experienced Deputy Director can guide work in 100-125 blocks, while a District Agricultural Officer of 3-4 Sub-Divisional Officers looking after 10—12 blocks each. In this case the District Agricultural Officer should be Class I cadre and the Deputy Directors should be included in selection grade corresponding to Superintending Engineers.

16. Until the Supply functions are transferred from the Department of Agriculture to other appropriate agencies such as Co-operative, District Agricultural Officers and the Deputy Directors should be provided with gazetted personal Assistants to relieve them of routine accounts, bills and supply work.

17. The Farm Advisory Service to be fully effective should be supported by an Agricultural Information Service consisting of trained staff specialising in mass communication methods. It is important that Agricultural information work should be distinguished from publicity and propaganda work which is the normal function of the Information and Publicity Department of a State.

Organisation for Agricultural Research and Education :

1. The total research programme under way at present is not considered adequate to meet the needs and the demand for improved agricultural materials and practices in the country.

2. There is a clear necessity for establishing major Research Stations for serving the needs of each agro-climatic region. These research stations should have a suitable complement of plant breeders, soil scientists, entomologists, mycologists, agronomists and horticulturists. Ultimately Agricultural Colleges and Training Centres should be built up around these major research stations. Subject-matter Specialists working at district stations should frequently visit the regional stations. The expenditure incurred should bear some relation to the area and importance of the crop in the region.

3. At least one of the Regional Stations should be developed into a first rate post-graduate training institution, with tripartite organisation for Research, education and extension. There should be one Principal or Dean for education and research and two Deputies, one for education and one for research where the regional research station and the Agricultural College are both located at one place.

4. Agricultural Colleges and Research Institutes should organise two separate sections for research and teaching in the fields of Agricultural Extension and Agricultural Economics.

5. Each district should have one Vocational School of Agriculture, imparting practical training in agriculture, extending over a period of two years for those who have passed the Secondary examination.

6. Short duration courses and Hostel facilities should be provided for the farmers who come for training in the district schools. These schools should be under the charge of Regional Deputy Directors of Extension but under the over-all control of the Dean or Principal of the Agriculture College of the region.

7. Close co-ordination between research, education and extension branches should be maintained through a system of annual conferences held at the major research stations which should be attended by all officers working in the region. Similar meetings should be held at District level once in three or four months.

8. To relieve the research staff from administrative and account work, there should be properly trained administrative and accounts staff who should take full responsibility in these matters.

9. The talents of retired Specialists who have settled down in different parts of the country should be utilised by associating them with research institutions or with local supervision of schemes.

College and Estate News

Rockefeller Foundation Lectures : The Rockefeller Foundation Lectures were inaugurated by Dr. E. C. Stakman, Professor, University of Minnesota. Extracts from his inaugural address are published elsewhere in this issue. Dr. Stakman also delivered a series of lectures to the M. Sc., (Ag.) students of the Plant Pathology Faculty. Dr. P. O. Ritcher, Visiting Professor, also participated.

Fertiliser Workshop : The "Fertiliser Workshop" was inaugurated by Sri M. Bhakthavatsalam, Minister for Agriculture on the 19th April. Sri V. C. Subbiah Gounder presided. Several departmental officials, leading agriculturists, and representatives of firms dealing in fertilisers, took part in the Seminar which continued till 22nd April. On the last day an exhibition of Posters was declared open by Mr. R. H. Engle, of the T. C. M.

University Examinations : The First and Second B. Sc. (Ag.) Examinations of the University of Madras were conducted during the month.

Indian Standards Institution

Standards for Agricultural and Food Products : Presiding over the fourth meeting of the Agricultural & Food Products Division Council of the Indian Standards Institution held on 26th March, Dr. M. S. Randhawa, Vice-President, Indian Council of Agricultural Research and Additional Secretary to the Government of India, Ministry of Food & Agriculture, said that standardization was absolutely necessary for the proper development of any industry, and it was also essential for the building up of the export trade on a sound footing. He stressed that national standards for as many agricultural products as possible should be laid down to make available in the market the right type of products. Such standards, he felt, would help, to a great extent, in checking the adulteration of foods which is so prevalent at present.

During the course of its deliberations, the Council set up three new Sectional Committees for formulating Indian Standards for farm implements and machinery, food colours, and spices and condiments. The Spices and Condiments Sectional Committee would also work as the national committee to correlate the work regarding the formulation of standards at the international level. It may be recollected that India was assigned the secretariat of the Spices and Condiments Subcommittee, set up by the Technical Committee for Agricultural Products of the International Organization for Standardization (ISO). India has a large sizable export trade in spices and condiments.

At the instance of the Chairman, the Council recommended that all purchasing agencies like the Central and State Governments Municipal Corporations, etc, should invariably make their purchases on the basis of Indian Standards and with the ISI Certification Mark, wherever available.

Dr. Randhawa and Dr. V. N. Patwardhan, Director of the Nutrition Research Laboratory, Hyderabad, were unanimously re-elected Chairman and Vice-Chairman, respectively, of the Division Council for a further period of three years.

Extracts from the Inaugural Address delivered by Prof. E. C. Stakman, on 23—3—1959.

Mr. Dean, Mr. Principal, Members of the Staff and Students,

This is indeed an honour for us, both Dr. Ritcher and myself, to be here and I am sure, both of us feel very highly honoured to have been asked to speak in an institution of this kind, which has built up such a remarkable reputation, and particularly so, because, the talk is at the beginning of your post-graduate course.

"What is man? What can he do? And what should he do?" Questions like these are particularly important to people who are engaged in scientific work and in fact these questions ought to have been raised in all the nations of the earth. Actually, the first person who raised these questions was the Greek philosopher Socrates who lived 400 years before the birth of Christ. At the time of Socrates, western science was flourishing only in Greece. The Greeks as you all know, were a very intelligent people and in spite of the fact that they had none of our "modern" instruments, by their sheer brain power and their love of intellectual speculation, they laid the foundations of real scientific research as we understand it to-day. They were speculating on everything, on the nature of the Heavens and on the nature of living things on the earth; and as a result of such speculations by a great many of their thinkers and philosophers, they were able to discover quite a lot of truths, but it remained for Socrates to point out the most important truth of all. He said "After all, man is the most important being in the world, What does he know about Nature, what can he become and what should he become? In other words, what am I? what can I do? and what should I do?".

These are very important questions, and what is more, they are just as important and vital to-day as when Socrates put these questions to his fellow-Greeks nearly 2400 years ago. In your post-graduate institution too, both the students and the teachers can well ask themselves these same questions. What is a post-graduate school in our establishment, what can it become, and what should it become; what do we study for and what is the meaning of science? Socrates said that man was the most important being in the world. Man is undoubtedly the most important to man himself and this raises three vital problems:— The first is, the problem of human subsistence, the second is obviously the problem of continuation of the human race in the face of violence and disease and the third is the problem of human relations. This last and third aspect has a great influence on the problem of subsistence as well as on the problem of continuance in the face of violence and disease. All of us wish to live long and painlessly. We want also that there should be something worth living for, and it is the aim of science to help us to attain these two objectives. The problem of human subsistence is the most basic of all problems. Next in importance comes the problem of human relations because we have all to get on in this world as human beings. Of course, if the problem of human subsistence is solved satisfactorily, then the problem of human relations also would get solved to a great extent. Science should help us to solve these problems, because after all, it is only science and human knowledge that is built up by science, that can lead to improvements in civilization.

Man in general is a curious animal, he is curious to know all about everything he sees around him. If we take workers in science we find that there are certain people who have a natural urge, a high degree of curiosity to know everything about things. These are the born research workers and it is the path of wisdom to provide such gifted persons with all the facilities necessary to enable them to satisfy their curiosity, which is after all the basis of all progress in science. Even if we cannot all be genuises, every real student, whether he is an undergraduate or post-graduate should develop this healthy curiosity to know all there is to know, in their special fields of knowledge.

In the field of agriculture, we can render very useful service, first by doing basic research, to get a better understanding of fundamental aspects and then taking up applied research, to investigate the numerous practical problems that must be solved in order to improve the level of our subsistence in this world. Incidentally, the social problems that arise have also to be tackled.

Inauguration of the Rockefeller Foundation Lectures at the Regional Post-Graduate Agricultural Research Institute, Coimbatore by Dr. E. C. Stakman and Dr. P. O. Ritcher.

I think that one of the most important things in the world is the fact that nearly three-fourths of the people in this world are now underfed. This is indeed a tragic situation and it is still more tragic when we consider that the population of the world is also increasing at an alarming rate at the rate of 5 millions mouths every year over the world as a whole. It is often said that the world is getting smaller, with air-planes and jet-planes and supersonic means of travel, but in a literal sense too, it is getting really smaller, on account of the steady crowding that is taking place as a result of the increasing population.

In this context, I should remind you that it is hardly feasible to effect any appreciable increase in land or water resources. These are more or less limited and hence the only other commodity that is available for improving the food resources of the world is man's intelligence. I am sure that you all realise that when we speak of adequate land and water we do so in relation to the world's population. It is of course, true that even the existing land is not evenly distributed. In some regions, the land available per capita is very small, indeed, in India for instance it is of the order of $\frac{3}{4}$ to 1 acre per capita, while in Japan it is even less, being less than 25 cents. It follows therefore, that those countries that have more land should make available their extra food grains. There should then be an international co-operation in such a way as to keep all the world fed adequately by increasing the efficiency of agricultural production. How can this be done? In the first place, there are great possibilities of developing better varieties of crops and plants and also better breeds of domestic animals which are in themselves more productive. Man, at the present time has scarcely started on his research to find out the genes for productivity. Many of these genes can produce varieties that are capable of very high yields of rice, let us say in place of the 15—18 bushels that is the average production now. Of course, it is not enough if you evolve a better type of wheat or better breed of cattle, but you should also give them the proper condition to express their superiority. There is no use of paying a thousand dollars for a fine dairy animal and then starving it to death. So the second category of improvements include adequate fertilizing, to supply all the nutrients needed for the maximum out-turns from the improved crop plants. Even when fertilizers are available in adequate quantities, it is very important to use them for the right crops, in right doses at the right time and in the right place.

The next important aspect is crop protection or the prevention of losses by pests and diseases. In the United States it is estimated that nearly a quarter i. e., 23 percent of the total potential production in agriculture each year, is being destroyed by insect pests, plant diseases and weeds. In other words, we are using nearly 15 million acres of land to feed insects, plant diseases organisms and weeds, land which could well feed about 75 million people and even 100 millions people at a pinch. These wastes can be effectively prevented only by people who are well trained in the different techniques of the sciences that have a bearing upon these problems.

I am sure that you young people, who are trying to get a basic education in agricultural sciences, will also develop the requisite techniques that are needed for solving these problems. It is of the utmost importance for you to develop a proper outlook, without getting swamped under a spirit of authoritarianism or bogged in a morass of bureaucracy. I want to emphasise to you students, that you should develop as productive scholars. A productive scholarship is the habitual application of a disciplined curiosity towards increasing our knowledge of a thing, supported by high standards and by a deep sense of social responsibilities. I feel sure that you are going to develop into such productive scholars in the fullest sense of the term, not merely for the sake of science, but because the people of to-day need all the benefits of science, merely to maintain an adquate level of subsistence.

Mr. Dean, I would like to thank you all, once again and say how greatly I feel honoured to be here and have this opportunity of speaking before this gathering. Thank you.

Weather Review — for March, 1959.

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January 1959
North	Madras (Meenambakkam)	..	— 0·3	1·0
	Tirurkuppam*	..	— 1·2	0·8
	Vellore	..	— 0·3	3·8
	Gudiyatham*		— 0·7	2·3
East Coast	Palur*	..	— 0·2	1·0
	Tindivanam*	..	— 0·5	3·9
	Cuddalore	..	— 0·7	2·0
	Nagapattinam	..	— 0·8	0·4
	Aduthurai*	..	— 0·3	0·5
	Pattukkottai*	..	— 0·7	2·2
Central	Salem	..	— 0·5	3·4
	Coimbatore (A. M. O.)* ..	..	— 0·2	0·4
	Coimbatore	..	— 0·5	0·3
	Tiruchirapalli	..	— 0·4	0·4
South	Mathurai	..	— 0·7	2·3
	Pamban	..	— 0·7	1·7
	Koilpatti*	..	— 1·0	2·3
	Palayamcottai	..	— 1·0	1·7
	Ambasamudram*	..	— 1·9	2·3
	Nagercoil*	..	— 1·4	1·5
Hills	Kodaikanal	..	— 1·8	1·9
	Coonoor*	0·1	— 3·6	1·9
	Ootacamund*	..	— 1·1	0·1
	Nanjanad*	..	— 1·0	0·0

* Meteorological Stations of the Madras Agricultural Department.

Except for an isolated shower of 0·09″ recorded at Coonoor on 23—3—59 dry weather prevailed during the month throughout the Madras State, with bright days and cool nights. There were no appreciable changes in the day and night temperature in Tamilnad during this month.

On 25—3—59, a thick fog (code 91) prevailed for about two hours from 0615 hrs. at Koilpatti in Tirunelveli District.

There was no noteworthy rainfall during this month in Madras State.

Zonal rainfall (in inches)

Name of Zone	Rainfall for February, 1959	Departure from normal	Remarks.
North	Nil	— 0·6″	Below normal
East Coast	Nil	— 0·5″	,,
Central	Nil	— 0·4″	,,
South	Nil	— 1·1″	Far below normal
Hills	0·02″	— 1·9″	,,

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore-3.
10th February, 1959.

C. B. M., M. V. J. & R. V.

Departmental Notifications

Gazetted Officers—Agricultural Department
Postings and Transfers during the month of April 1959.

Name and Designation	Posted or Transfered to
Sri A. Subramaniam, Asst. Millets Specialist, Coimbatore	Earned leave for 60 days from 19-3-59 A. N.
,, Alfred Williams, Asst. Agricultual Engineer, and temporary stock verifier, Madras	Reverted to the Madras Agricultural subordinate service.
,, K. Lingannan, Asst. Director, Industrial Engineering Workshops, Madras	Earned leave for 80 days from 9-3-59.
,, K. M. Krishna Menon, Agricultural Bacteriologist, Coimbatore	Earned leave for 80 days from date of relief.
,, K. C. Chandy, Apiculturist, Coimbatore	Transferred temporarily as Asst. Entomologists in the Civil Supplies Dept.
,, E. V. Abraham, Asst. Entomologist, Coimbatore	
,, T. B. Krishnaswami Rao, Asst. Cotton Extension Officer, Madarai	Earned leave for 30 days from date of relief.
,, M. K. Venkatasubramaniam, Supdt., A. R. S., Tirurkuppam	Supdt. Agricultural Research Station, Palur.
,, K. Thandavarayan, Supdt., A.R.S. Palur	Earned leave for 92 days from date of relief by Sri M. K. Venkatasubramaniam.

Upper Subordinates — Agricultural Department
Postings and Transfers during the month of March 1959.

Name and Designation	Posted or Transferred to
Sri P. V. Anantaraman, Assistant Lecturer in Chemistry, A.C. & R.I., Coimbatore	Resignation accepted from 14—3—1959
,, K. P. Krishnan, Entomology Assistant, Coimbatore	Marketing Assistant, Erode
,, M. Ranganathan, Plant Protection Assistant, Mayuram	Marketing Assistant, Ramanathapuram
,, L. Subbusami, Compost Inspector	Do. Kanyakumari
,, C. M. Ratna Singh, Paddy Assistant, Palur	Agronomy Assistant, Sugarcane Research Station, Kulitalai
,, G. Venkatesan, Extension Officer for Agriculture, Nagapattinam	Paddy Assistant, Palur
,, N. Rajamani, Chemistry Assistant, A. C. & R. I., Coimbatore	Resignation accepted from 7—3—59 (F. N.)
Srimathi P. Meenakshi, Assistant in Millets., A. C. & R. I., Coimbatore	Assistant in Plant Physiology A. C. & R. I, Coimbatore
Sri K. S. Sankarakrishnan,	Appointed as Assistant in Chemistry (Stores), A. C. & R. I
,, K. V, Seshadri	Do. Do. Do.
,, V. Muthukrishnan, Agricultural Demonstratior, Wandiwash	Farm Manager, Government Sheep Breeding Station, Kattupakkam, Chinglepet District
,, J. Appandaraj, Farm Manager, Kattupakam	Agricultural Demonstrator, Wandiwash

STATEMENT ABOUT OWNERSHIP & OTHER PARTICULARS REGARDING THE MADRAS AGRICULTURAL JOURNAL.

FORM IV.

Rule 8 of the Press and Registration of Books Act, 1867.

1.	Place of publication	:	Coimbatore.
2.	Periodicity of its publication	:	Monthly.
3.	Printer's Name	:	A. Subramaniam.
	Nationality	:	Indian.
	Address	:	Secretary, The Coimbatore Co-operative Printing Works, Ltd., Coimbatore.
4.	Publisher's Name	:	T. Nataraj.
	Nationality	:	Indian.
	Address	:	Agronomist and Professor of Agriculture, Agricultural College, Coimbatore.
5.	Editor's Name	:	T. Nataraj.
	Nationality	:	(As given above)
	Address	:	...
6.	Names and addresses of individuals who own the newspaper and partners or share-holders holding more than one per cent of the total capital.		The Madras Agricultural Students' Union, Agricultural College, Coimbatore.

I, Sri T. Nataraj, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Date: 28—2—1959. *Signature of Publisher:* **T. NATARAJ.**

Review on market conditions of commercial crops in the notified areas for the month of March, 1959.

Cotton: In this section, lint: Candy of 784 lbs.
Kapas: Pothi of 280 lbs.

Tirupur: Coimbatore District: Season: There was no rain during the month under report. The whether was reported to be hot, dry and sultry. The Karunganni cotton crop was reported to be affected adversely due to want of rain and the yield was poor.

Arrivals and Transaction: Lint: The market started with an opening balance of 3286 candys of Cambodia and 215 candys of Karunganni lint during the month. The total arrivals into the market were 8636 candys of Cambodia and 780 candys of Karunganni lint which included 2784 candys of Cambodia and 45 candys of Karunganni lint locally ginned. A quantity of 6037 candys of Cambodia and 609 candys of Karunganni lint were despatched from Tirupur. At the end of the month there was a closing balance of 5885 candys of Cambodia and 386 candys of Karunganni lint with the trade.

Kapas: The market for kapas started with an opening balance of 4348 pothis of Cambodia and 61 pothis of Karunganni kapas. The total arrivals into the market were 70968 pothis of Cambodia and 5541 pothis of Karunganni kapas. The disposals during the month were 43875 pothis of Cambodia and 4061 pothis of Karunganni kapas. At the end of the month there was a closing balance of 31441 pothis of Cambodia and 1541 pothis of Karunganni kapas.

Prices: The average prices of Cambodia and Karunganni lint during March, 1959 and February, 1959 were as follows:

Lint in Candy of 784 lbs. or 355.616 Kilo-grams.

Name of Variety.	March, 1949.	February, 1959.
Cambodia Superior quality	Rs. 980—981	Rs. 900—926
Cambodia average quality	Rs. 839—845	...
Karunganni Superior quality	Rs. 826.00	Rs. 850—871
Karunganni average quality	Rs. Not Quoted.	

Kapas pothi of 280 lbs.

Cambodia Superior quality	Rs. 134—147.37	Rs. 131—145
Cambodia average quality	Rs. 120—131.50	Rs. 120—130
Karunganni Superior quality	Rs. 114—124.37	Rs. 105—112
Karunganni average quality	Rs. Not quoted.	Rs. 87.37—97·37

Ramanathapuram District: Season: There was no rain in the district during the month under report. Hot weather continued throughout the month in the district during the month.

Arrivals and Transactions: The following were the opening stocks, arrivals, disposals and closing stocks of kapas and lint in the important markets in the district.

Kapas in pothi of 280 lbs.

Name of Market	Opening Stock	Arrivals	Disposals	Closing stock
Virudhunagar ...	...	31000	29500	1500
Sattur ...	...	11250	10750	500
Rajapalayam ...	...	8000	8000	...
Total ...	...	50250	48250	2000

Lint in Candy of 784 lbs.

Virudhunagar ...	30	1850	1600	280
Sattur ...	...	1075	975	100
Rajapalayam ...	90	1300	1200	190
Total ...	120	4225	2775	570

Prices: Prices of kapas, lint and seeds in the district during the month as compared to that of last month were as detailed below:

Kapas:	March, 1959	February, 1959.
Karunganni ...	Rs. 100—108	Rs. 83—106
Tinny-Karunganni ...	Rs. 80—102	Rs. 80— 95

Lint:

Karunganni ...	Rs. 761—830	Rs. 760—810
Tinny-Karunganni ...	Rs. 711—751	Rs. 660—736
Tinny ...	Rs. 646—690	Rs. 545—661
Uganda certified ...	Rs. Not quoted	Rs. 1376.00
Uganda uncertified ...	Rs. Not quoted	No transaction
Cambodia ...	Rs. Not quoted	Rs. 696—736

Cotton Seeds in St. Maunds:

Karunganni ...	Rs. 11.42—12.61	Rs. 10.44—14.36
Cambodia ...	Rs. 11.92—12.55	Rs. 10.52—12.41

It is seen from the above that the prices for kapas lint and seeds were on the increase when compared to last month:

Groundnut: *South Arcot District: Groundnut Kernels:* Arrivals of groundnut kernels during the month were on the decline due to the closure of the Marketing Season. The total arrivals came to 1648 tons out of which 451 tons were from neibouring districts like Tanjore, Trichy and North Arcot. Despatches from this district were 22 tons to Pondicherry and 664 tons to the districts in the Madras State. Oil Mills and country chekkus consumed 1503 tons and 219 tons respectively. Wastages were calculated 185 tons. At the end of the month the stock with the trade stood 580 tons.

The average prices in the several markets in the district varied from Rs. 148.32 to 170.65 per candy of 531 lbs. according to quality.

North Arcot District: Season: There was no rain in the district hot and dry weather continued throughout the month.

Arrivals and Transactions: The opening stocks, arrivals disposals and closing stocks were as detailed below during the month in all the markets in the district.

Quantity in Matric Tons.

	Opening Stock	Arrivals	Disposals	Closing Stock
Groundnut pods ...	1033.638	667.154	815.797	887·994
Groundnut kernels ...	361·696	999.744	995·680	365·760

N. B:— 1.016 Metric ton = 1 ton.

Prices: The following were the price range of groundnut pods kernels and oil in different markets in the State during the month compared to previous month.

		March, 1959	February, 1959
Groundnut pods (per bag of 80 lbs.)	...	N. Q.	12.50—18.50
Groundnut kernels (candy of 531 lbs.)	...	N. Q.	140—174
Groundnut oil (candy of 500 lbs.)	...	N. Q.	214—330
Groundnut cake (per st. Maund)	...	N. Q.	...

N. Q. = Not quoted.

Ramanathapuram District: Arrivals and Transaction: The following were the arrivals and disposals of groundnuts pods and kernels in the district during the month.

	Opening stock	Arrivals	Disposals	Closing stock
pods-in tons	400	...	400	Nil
kernels-in candy of 531 lbs)	5740	1400	4000	3140

Prices: The following were the prices of pods, kernels, oil and oil cakes during the month:

	March, 1959	February 1959
Groundnut pods (bag of 82 2/7 lb.)	N. A.	N. A.
Groundnut kernels (candy of 531 lbs.)	160—183	165—178
Groundnut oil (candy of 500 lbs.)	295—315	295—310
Groundnut oil cake (st. maund of 82 2/7 lb.)	9.36—12·37	9.87—11·36

Gingelly: *South Arcot District:* The arrivals of gingelly in the South Arcot district amounted to 1053 bags out of which 147 bags came from Trichy district alone. Despatches to other districts like Madras, Salem, and Tanjore came to 233 bags. Consumption by country chekkus amounted to 818 bags. The stock with the trade at the end of the month stood at 447 bags.

The average prices per bag of 168 lbs. ranged from Rs. 60·50 to 64·11 according to quality.

Tobacco: Coimbatore District: (In this section candy 500 lbs.)

Harvest of tobacco crops was reported to be almost over in the district.

At the end of the month there was a stock of 9310 candys of chewing and 100 candys of cheroot tobacco. About 2670 candys of chewing and 50 candys of cheroot tobacco were exported to places in Salem, Tanjore, Trichy, Ramnad and Madurai in Madras State and Bombay, Mysore, Kerala and Andhra Pradesh States.

Chewing tobacco market was reported to be dull. The following were the prices of tobacco in the district during the month:

Prices in Rs. per candy of 500 lbs. or 226.80 kilo-grams.

Variety	I Grade	II Grade	III Grade
1. *Chewing Tobacco-Sun cured:*			
(a) Meenampalayam	300—450	200—300	125—190
(b) Other varieties	245—330	180—240	110—175
2. *Cheroot varieties:*			
Sun-cured (grown in Erode and Bhavani taluks)	275—340	240—260	200—230
3. *Chewing Tobacco-pitcured:*			
grown in Palladam and Sulur areas)	250—265	150—200	80—140

Cardamom: *Madurai District:* There was no rain during the month in the district under report. The standing crop was reported to be fair. Pickings and curings of cardamom fruits were in progress.

The arrivals, in general during the month were reported to be on the decline. Despatches from Bodinaickanoor were mainly to Bombay, New Delhi, Calcutta, Amirtsar and Kanpur and also to overseas countries like Sweedan, Masseils Hamburg and London etc.

The following were the estimated arrivals and despatches of cardamom in the important markets during the month:

Name of assembling centres		Opening stock	Arrivals	Disposals	Closing Balance
1. Bodinaickanoor	...	30000	215000	205000	40000
2. Thevaram	...	30000	10000	19000	21000
3. Pannaipuram	...	12000	2000	2000	12000
4. Kombai	...	15000	1000	4000	12000
5. Uthamapalayam	...	8000	2000	4000	6000
6. Cumbum	...	110000	35000	35000	10000
7. Gudaloor	...	20000	3000	7000	16000
8. Pattiveeranpatti	...	8500	38500	43000	4000
9. Virudhunagar	...	25000	46000	50000	21000
Total	...	258500	352500	369000	242000

The following were the prices of Cardamom in different markets during the month:

		Name of the quality.	*Prices per lb.*
1. *Bodinaickanoor:*	(1)	Special	Rs. 10.01
	(2)	Superior Bulk	,, 9.15— 9.92
	(3)	Medium Bulk	,, 8.48— 9·32
	(4)	Inferior Bulk	,, 8.00— 8·53
	(5)	Seed or Rice	,, 10.00—10.71
	(6)	Local pats	,, 11.75—12.00
2. *Pattiveeranpatti:*	(1)	*Sun dried:*	
		Superior and Bold	Rs. 9.37—10.22
		Medium and Bulk	,, 9.14— 9.52
		Inferior and small	,, 8.56— 9.31
		Others	,, 7.20— 8.27
	(2)	*Store green:*	
		Superior and Bold	Rs. 9.72—10.22
		Medium and Bulk	,, 9.26— 9.72
		Inferior and Small	,, 8.90— 9.32
		Others	,, 7.40— 8.30
	(3)	Seed or rice	,, 11.00—11.77
3. *Virudhunagar:*			
	(1)	Bold quality	,, 10.00—10.50
	(2)	Superior	,, 9.50—10.00
	(3)	Medium	,, 8.75— 9.25
	(4)	Inferior	,, 8.25— 8.50
	(5)	Seed or rice	,, 11.75—12.25

Review of administrative activities of market committees during March, 1959.

General: The Market Committees of South Arcot, North Arcot, Trichy and Coimbatore continued to functian briskly during the month under report. Efforts are being made to revive the activities of other Market Committees of Ramanathapuram and Tirunelveli due to disposals of the appeal in the Supreme Court.

Enforcement: The progress of licencing by the Markets Committees during the month were as follows:

Name of the Market Committees	Section 5 (1) A	Section 5 (1) B	Section 5 (3) A	Section 5 (3) B	Weighmen A	Weighmen B
North Arcot Market Committee	116	653	121	627	54	307
South Arcot Market Committee	115	1027	87	713	78	659
Coimbatore Market Committee	206	520	179	435	161	320
Trichy Market Committee	57	241	33	132	13	75

A = Licences issued during the month.

B = Licences issued up to the end of this month.

Meetings: A meeting of the Trichy Market Committee was held on 22—3—1959 and 19 subjects were discussed.

An ordinary meeting of the North Arcot Market Committee was held on 29—3—1959 at Arcot and 40 subjects were discussed.

A meeting of the South Arcot Market Committee was held at Tindivanam on 20—3—1959.

Quality Analysis: Nil.

Quality Competetion: Nil.

The Madras Agricultural Students' Union.

PATRONS.

1. Dewan Bahadur C. Arunachala Mudaliar, Zamindar of Chunampet, Chunnampet P. O.
2. Raja Sri Krishnachandra Gajapathi Narayana Dev, Parlakimidi P. O.
3. Sri V. C. Palaniswami Gounder, M. L. A., Vellaikinar, Coimbatore Dist.
4. Dr. C. P. Ramaswami Iyer, Ootacamund
5. Sri Jeevandass, Varnasi, Parlakimidi P. O.
6. Sri Ramachandra Ananga Bhima Dev, Kesari Gajapathi, Raja Saheb of Budokhemidi, Berhampore, Ganjam Dist.
7. Rao Bahadur K. T. Alwa, Retd. Deputy Director of Agriculture, Mangalore
8. Sri R. K. Kandaswamy, "Brindavan", Tiruchi Road, Coimbatore
9. ,, G. D. Naidu, "Gopal Bagh", Avanashi Road, Coimbatore
10. ,, K. Thiruvenkata Mudaliar, 34, 2nd Main Road, Gandhinagar, Madras-20.
11. ,, P. G. Karuthiruman, B. Sc., M. L. A., Nanjaipuliampatti, Thukkanaickenpalayam, P. O., (Via) Anthiyur, Coimbatore Dist.
12. ,, K. Venkataswami Naidu, B. A., B. L., Gopalapuram, Coimbatore
13. ,, C. V. Bashyam, "Dharma Vilas", Land Lord, Coimbatore
14. ,, V. C. Subbaiya Gounder, Gnanambika Mills P. O., Coimbatore
15. ,, M. S. Palaniappa Mudaliar, B. A., 125, Rajah Street, Coimbatore
16. ,, A. K. Balaramaraju, Land-Lord, Rajapalayam
17. ,, K. P. Amrithanatha Iyer, President, Co-operative Union Ltd., Ambalapuzha Taluk, Monkompu P. O., Kerala State
18. ,, N. S. Vydianatha Iyer, Sengalipuram, (Via) Kodavasal, Tanjore Dist.
19. ,, M. Subba Rao B. Sc., (Ag.) Mango Range, P. O. Nilgiris
20. ,, M. R. Balakrishnan, B. A., B. Sc. (Ag.), F. A. O., Irrigation Agronomist, Bangkok, Thailand
21. ,, S. Raja Iyengar, Land Lord and Agriculturist, Madurai
22. ,, K. Rangachari, Land Lord, 16, Old Munsiff Court Road, Saidapet, Vellore
23. ,, R. Ramakrishna Naidu, Palamalai Ranganathar Mills, Perianaickanpalayam P. O.
24. ,, C. M. John, B. A., Agricultural Technical Advisor, The Potash Scheme-India, 7, Lavelle Road, Banglore-1
25. ,, S. N. Venkataraman, B. A., B. Sc. (Ag.), Retd. Deputy Director of Agriculture (H. Q.), 33, Third Main Road, Gandhinagar, Madras
26. Dr. T. S. Sadasivan, Director, Botany Laboratory, Madras University, Triplicane, Madras-5
27. Sri W. P. A. Soundara Pandian, Pattiveeranpatti, P. O., (Via) Kodai Road.
28. ,, M. A. Ayee Gounder, Kasipalayam, (Via) Gobichettipalayam
29. ,, K. S. Vengu Chettiar, 'Kottachi House' Kornad, Mayuram
30. ,, V. P. K. Kayarohanam Pillai, Agriculturist & Businessman, Nagapattinam
31. ,, A. K. Subramania Odyar, Mirasdar, Attur Village, Nannilam Taluk
32. ,, R. V. Sundara Reddiar, B. A., B. L., Advocate, 'Bhaskara' Vilas, Cuddalore
33. ,, N. M. Rajaram Reddiar, Nathapet P. O., Cuddalore
34. ,, M. Arunachalam, B. Sc., (Ag.), C/o. Sri Muthunara Reddiar, Pagandai Village P. O., (Via) Panrutti
35. ,, S. D. Rama Reddiar, Purnasugaipalayam P. O., (Via) Pallianellur, Villupuram
36. ,, S. Kothandapani Pillai, Purnasugaipalayam, Pallianellur, P. O., Villupuram
37. ,, G. Venkatamuni, B. Sc., (Ag.), Partner, Mysore Fertiliser, 34, North Beach Road, Madras
38. ,, C. K. N. S. Nagarajan, Valavanoor, S. Arcot Dist.
39. ,, D. Konda Reddiar, Municipal Chairman, Villupuram, S. Arcot Dist.
40. ,, V. Sarangapani Gounder, M. L. A., Mirasdar, Maharajapuram, (Via) Villupuram East P. O., S. Arcot Dist.
41. ,, R. Subramania Reddiar, Mirasdar of Irvelpet, P. O., Villupuram Taluk
42. ,, G. Govindan, Proprietor, Ramson & Co, Madras
43. ,, C. K. N. S. Bhaskaran, Valavanoor, S. Arcot Dist.
44. ,, K. Santhanam, Suvarnavur, Villupuram
45. ,, S. Sivasankaran Chettiar, Land Lord & Merchant, No. 2, Big Kannara Street, Mayuram, Tanjore Dt.
46. ,, K. M. Venkatachalam, Dip. Econ., 16, Chockalingam Pillai Street, Chidambaram.
47. ,, S. Ramamurthy Iyer of Kunnam, Land Holder, Kunnam House, Sirkali, Tanjore Dist.

THE MADRAS AGRICULTURAL STUDENTS' UNION.

This is an association of the students, past and present, of the Madras Agricultural College, and of the officers of the Madras Agricultural Department, the Principal of the Agricultural College being the President, (ex-officio). The Union conducts this Journal and celebrates annually the College Day, on which occasion it convenes an Agricultural Conference. The Association has Members, Associates, Honorary Members and Patrons. For detailed particulars apply to the Secretary.

THE MADRAS AGRICULTURAL JOURNAL

A Premier Agricultural Monthly in India

Editorial Board:

T. Nataraj, B A., B. Sc. (Ag.)

V. Subbiah, B. Sc. (Ag.) — C. Balasubramania Mudaliar, B. A., B. Sc. (Ag.)

G. Thulasidas, B. Sc., B. Sc. (Ag.) — C. V. Govindaswamy, B. Sc. (Ag.), Assoc. I. A. R. I., D. P. P. (Bristol).

Dr. S. K. David, Ph. D. — A. Maharaja, (Editor, Tatler)

K. S. Sundaresan, (Club Secretary)

A monthly journal in English devoted to the study and development of Agricultural Science; contains articles of scientific as well as of general interest written in popular language. Reviews of agricultural publications and extracts from various Journals – both Indian and foreign, form a special feature. Commands a wide circulation and is therefore an excellent medium for advertisements.

Rates of Subscription

Journal supplied *free* to Members, Associates and Patrons of the Union.

Annual subscription rates for others:

India and Ceylon Rs. 6·00, Foreign Rs. 7·00, Single number Re. 0·50.

Rates of Advertisement:

For single insertion:

	Rs.
For full page	20·00
For half page	10·00
For quarter page ..	5·00

Inside cover pages 25 percent extra.

Outside cover pages 50 percent extra.

Preparation of blocks unless supplied by advertisers, charged extra.

N. B.— All advertisements are subject to the approval of the M. A. S. U. Managing Committee before insertion. The charges are payable strictly in advance.

Contributions to the Journal:

Contributions on Agricultural Science, subjects of agricultural interest or pertaining to rural economics and co-operation will be accepted for publication, subject to approval by the Editorial Board. Correspondence and queries on agricultural and allied subjects are invited. Manuscripts should be sent clearly typed on *one side of the paper* only. The manuscripts should not ordinarily exceed 8 typed pages, including tables and figures.

Twenty-five copies of reprints of contributions will be presented to authors. *Extra copies and printed covers for reprints*, if required, can be supplied at actual cost if intimation is given when the manuscript is presented. Contributors will be charged half the actual cost of block-making. Members will be charged only one fourth the actual cost of block-making.

N. B.— *The Editorial Board does not hold itself responsible for the opinions expressed by the contributors.*

All communications should be addressed to:

The Secretary, M. A. S. Union,
Coimbatore—3.

JUBILEE SHIELD FOR CHEMISTRY

The Golden Jubilee rolling shield of the Chemistry Section to be awarded during the College Day and Conference to the best scientific workers in the field of Agricultural Chemistry.

Rules and conditions for the award:

(1) The shield will be awarded to the best scientific worker in the field of Agricultural Chemistry. All Scientific workers and Research Students of the Chemistry Section at the Agricultural College and Research Institute, Coimbatore as well as in the Department of Agriculture, Madras State will be eligible for the award.

(2) The shield is a rolling one and will be awarded at the time of the Annual College Day and Conference of the Agricultural College and Research Institute every year.

(3) A committee to adjudge the best worker for the award shall comprise.

(1) The Principal (Chairman — Ex-Officio)

(2) The Government Agricultural Chemist (Ex-Officio)

(3) A senior officer of the Research Council elected by Research Council.

(4) The award will be made to the worker adjudged as the best on the basis of the reports or papers containing either (i) an account of original research in which the author's share is the maximum or (ii) a critical discussion or analysis of any subject related to agricultural chemistry, throwing new light on or adding new knowledge to the subject.

(5) A certificate will also be awarded to the winner of the rolling shield.

(6) The shield shall be returned to the Government Agricultural Chemist after the award for keeping in safe custody.

(7) The award will not be made more than once to the same person.

(8) The power to modify the rules to suit any situation that may arise at any time rests with the Government.

Papers and reports etc. for the award are invited on or before the 15th June 1959 by the undersigned.

Lawley Road P. O.

A. Mariakulandai,
Professor of Soil Science.

Edited and published by T. Nataraj, B. A., B. Sc. (Ag.), for the Madras Agricultural Students' Union and printed by A. Subramaniam, at The Coimbatore Co-operative Printing Works, Ltd., Coimbatore.