THE MADRAS AGRICULTURAL JOURNAL

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Retirement

Shri C. M. John, Principal, Agricultural College and Research Institute, Coimbatore, on foreign service as the Director, Central Coconut Research Station, Kasaragod, retired from the Madras Government service on 7—6—1953 after putting in nearly 31 years of meritorious service in the Department of Agriculture.

Shri C. M. John joined the Madras Department of Agriculture in 1922 as a Reserach Assistant. He worked in that capacity in the Paddy and Oilseed Sections, till 1937 when he was Gazetted as Superintendent, Agricultural Research Station, Tindivanam. In 1939 he was appointed as Oilseeds Specialist which post he held till 1947 when he was promoted as Principal, Agricultural College, Bapatla. Later on he became Principal, Agricultural College and Research Institute, Coimbatore. In December 1950 his services were lent to the Indian Central Coconut Committee for appointment as Director of the Committee's Central Coconut Research Station at Kasaragod. Shri C. M. John is a very capable research worker and his preeminent position in this line has made the Indian Central Coconut Committee and the Indian Central

Oilseeds Committee to invite him to review the work done on the crops coming under the purview of those Committees and to suggest future lines on which research should be organized and carried out on an All-India basis. He has large number of scientific publications to his credit; particular mention may be made of the "Handbook on Coconut Cultivation" (published by the Indian Central Coconut Committee) which is acknowledged as good scientific work on 'Coconut'.

Shri C. M. John possesses some sterling qualities which endear him to one and all who come in contact with him. He was an active member of the Madras Students' Union and took very keen interest in its working. He served the Union in the capacity as Editor of the Madras Agricultural Journal for nearly 1½ years and latter on as its Vice-President and President.

We wish him a long and prosperous future.

MADRAS AGRICULTURAL UPPER SUBORDINATES' ASSOCIATION.

The annual general body meeting of the Madras Agricultural Upper Subordinates' Association will be held on 16—8—1953 at 10 A. M. at the Agricultural College, Coimbatore, to consider the following :—

1. Adoption of the annual Report.
2. Adoption of the audit report.
3. Any resolutions sent by the members.
4. Election of office-bearers.

Members desirous of moving any resolutions in the meeting may kindly send them to the Secretary before 1—8—1953.

N. Ranganathachari,
Secretary.

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Editorial

Science and Foreign Relations : National security depends far more upon the total scientific potential than upon anything else. To attain this end there must be free flow of unclassified scientific and technological information. Scientists should have ample scope and facilities to move about freely and come in contact with the eminent scientists in different parts of the world. The authorities in power should endeavour to afford at least the minimum facilities and encourage the free movement of scientists and exchange of their ideas with scientists of reputation working in similar fields in other parts of the world. This aspect of international security is slowly gaining importance and it is hoped that time is not far off when the scientists will contribute a mighty share towards international plenty, security and prosperity.

In recent years several books on "Secrecy and Security Relations as applied to Science" have been published in America. In these publications it is made clear that intellectual freedom of investigation, utterance and communication is the pre-requisite for real scientific advancement. This observation has been made by the American scientists with reference to the conditions prevailing in America. A closer examination of this observation will reveal that what is applicable to America is equally applicable to every other country in the world. The experience of British, French and other European scientific men is in full conformity with that of the American scientists.

Professor A. V. Hill in his Presidential Address to the British Association has asserted that complete abandonment of secrecy in Government policy, particularly in industry and finance, is out of question and that some control measures are inevitable in the interest of national security. But the freedom of conscience of the scientists must be given ample scope to bring out the best of it for the security of the nation. The existence of anti-scientific trends in any country should be eradicated if the scientists are to take care of the foreign relations. These trends are responsible for the misunderstandings and miscalculated judgments, which invariably hinder the furtherance of real scientific progress in any country. All these defects will be removed if the scientists realise that prestige

of science is not their personal property but a trust, meant for being passed on to coming generations not only in their country but in other countries as well.

If the international security is to prosper and grow strong day by day the scientists and the State should work hand in hand and solve all the intricate problems that confront the industrial and economic advancements of the different nations in the world. For this, there must be ample scope for the scientists in different parts of the world to exchange their ideas and thereby enrich scientific knowledge. Days are fast approaching when the scientists will have greater responsibilities than the politicians in shaping the policy of their nations and establishing a harmonious concord of international fraternity and prosperity.

Rice Delegation to Japan: 'Observe and learn more, should be the motto of the scientists. The authorities in power have recognised the importance of this saying and consequently have sent a delegation of three eminent Indian Scientists in the field of rice culture, to Japan. It needs no mention that today Japan occupies the top rank in the list of rice producing countries of the world.

The members of the delegation are:

(1) Dr. N. Parthasarathy (Leader) Director, Central Rice Research Institute, Cuttack.

(2) Sri M. B. V. Narasinga Rao, Paddy Specialist, Coimbatore.

(3) Sri Pareja from Bihar.

Leader of the delegation as well as Sri M. B. V. Narasinga Rao, belong to Madras. The members will observe and study all aspects of rice cultivation and gain consequently a clear conception of the contributory causes for the phenominally high yield of paddy in Japan. They are congratulated on their happy and useful delegation to study all about rice cultivation in Japan. It is fervently hoped that after their return to India they will do their best to step up the average acre yield of paddy in their respective spheres of activity and thus relieve the food shortage in the country.

Potato Improvement by Multiplication of Virus-free Seed

By

K. SAPTHARISHI

Agricultural Research Station, Nanjanad

Potato is an important food crop that deserves both large-scale and quick multiplication of quality seed material and widespread extension to regions in which it can be profitably cropped. At present, its cultivation is chiefly confined to about 20,000 acres on the higher plateau of the Nilgiris, where it is a major food and money crop.

Unfortunately, no single commercial variety offers a high resistance to the several virus diseases, four of which have been recorded on the Nilgiris. *Great Scot* may be said to show the greatest resistance among the popular cultivated varieties. The absence of a good variety; totally immune to virus, has been responsible for the deterioration in the yield values of the potato throughout the world.

In view of the serious havoc caused by virus diseases, active investigations on their prevention and control are in progress in America and the Irish Free State and to the greatest extent at Wageningen in Holland.

Coming nearer home, an idea of the huge loss in potato production in the Madras State is necessary to appreciate the critical situation confronting the grower. The over-all yields from the seed material produced and supplied from the Agricultural Research Station, Nanjanad, have been steadily declining with the passage of years. This gradual fall has been found as being mainly due to the incidence of virus diseases, which have been spreading in the seed material imported years ago. For example, it is found that the range of acre-yields in the main crop had declined from 16,800 lb. in 1939 – '40 to about 8,500 lb. as at present. The high yields of 1939 – '40 were never attained in any of the succeeding years. In the case of the second crop, the fall was still more marked. The high figure of 14,600 lb. of 1939 – '40 has came down to the region of about 5,000 lb. The same is the story for the irrigated crop, the corresponding respective figures being 14,800 lb. and 6,000 lb.

In between the years above mentioned, small consignments of certified virus-free 'Class A' *Great Scot* seeds were obtained from Scotland and tried against the seed of the same variety grown year after year at the Station. The amazingly high yields secured through the freshly imported material proved a pointer, viz., that any measures taken

to make similar disease-free seed available in abundance to our growers can and must bring about a marked improvement in production in the shortest possible time.

Before taking up the question of virus-free seed multiplication, it would be useful to see how the infection spreads from year to year and 'runs out' established good yielders. The infection is said to occur, jointly and severally, by the following ways:

(a) Sucking insects, aphids among the more important of them, conveying the disease from the diseased to the healthy plants. But, if centres of seed production are isolated at a distance of about 300 yards away from the infected areas, a partial protection is conferred on the material multiplied. But this is not strictly safe for it is recorded that infection has occurred over a distance of more than a mile from such safety-belts by migrating aphids acting as carriers.

(b) Infected left-over tubers on the field after lifting the crop transmit the disease to the incoming potato crop. Active propaganda in favour of search and removal of such tubers will prove of use in minimising the spread of virus.

(c) The use of small sized tubers or 'chats' is another factor responsible for spreading the disease. Infected plants usually produce snch chats and if these are utilised for seed, the virus naturally multiplies and overpowers the resulting crop.

(d) A number of plants like *Datura*, *Petunia* and other *Solanum* species have been found to be infected with virus. These are usually found growing as weeds near potato holdings. Insects transmit the disease from these to the potato crop. Destruction of these weeds may help to check the spread of virus.

It may be concluded that all the above methods can, at the best, only afford partial prevention. The only effective solution lies in the rapid multiplication of certified virus – free foundation seed stock under the control of the State Department of Agriculture.

Methods of Maximisation of .Production *

By

C. EKAMBARAM, B. SC. (Ag.), A. I. D. I.
Superintendent, Sugarcane Liaison Farm, Hospet

Introduction: Agricultural production has to be increased not only to meet the immediate needs, but has to keep pace with the increase in population. The population of the province has risen from 33·732 millions in 1891 to 49·842 millions in 1941 an increase of 45·9%. Every decade records an increase of nearly 10%.

Methods of increasing agricultural production: Agricultural production can be increased by (a) increasing the area under cultivation and (b) by increasing the yield per acre.

Increasing the area under cultivation: Though not an easy proposition it has to be tackled. India being an old agricultural country, best parts of it's land have already been brought under the plough. But yet there is large area classified as cultivable waste. The area of cultivable waste is put down as 11·85 millions and current fallows as 9·5 millions acres for the province. Though the entire area may not be quite suitable for good standard of cultivation, at least appreciable area could be reclaimed and made to yield good results. As a first step it is necessary to survey such areas and select the most suitable ones to be tackled first. However there will still be many handicaps in this process to be overcome.

There may not be proper roads and communication and some areas may be unhealthy. These will have to be met with and regular land reclamation schemes with mechanised cultivation and colonisation will have to be taken up.

The process of reclamation cannot be left to the individual enthusiasm of enterprising cultivators. The State has to undertake the task with a set organisation and almost every district should have a land reclamation erganisation.

This has to be taken up as a long range policy to keep pace at least with the increase in population.

(b) **Increasing the yield per acre:** The average yields of crops in the country are very low as compared to yields in other countries and also the maximum yields that are capable of achievement in this country itself. The average yield of rice, the staple food crop of this province is still very low 1,300 lbs. per acre, as against 5,100 lbs. in Spain or 4,000 lbs. in Japan. High yields of 5,000 lbs. per acre are being obtained in our

* Summary of Paper contributed for College Day & Conference 1952.

own province in congenial stituation which have received proper culture and manure, and even record yields of 12,000 lbs of paddy per acre have been obtained. Again in sugarcane the average yield is only about 30 tons per acre, while individual fields yields up to 90 to 100 tons have been recorded. This only shows how far the average yields can be increased by giving the necessary conditions. Our present yields can be commensurately increased if not doubled.

Among the chief factors that affect the growth and yield of crops may be mentioned the following:

(i) Thorough cultivation and attaining of proper tilth
(ii) Improved varieties and good seed
(iii) Adequate manure in time
(iv) Proper irrigation and drainage
(v) Timely planting and cultural operations
(vi) Control of pests and diseases, and
(vii) Provision of finance and supply of materials.

Summary and conclusion: Maximising production is essential for making the country self-sufficient and strong, also to meet the needs of the increasing population. Agricultural production is to be increased by extending the area under cultivation and also increasing the yield per acre. This is to be achieved both on a long term and short term basis. Reclamation of cultivable wastes and increasing the area under cultivation, execution of major irrigation projects will have to be taken up as a long term policy. Production and distribution of good seed of improved varieties, supply of manures, fertilisers and implements, increasing irrigation facilities by executing minor irrigation schemes and sinking of more wells with provision of extended power supply, control of pests and diseases, and advancement of loans for cultivation on an extended scale will have to be taken up as a short range policy.

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Methods to be Adopted to Maximise Production and Development of Improved Strains and Plant Materials *

By

P. V. RAJAPPAN, B. Sc., (Ag.), D. I. H.
Agricultural Research Station, Taliparamba

The fruit breeder wants maximum yield, minimum disease, drought and frost resistance, maximum keeping quality for his produce, the aim being to get the maximum price. These can be attained only by producing improvad strains and plant materials and the production of the improved strains is to be maximised so that these can be distributed throughout the state. How to achive this object?

Introduction of plants: The introduction of plants and trials to acclimatise them is one of the old methods of development of improved strains and types. Once an improved strain or variety gets acclimatised this can be multiplied in large numbers and distributed as in the case of Malta lemon and Singapore jack.

Selection of bud sport: The wide variations of forms that is existing at this time is due to bed sports establishing in the orchard with and without the knowledge of the owner. Some bud sports may have desirable variations and is worthy of perpetuation and multiplication. Two suspected bud mutants in Rubio and October purple have been isolated at Coonoor and seven bud sports of sweet orange are undergoing progeny tests at Kodur.

Selection from chance seedlings: All the so called good varieties of fruit trees like Mundappa, Allumpur baneshan etc., have at one time or other originated as a chance seedling and due to their desirable qualities were multiplied and have now established in all places. The seedling selection of K. O. 2 and K. O. 6 are worth mentioning in this direction. Likewise the selection of good chance seedlings have to be continued and those showing desirable characters should be multiplied.

Hybridisation: This aspect of fruit development has also received attention in our State. The desirable crosses between Himayuddin X Swarnareka and Himayuddin X Neelum combining the desirable characters of each other are worth mentioning in this direction. The coconut hybridisation work and distribution of hybrid seed nuts that is now in progress at Nileshwar are work on these lines.

Other methods: Other methods like, X-ray, heat treatment, treatment by chemicals like colchicine etc., are also worth while trying

Summary of Paper contributed for College Day & Conference 1952.

for producing new types of desirable characters though the possibility of this method of approach is likely to be slow and doubtful.

Root stocks: That root stocks also play an important role in the development of fruit wealth is known for some time past. The vigour exhibited by polyembroyonic stocks as well as the role played by the "Men Stock" in re-establishing the apple industry in South India is too well known to need emphasis.

After producing an improved strain by any or all of the methods shown above, the next problem that faces the breeder is how to perpetuate the same as well as multiply them for distribution to the public at large.

Maximisation of the production of improved strains: For the plants that respond to vegetative propagation by cutting it is easy to propagate the same by this simple method of operation. But with obstinate cases like mango, inarching or side-grafting is the only way open for multiplication. Among the same species great difference is noticed in the method of vegetative propagation to which each member adapts itself. Malta lemon can be easily raised by cuttings and the other members of the group show more or less adaptability to this method of propagation. Mulberry, pomegranate, fig, and grape vine give high percentage of rooting when raised as cuttings. Guava responds to layering favourably and jack and mango refuses to lend themself to this method of propagation.

Trials with Seradix B_{12} at Coonoor, has revealed that this increases the percentage of rooting in Cape goosberry. Different kinds of treating the cuttings like oval cut at base, slanting cut at base and other modifications have been found to give increase in the percentage of cuttings rooted at least in the stock pear at Coonoor. In Malta lemon 6" cuttings were found to give as high a percentage of rooting as 12" cuttings at the A. R. S., Taliparamba. Thus the working out of the minimum length of cuttings required to get the maximum percentage of plants in each variety may help to economise scion material as well as increasing the number af plants that can be propagated from one tree.

The percentage of rooting was even found to be controlled by the month of planting and even in the particular month certain periods were found to be more conducive for better rooting than the others. To cite an instance the last week of September was found to be more conducive for rooting than the other weeks of the same month with pear cuttings at Coonoor.

Similarly the best season for the propagational activities also varies from plant to plant. In fig a maximum success of 50% was obtained

during January—February and August at Coonoor. For top-working by side-grafting the months of June to September was found to be more favourable under West Coast conditions.

Difference in size and age of stock also influence the "take" in jack and it is found that thin "stock" gives a higher percentage of success than customary pencil thickness stock.

The above reveals the wide range of adaptabilty or otherwise shown by different plants regarding the vegetative propagation. The method which gives the highest percentage of success is to be worked out and standardised and disseminated to the public.

Considering the great demand for plants the production is limited and has reached almost the breaking point due to the limited resources available. The opening of Model Orchard cum nursery centres in many places may fill up this gap to a certain extent though not to the satiating point.

Licencing private nursery trade: This should be done to regulate the quality of plant material so that the extra demand for plants may be diverted to the private trade to balance the demand and supply. As it is, it is not safe to divert to any private nursery as no work has been done to standardise their product.

What the public can do: The public can also take a good part in these activities. They may point out trees of desirable characters to the departmental staff for perpetuating the clones for future multiplication and distribution.

Want of skilled field staff: Some of the vegetative propagational methods are of recent origin and this accounts for the poor development of this horticultural aspect of agriculture. To give fillip to this it is necessary to impart knowledge to the ryots in the villages who are actual cultivators by means of demonstration as well as through the medium of schools and vernacular papers and films, if possible.

Methods to be Adopted for Maximising Production and Development of Improved Strains — Oilseeds

By

C. R. SESHADRI

Oilseeds Section

Introduction: In the present context of acute shortage of oils and fats in the world, it has become increasingly necessary to augment their production to the maximum extent possible. India, the biggest producer of oilseeds, has a special responsibility in meeting this shortage. Since the commencement of the Second World War, the export of oilseeds from this country has dwindled considerably owing to the development of oil crushing and to the increased consumption for edible and industrial purposes. Hence there is urgent need to step up production of Oilseeds to meet the growing internal demand and also to maintain India's status in the international markets. Otherwise, she may permanently lose the substantial export trade which had been built up all these years and thus fail to earn foreign exchange which the country badly needs at the present moment.

The Panel on Oils and Soaps constituted by the Government of India, went into this question thoroughly and recommended increased targets of production for each of the oilseeds grown in the country with a view to attaining self-sufficiency in respect of both internal consumption and export demand. Madras being the most important oilseeds producing State in the Indian Union has got to play her part in this great effort at self-sufficiency. On the basis of the targets fixed by the Panel, this State is required to increase her present production by more than 50 per cent. To achieve this additional production, it would be necessary with the existing methods of cultivation, to increase the acreage under these crops by another 3 million acres. This is neither possible nor desirable at present. So other avenues of augmenting production will have to be explored. In this paper, the utility of improved strains for this purpose is discussed and suggestions to effect improvements in the present methods of their production and development are given. The crops mainly considered here are groundnut, gingelly and castor.

Methods of Increasing Production: Increasing the areas, adopting intensive cultivation, controlling pests and diseases and using improved strains are the common methods of increasing production. Extending the area under oilseeds at the expense of other crops like cereals, pulses, cotton, etc., is not desirable at present as the production of the latter crops are also far short of the requirements. Under these conditions the extension of area under oilseeds has only limited scope. Any step taken

for increasing production of oilseeds should necessarily be one that does not interfere with other crops. At best, these can be raised as catch crops in areas which remain fallow. The dryland fallows of the coastal districts and the rice fallows of the deltas could be utilised for growing cold weather gingelly and summer groundnut and gingelly respectively. If a special drive is launched to induce the cultivators to take up to such cultivation, then the present acreage under oilseeds can be increased by about 5 lakhs acres.

Intensive cultivation and control of pests and diseases would no doubt result in increased yield of oilseeds by 10 to 20 per cent. To achieve this, considerable spade work by way of collection of experimental data and carrying out of propaganda will be necessary. This would naturally involve time and may not therefore be capable of giving quick results.

Number of high yielding strains of groundnut, gingelly and castor have been evolved by the Oilseeds Section and trials carried out with these under ryots' conditions have conclusively proved that they are capable of giving increased yields of more than 20 per cent over the local cultivated varieties. If the local varieties are replaced by the improved strains, the present level of production can be increased at least by 20 per cent within a few years. Thus the use of improved strains appears to be the most potent method of increasing production of oilseeds in the State.

Progress of Oilseeds Development Work: Supply of improved strains of oilseeds to the District Officers has been regularly made from the Oilseeds Breeding Station, Tindivanam for the last 10 years. But their multiplication and spread have not proceeded to the extent desired. The area under the improved strains is now estimated to be about 5 lakhs acres which is not even 10 per cent of the total acreage. Review of the developmental work relating to the oilseed strains would show that the following factors have been responsible for this poor spread :

(i) Inability of the Breeding Station to meet the full requirements of seeds of the District Staff.

(ii) Failure of the monsoons.

(iii) Low rate of multiplication in the case of groundnut.

(iv) Inability of the District Staff to pay the requisite attention to seed development work.

(v) Absence of incentive to Seed Farm cultivators to produce seeds of good quality.

(vi) Inability of the department to make available seeds of improved strains at reasonable prices.

All these factors appear to have contributed equally to the low rate of spread of the strains. Unless suitable steps are taken to overcome these limiting factors, the oilseeds development work cannot be expected to record any satisfactory progress in future.

Suggestions to improve existing methods: To make large quantity of pure seeds of the strains available to the cultivators, it is necessary to multiply them on a much larger scale than has hitherto been attempted. With a single nucleus seed centre it would not be possible to meet the requirements of the entire State. Maintenance of a single centre has other serious disadvantages namely (i) the quantity and quality of seeds are adversely affected by vagaries of the seasons and (ii) cost of seeds gets increased on account of transport over long distances. These can be avoided by establishing Nucleus Seed Farms in different parts of the State. The establishment of such Zonal Nucleus Seed Farms would not only result in increased production of improved seeds but would also help in getting over the adverse effects of the season and in reducing the cost of transport. Six such Zonal Nucleus Seed Farms for the large scale multiplication and distribution of improved strains of groundnut and castor have been started this year in this State under a scheme financed by the Indian Central Oilseeds Committee.

The seed rate for groundnut is very high (100 lb. to 150 lb. of pods per acre) and hence the rate of multiplication in the crop even under normal conditions is very low being only 5 to 6 times. As the area devoted to the cultivation of this crop is very large and as the rate of multiplication is low, it is very necessary to organise seed farms on an extensive scale in order to produce large quantities of seeds. In some of the important groundnut growing districts of the State, the area under the crop in each taluk may be more than 50,000 acres. Unless 50 acres of primary seed farms and 250 acres of secondary seed farms are organised in each such taluk every year and their produce systematically procured and distributed, it may not be possible to replace the local with the improved strains in less than 10 years. Thus there is urgent need to organise seed farms of groundnut strains on a very large scale, especially in localities where this crop is extensively cultivated. It is in furtherance of this object that regular supply of nucleus seeds of the groundnut strains are proposed to be made from the six Zonal Nucleus Seed Farms recently started in this State.

The developmental work connected with the improved strains requires considerable attention. Unless proper attention and care is bestowed to the various details connected with the cultivation, roguing, handling produce after harvest, procurement, storage and distribution it will not be possible to supply large quantity of pure seeds of the strains. The District Staff have not been able to pay the desired attention to this

work as it forms one among the several duties assigned to them. Consequently, both the quantity and the quality of seeds distributed have suffered a great deal. In the case of groundnut where the rate of multiplication is low and where quality of seeds is of the utmost importance, special care has to be taken at every stage of this work to get the desired result. The District staff as at present organised is not in a position to devote as much attention and care as the work actually demands. As this item of work is the most important one in our departmental activity, it calls forth for much better attention than in the past. For carrying out this work effectively and efficiently, a special 'Seed Development Wing' will have to be established which can be entrusted with the sole task of multiplication and distribution of improved strains of all the important crops. The Nucleus Seed Farms established in the different tracts will supply necessary nucleus seeds to the Seed Development Staff and they will multiply them in further stages and make large quantity of pure seeds of the strains available to the cultivators. Special Seed Development Officers will have to be appointed for this work. The Seed Development Officers will be in-charge of one or two districts and they should possess adequate knowledge of all the crops. For this purpose, they will be required to undergo intensive training at the main Crop Breeding Stations. This would equip them with requisite knowledge to carry out the work efficiently. They will be assisted by Seed Development Assistants and Fieldmen at the taluk level. It will be the duty of the Subordinate Staff to organise the various stages of seed farms, procure seeds of the desired quality and arrange for their proper distribution. The method of working suggested is similar to the one now carried on in cereals and cotton. But in this new proposal, the Seed Development Staff will be required to handle all the important crops in the tract and carry out the work intensively within a limited area. The officers and subordinate staff now working in the various Seed Development Schemes can be utilised for bringing into existence this 'Seed Development Wing'. Creation of this special wing will go a long way in accelerating the spread of improved strains of oilseeds and take us nearer towards self-sufficiency in a shorter time.

Distribution of market quality seeds will not serve the object in view especially in the case of groundnut as such material cannot be expected to have received adequate drying and cleaning. To secure good seeds that would ensure proper stand of the crop and give remunerative return, it is very necessary that the produce should be thoroughly dried and the seed pods hand-picked to facilitate rejection of immature and damaged pods and other off types. Unless this is scrupulously carried out, it may not be possible to establish a reputation for good quality seeds in groundnuts. The process of drying and cleaning not only involves extra labour but also entails some loss to the cultivator by way of driage and reduction in market value of the rejected produce. To induce the Seed

Farm Cultivators to deliver seeds of the desired quality, adequate compensation will have to be paid by way of premium. The amount of premium to be paid would depend largely on the local conditions and this can be fixed for each of the important producing areas. Without payment of premium, the cultivators cannot reasonably be expected to deliver good quality seeds to the department. For maintaining the reputation of the department, only standard quality seeds should be procured for distribution by payment of adequate premium.

Another equally important factor affecting development of improved strains is their price. The average cultivator being poor and illiterate, cannot appreciate the usefulness of the strains and come forward to purchase them at enhanced rates. As the price of seeds is the major obstacle in the spread of the strains, every endeavour should be made to supply them at reasonable prices. This can be done either by making the seeds available at comparatively cheap rates or exchanging them for the local varieties weight for weight. By adopting these methods even the most conservative among the cultivators can be induced to take up to the strains in preference to the local seed. The adoption of these methods would, however, result in some loss to Government. This loss would be more when the strains are taken in exchange for the local seeds. To make seed development work a success, the Government should undertake to meet this loss. Unless the Government adopted a bold policy in subsidising supply of seeds of improved strains, the progress of their spread in this State cannot be sufficiently rapid to achieve the increased production aimed at within a reasonable time.

Summary: It is very necessary to increase production of oilseeds in the State to meet internal consumption and export demand. Of the different methods of increasing production, use of improved strains is the most potent one, capable of giving substantial and quick results. To make large scale multiplication and distribution of improved strains a success, the present methods of development work will have to be reorganised on the following lines.

(a) Establishing Nucleus Seed Centres on a Zonal basis so as to ensure regular supply of pure seeds to the Seed Development Staff.

(b) Organising at least 50 acres of primary seed farms and 250 acres of secondary seed farms of groundnut strains in important groundnut growing taluks to accelerate the rate of their spread.

(c) Organising a special 'Seed Development Wing' in the department exclusively for the purpose of large scale multiplication and distribution of improved strains.

(d) Offering adequate premium to Seed Farm Cultivators as inducement for delivering standard quality seeds to the department.

(e) Making available large quantity of pure seeds of improved strains to the cultivators either on exchange basis or at some reasonable prices.

If these suggestions are adopted, the improved strains of oilseeds would rapidly replace the local varieties and a substantial increase in the production of oilseeds would result within a short time.

OBITUARY

It is with deep sorrow that the demise of Sri C. S. Rajarathna Mudaliar is recorded in this Journal. He was actively connected with particularly the entertainment activities of many College Day and Conferences celebrated in the previous years. We pray that the Almighty should rest the departed soul in peace and give the required strength of mind and body to the members of the bereaved family to overcome the irrepairable loss.

A Note on the Importance of Seed Multiplication Work in Cotton in Maximising Production and Suggestions to overcome the Difficulties met with in the Procurement of Seeds *

By

N. G. NARAYANAN, B. Sc. (Ag.)

Of all achievements made by the Agricultural Department for maximising production and increasing the income of the cultivators, the evolution of improved strains of crops is the most important one. Even the worst critic of the Department cannot but admit the advantages derived by the cultivators by growing the departmental strains. Since a good deal of attention is paid by the cotton breeders to evolve a strain combining good yield, higher ginning percentage and better staple, growers of departmental strains are benefitted not only by the increased yield that they get, but also by the higher price offered to their produce on account of its higher ginning percentage and better staple. In order to see that the ryots derive the benefit of growing improved strains, sufficient quantity of pure seeds of improved strains should be made available to them. In pulses and cereal crops the cultivators generally gather their own seeds from the previous crop and keep for their next sowings. But in Cotton, this practice cannot be followed due to the peculiar nature of the produce and its method of marketting. The cotton growers invariably sell their produce as kapas and purchase their requirements of seeds every year from other sources. Unless the Department runs seed multiplication schemes for each and every strain of Cotton, with a view to supply pure seeds of these new strains to the cultivators every year, the strains evolved by laborious work at great cost will lose its value by getting mixed with other varieties, and the cultivators cannot get their requirements of pure seed. Thus the work of seed multiplication in cotton assumes greater importance than in the case of grain crops.

Procurement work of cotton seeds from seed farm ryots bristles with difficulties due to the peculiar nature of the commercial crop and its highly fluctuating prices. Unlike cereals or pulses which can be purchased directly from the producers, cotton seeds cannot be purchased from the growers as the seeds cannot be easily extracted from the produce (Kapas) except with the aid of a machine. Since the more valuable portion of the kapas is lint, the cotton seed is treated as a product of lesser importance in trade. Cotton growers have always been in the habit of selling their produce only in the form of kapas. It has not been a practice with the ordinary ryot to gin his produce and dispose of the lint and seed separately. So delivery of seed to the Department by individual ryots is not a practical proposition. Introduction of Cotton

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Control order fixing ceiling prices for lint has made the situation worse, since the prices for kapas always ruled high and there was no parity between lint and kapas prices. The growers would get the maximum profit only if they dispose of their produce in the form of kapas. So the department has to make arrangements to procure the seed through merchants or ginning factories. Since, kapas prices will be highly fluctuating according to supply and demand, the ryots would not easily part with their kapas till they get the most advangeous price for their produce. Sometimes they keep the produce even after the sowing of the next crop. A portion of the seedfarm produce is thus denied for procurement. Another difficulty is due to the competition among merchants, in the purchase of kapas. They go to the villages and purchase seed farm kapas at higher prices without the knowledge of the Department. Of late, many of the seed farm ryots do not honour the seedfarm agreements they have executed. So a good portion of the seedfarm produce is sold outside without notice to the Department.

Another difficulty is also met with in procurement. Most of the seedfarm ryots are in need of money after the harvest is over. They at the same time, are unwilling to part with their kapas at the prevailing prices, as they are anxious to wait for better prices. Since, there is no provision to give loan to seed farm ryots on the pledge of their produce, the ryots take their produce to the ginning factories and take loan from the owners on the pledge of their kapas. Such ryots generally have to sell their kapas to the factory or merchant who has financed them, and the seed is thereby lost to the Department.

Procurement of seed farm kapas can be made easy if the following suggestions are adopted.

1. The seed farm cotton should be given an attractive premium over non-seed farm cotton in order to prevent seed farm ryots from selling their kapas to merchants. A premium of 15% over the prices of non-seed farm cotton is suggested. This premium should be made available only to such cotton, the seeds of which are procured by the Department for sowing.

2. The premium paid for the seed should be raised to 40% over Cattlefood rate in order to make it profitable for the ryots to gin their kapas and sell the seed to the Department.

3. The seed farm ryots should be given an advance to the limit of 70% of the value of kapas brought by them to the ginning factory fixed by the Department to prevent the seed farm ryots from pledging their stock with ginning factories and merchants.

If the Department can guarantee prices for seed farm cotton higher than those offered by other agencies there cannot be any difficulty in the procurement of seed farm produce.

A Note on "The Methods to be Adopted to Maximise Production and Development of Improved Strain and Plant Materials" *

By

K. SATHYANARAYANAMOORTHY, B. Sc., (Ag.)

Among the various methods that are in vogue for maximising production and development of improved strain and plant materials in different parts of the country, those that are suitable for a particular locality are to be adopted. The important methods that can be adopted to achieve the objects are :

1. Production of pure seeds of the strains either on Government Farms or on private holdings or on both each supplementing the other at some stages of production.
2. Adopting certain methods so as to keep the pure seeds of the strain within the reach of the cultivator for the purposes of purchasing at the time of sowing or a little earlier.
3. By keeping the cost of production and transport of these seeds at a minimum level so that it may be within the financial means of the cultivators or at any rate not more than the local market rate.
4. By educating the ryots, stressing the importance of the good characters of the strain and the increased profit that could be obtained by growing the improved strains.
5. By arranging to market the produce, if there is no market in the locality for the produce.

It is needless to mention that there should as many seed farms as possible for the production of pure seeds at one place or more centres in a locality or zone where conditions for obtaining increased yields per acre are more favourable. One aspect which may add to maximise production and development of improved strains is to keep these seed farms (from the primary multiplication to large scale multiplication stage).

2. *Availability of seeds to the ryots :* Maximum quantity of seeds can be sold by making them available for sale practically in every big village or for a small group of villages situated near by just before the sowing time or a little earlier. This can be achieved by various means, (a) by encouraging formation of multi-purpose co-operative societies practically in every village or a group of villages through which the seeds can supplied and (b) by supplying through departmental lorries in addition to the depots now existing under the guidance of the Department. Now that the propaganda Officers are provided with vehicles and staff, it will be of immense help to the cultivators if the improved seeds

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are transported and sold on a shandy day in the villages in proper season. This not only popularises the activities of the Department but helps to maximise production of improved strains.

3. *Keeping the cost of production low:* The objection often raised by the cultivators is the high cost of improved seeds. Though they are aware of the advantages of growing the improved seeds many ryots usually hesitate to purchase at a high cost due to initial investment involved. The cost of roguing is generally the additional item (leaving apart careful harvesting and threshing) in the production of improved seeds and this can be minimised.

4. *Educating the ryots:* Under this item, it is possible to introduce a number of new items (of course involving comparatively less cost) in addition to the usual methods of propaganda now being adopted (like conducting exhibitions, lectures, radio talks and coming in contact with the rural folk etc.) The most important place at present for doing propaganda or educating the public both urban and rural is a cinema theatre. It is a known fact that there are very few people who have not seen a talkie now-a-days—whether residing in the villages or towns and anything exhibited in a cinema will have a much more educative and propaganda value and will leave a deep impression on the minds of the spectators. In addition to exhibiting slides, small reels—not running for more than ten or fifteen minutes like the news reels now being exhibited in many theaters can be produced and exhibited. Of course it will be made interesting by combining with an interesting story, or a dialogue or a popular song.

Writing small plays about the improved strains in popular language to fit in the village dramas (for enacting during intervals—especially between serious scenes) is another way of educating the public and maximising the production of improved seeds.

5. *Marketing of the produce:* The difficulty of marketing of the produce exists only in certain crops (for obtaining the proper price due to the improved strain) like cotton and this difficulty can be got over by organising the multipurpose co-operative societies which can arrange even storage facilities for a short time at least. Intimation of correct prices and standardization of local weights will go a long way in obtaining the proper value for the improved strains and maximising the production.

Above all, production of improved strains with marked improvements in at least one character or other over the existing strain under cultivation will give the highest impetus for maximising production of the improved strain, the standing examples being Westerns 1 (H. 1) cotton, Co. 419 sugarcane 'G. E. B. 24 paddy' etc.

Five Year Plan and National Progress with Special reference to Agronomical aspect*

By

N. RANGANATHACHARI, B. Sc. (Ag.),
(Asst. Lecturer, Agricultural College, Coimbatore.)

Indroduction: The Five Year plan has been launched on a nation wide basis with the object of achieving 'Economic Freedom' after the attainment of 'Political Freedom.' No subject in recent years has come to more prominence than this Plan.

A nation can achieve real progress if every aspect is properly tackled and efforts of various operators are co-ordinated.

Targets to be achieved as a result of the Plan:

	For the Indian Union.	*For Madras State.*
Food grains	7·2 million tons	8·34 lakhs of tons.
Cotton	1·2 million bales	2·18 lakhs of bales.
Oil seeds	3·7 lakh tons	1·42 lakhs of tons.
Sugar	6·9 lakh tons	78,000 tons.

The agriculturists, traders, industrial population and men in services go to form the bulk of the population of a country besides a negligible number engaged in literary pursuits, arts and social services.

Rural Problems: 1. Nearly 85% of the population depend upon land in Madras State. 2/3 of the farmers possess '*uneconomic holdings*' 60% of the farmers cultivate their own lands. 15% are land owners who do not cultivate, but make use of land-less labour in the villages. Another 10% also are land owners, and they take lands of non-cultivating owners' lands for cultivation in addition to their own.

2. *Rural Indebtedness* is another bottleneck and a major obstacle to agricultural advancement. In spite of the increased prices of commodities, the chronic poverty of farmers persists resulting in a vicious circle of lower investment, lower standard of cultivation, lower income, lower standard of living and lower efficiency. As a result of this vicious circle, yields have declined or remained stagnant; land has been excessively exploited due to increasing pressure of population. Since only 28% of the cultivable land is having irrigation facilities, the profession of farming is still in the stage of gambling.

3. *Village factions*, the resultant litigation and the time wasted in pursuing the litigation to the detriment of agricultural business the

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lack of security of produce due to easy going elements who deprive the owner of his legitimate fruits of his labour are other causes retarding agricultural progress.

4. The development of unlimited number of amusements and eating houses in towns and cities has attracted the vital food of the village namely milk, milk products and vegetables to flow out of the village, (to fetch better prices) beyond reasonable limits, starving the village population and sapping their vitality. This is a slow acting silent evil that has gained momentum since two decades and the deleterious effects are very clearly seen in the rural population.

5. Modern health and medical services, education facilities and services of veterinary staff for animal husbandry improvements have not reached village population to the extent desired.

Tangible results can be had on tackling the deficiencies in a collective way since the cumulative effect of all the measures taken alone can have the desired reformation that is expected to be brought about in the villages.

The pre-requisite for this, is, tackling small units of 3 villages by providing a trained multi-purpose worker and a village committee to work in co-operation. These people will draw out a plan to produce in their unit sufficient food, clothing, fuel, pasture, cattle food and raw materials for housing.

A mobile team of workers from Agriculture, Animal Husbandry, Co-operative, Industries, Health, Education and Medical Departments should be entrusted with 4 or 5 units of villages (i. e. 12 to 15 villages) for bringing about all round improvements.

Besides these, agrarian reforms suited to each tract must be formulated and implemented to offset the defects of uneconomic holdings which will pave the way for stepping up production.

In general, a better system of tax on land viz. Agricultural Income Tax, provision of easy credit through co-operative banks, modifying the existing rules in the matter of recovery of loans will be of immense help.

Water for irrigation being most essential, and for which many do not have the means to provide themselves, the irrigation engineering units of Civil and Military Departments should be set to work in rural areas, with the main purpose of tapping water for digging new wells or augmenting water supply in existing wells by the use of their machinery and immediately fitting up pumps wherever needed. The owners of lands will meet the cost of well and pumpset in one instalment or take charge through Co-operative Societies. This will greatly relieve the farmers the troubles they are now experiencing in this direction.

Next to water, good seeds, adequate manures and work cattle are essential for which credit facilities can be offered through Co-operative Banks for those who are in need.

Regarding the Agrarian reforms envisaged "Collective farms" on lands of poor quality and cultivate wastes, and "Co-operotive farms" on less densly populated areas are suggested worthy of consideration. Zionist colonies of Palestine, collective farming in U. S. S. R. have met with success. The "Individual farming" in its present set up need not be meddled with. Facilities for water, seeds and manures have to be provided to these holdings in a practical way.

For the conditions existing in our state co-operative farming (complete or partial) for sparely populated places and collective farming for less fertile lands is likely to be suitable.

Having dealt with the rural ills and the possible ameliorative measures; a few words about the 'Human Factor' on which rests the entire responsibility of success or otherwise of any scheme and especially a scheme of this magnitude and importance aimed at elevating the nation as a whole from its present level, needs mentioning.

Teams of social workers have to go about imparting moral lessons in the shape of stories, poems, posters pertaining to our glorious past which has so long been maintaining us from degeneration.

Inspite of the food position being grave, the required sense of emergency has not pervaded over the country. It is probably due to inadequacy of tempo behind the appeal so far made or want of thrill on the part of the population to respond to the appeal or partly both. The height to which the enthusiasm and sense of duty should have risen has not so far been reached to meet the needs of a situation of this magnitude. Imagine a calamity in the form of fire or flood occuring in a place or the advance of an army and the reaction it involuntarily creats in the people of that region to safeguard themselves and protect their hearths and homes. In the grave danger of starvation occurring since several years the feeling of emergency has not been stirred to the desired extent to meet the danger. This has to be closely scrutinised and all impediments responsible for damping the enthusiasm should be removed.

In every zone the Plan operates, the specific items that are being tackled and the nature of help that is required from that area should be chalked out and given widest publicity. Propaganda that should be appealing to the people should be adopted. Business houses and film industries offer a lot of material worthy of copying.

The Community Projects Scheme started last year is on the lines contemplated in the Five Year Plan. In the course of executing them many important lessons may be learnt.

Some Successful Plant Introduction and How Best to Maximise Their Production

By

C. RAJASEKHARA MUDALIAR, M. A.,
Government Lecturing and Systematic Botanist, Coimbatore

A short account of the successful plants has been given and how these can be multiplied on a large scale has been indicated under each crop. Recently a Scheme to maximise production of green leaves in dry areas of the State has been formulated and most hardy plants suitable for these tracts have been recommended; the object of this Scheme is to maximise production of green leaves in these poor rainfall tracts so that each Research Station can be self-sufficient in the matter of compost requirements. A scheme has also been taken on hand to grow extensively cover crops such as *Calopogonium muconoides, Centrosema pubescens* and tropical 'Kudzu' in the Nilgiris, Malabar Arakuvalley and other heavy rainfall tracts so that all slopy lands can be quickly covered with vegetation to prevent soil erosion. Seeds of these crops have been distributed to these centres this year for starting the trials. To ensure rich and nutritious pasture on the hills, seeds of Clover (*Trifolium* spp.) obtained from Africa have been distributed to the Research Stations in the Nilgiris for trial and introduction. During Botanical surveys in the Nilgiris *Trifolium* spp. particularly, *Trifolium repens* and *Trifolium subterraneum* have become naturalised on the hill slopes and already they have been observed to form good mixtures with local grasses such as *Paspalum* spp., Kikyu, etc. In addition to the natural spread, if propagation by seeds and cuttings is taken up practically all available pastures on the Nilgiris Hill tops can be covered with this rich and nutritious fodder.

A short account of the successful plant introductions and the efforts that are being made to maximise their production are given.

Under fodder grasses, the introduction, performance and methods for multiplication of water grass, Giant star, *Panicum antidotale*, 'Bloubuffel' and Thin Napier are indicated.

Similarly under legumes and cover crops, the multiplication of important introductions like *Glycine javanica, Centrosema pubescens, Calopogonium mucnoides, Pueraria phaseoloides* and *Indigofera endecaphylla* are given.

The section under green manure deals with *Tephrosia Crotolaria* and *Tithonia*.

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Trial of scented geraniums, *Vetiveria zizanoides*, *Eucalyptus citriodora*, *Beta vulgaris* (white), *Canna edulis*, *Mentha-piperata*, *Boehmeria nivea*, *Hibiscus sabdariffa* and Balsa, in different Agricultural Research Stations and the possiblities of increasing their production are given.

The Schemes now on hand to maximise the production of greenleaf for composting, cover crops for soil erosion and Clovers for pasture are indicated.

Production and Development of Improved Strains of Vegetable Seeds *

By

S. A. EBRAHIM ALI, B.SC., AG., D.I.H.,
Plant Protection Assistant Entomology, Tanjore.

Introduction : The role of vegetables in human nutrition needs no emphasis. As per latest standards of nutrition, each adult requires 6 oz. of non-leafy vegetables and 4 oz. of leafy vegetables per day. Therefore an annual per capita production of 228 lbs. is required to maintain normal health of the people and prevent malnutrition. But the present 'per capita' production in our State is miserably low, as low as 37 lbs. Thus we are confronted with a huge deficit which has to be made good by a more intensive and planned scheme of cultivation.

Importance of Good Seed: Among the various methods of increasing the production of vegetables, improved seeds play a vital part. Production of vegetable seeds has not been an organised industry

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in our State. Most of the vegetable growers are content with the seeds produced in their farm itself except in the case of some exotic vegetables where seeds do not set properly. It requires expert knowledge to select properly the best plants for seed production, to harvest at the right stage of maturity and cure the seed in such a way as to insure good germination.

Except perhaps a few of the well established seed firms, with a claim for long record of useful service, all others are only keen on making quick profits. Naick (1944) found out that the percentage of impurity in the vegetable seeds supplied by these firms ranged from 40 to 83 while the percentage of germination varied from 32—65 in brinjal, 59—81 in bhendi, 40—65 in beet, 40—80 in beans, 60—68 in cabbage and 20—95 in turnip. Such a pitiable state of affairs not only speak very bad of our vegetables seed trade but also involves huge national loss in the cumulative effect of such an unregulated seed industry. A system of guaranteeing purity, viability and disinfection is therefore urgently needed to safeguard the vegetable produces from the recurring loss due to the supply of useless, impure and unviable seeds.

Seed production in advanced countries like U. S. A. is a specialised industry centralised in localities which are peculiarly adapted because of soil, climate and often freedom from disease. The commercial production of seed is accomplished under very careful and expert supervision. Seed houses have trial grounds where the seed of each individual lot is tested for purity. But supply of quality seeds will go a great way to increase vegetable production.

Improvement of Vegetable Seeds: Our vegetable industry is still in the infant stage. We have a vast number of undefined heterogenous varieties of vegetables with poor performance. Thus many problems remain to be tackled before any improvement in the production of seeds could be effected. As in the case of other crops, varietal trial and introduction of both indigenous and exotic varieties with a view to study their comparative merits must be taken up. Detailed descriptions of species and varieties have to be made to facilitate identification. In view of the large number of varieties in cultivation, there is much scope for selection of promising varieties. Maintenance of purity at the original level of heredities by preventing cross or interfertilisation must of enforced through seed inspection services and field inspection of mother plants and control culture of daughter plants. It is widely believed that the South Indian climate is not congenial for seed setting in the case of a few exotic vegetables like cabbage, cauliflower etc. Work done at Coonoor Pomological Station has disclosed that there is no foundation to this belief. One of the well known imported cabbage varieties viz. 'Early Drumhead' was successfully induced to set seed

and a popular variety of cauliflower 'Pomocol' has also been found to yield good crop of seeds. Acclimatisation of desirable imported strains must be done before distribution. Hybrid vigor has been profitably employed not only to increase yield but also promote other desirable qualities like earliness, size and taste etc. The classical work Kakizaki and others lends support to this line work, though it has got its limitations. It may be quite easy in the case of vegetables like tomato, brinjal and some cucurbits. But care must be taken to see whether the performance of the F_1 hybrid is remunerative under varying climatic and soil conditions. It is also essential to prevent the collection of seeds from F_1 plants so that the hybrid vigour secured in the first generation. All these could be taken up only by State agencies with an elaborate research staff. In fact there must be a wholetime Specialist to look after all these items of research for the improvement of vegetable crops.

Summary and Conclusion: Home production of vegetable seeds has its limitation. The private seed trade must be regulated and controlled. Indiscriminate supply of seeds should be stopped and only selected and approved seeds must be issued. Guarantee certificates regarding purity and viability must accompany all consignments of seeds supplied to the Public. A scheme of elaborate research consisting of classification and nomenclature of vegetables, introduction and selection of desirable varieties and production and distribution of Hybrid seeds, must be launched. Such a scientific investigation holds out brighter hopes for our vegetable seed trade and consequent improvement in the quality and quantity of vegetables produced, accompanied by a welcome changes in the standard of our public health.

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Maximisation and Development of Selected Seedlings Production in Government Coconut Nurseries*

By

S. G. AIYADURAI, B.Sc., (Ag)
Assistant Oilseeds Specialist

&

A. N. VENKATESWARAN, B.Sc., (Ag.)
Coconut Nursery Assistant.

Introduction: Madras accounts for nearly fifty per cent of the total acreage under coconut in the whole of Indian Union. About 1,500 millions coconuts are produced annually from the coconut growing tracts in the State. Coconut is considered as one of the world's principal sources of food both for the peoples of the tropics and those of the heavily populated temperate regions. In addition it is an important industrial crop There is growing demand for coconuts and coconut oil resulting chiefly from the increase in population and the rising tempo of industrialisation within the country. Therefore it has, become very necessary to step up production of coconuts in order to bridge the wide gulf between the supply and demand.

To attain self sufficiency, the production of coconuts has to be almost doubled in the State. The short-term method of increasing the production in the existing gardens by adopting improved methods of cultivation and manuring alone may not be sufficient to achieve this end. Side by side with the short term programme, the long-range method of increasing the area under coconut has also to be adopted. In addition many of the existing coconut gardens have become too old and unremunerative. Underplanting in such gardens has to be immediately taken up. The programme of undertaking fresh planting naturally involves the demand for sufficient planting material of good quality.

Requirements of Coconut Seedlings of Madras state: Considering the area under the crop in the State and assuming that all the existing coconut gardens were grouped according to their age, nearly 1/70 of the total area, about 9,000 acres would become due for under planting every year, allowing a useful bearing age of 70 years for the palm. Calculating at the rate of 60 trees per acre the annual total requirements of coconut seedlings for underplanting would therefore be about 5 lakhs. The total number of coconut trees in the State has been estimated to be 4,34,26,740 and of these 2 per cent of the trees may be taken as casualities every year either due to incidence of pests or diseases or damage caused by natural forces. This would, therefore, require about 8 lakhs seedlings every year to fill up the gaps. Also provision has to be made for supply

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of seedlings to raise fresh plantations. But it was observed that during the past four years there has been a steady demand for supply of nearly 2 lakhs seedlings every year and about 70 percent of this demand was being met by supplies from coconut nurseries. However there is no denying the fact that a large number of coconut seedlings are being bought every year by the growers from the private nursery men and big garden owners who raise coconut seedlings for sale.

Government Coconut Nurseries and Distribution of Seedlings: In order to supply the coconut growers in the State with selected coconut seedlings of reliable quality, small coconut nurseries were started by the State Government at the Coconut Research Station, Nileshwar in 1944 and at the Agricultural Research Stations, Pattukottai, Samalkot and Pattambi in 1946. While running these nurseries, it was observed that as the seedlings produced at the Government nurseries were considered superior to those obtained from other sources, the demand for them was rapidly increasing from all quarters. Therefore, with a view to produce selected coconut seedlings on a large scale eight coconut nurseries with a total target of 1,60,000 selected seedlings per year were started in the important coconut growing districts of the State in 1949 with the financial aid of the Indian Central Coconut Committee. During the past three planting seasons a total of 3,61,357 seedlings have been distributed among the coconut growers in the State. The large scale production of selected seedlings at the Governmant nurseries has to a great extent eliminated the possibility of the growers obtaining and planting coconut seedlings of unknown pedigree bought from local nursery men.

Suggestions for Improving Coconut Nursery Work and Maximising Production of Coconut Seedlings: In the running of the nurseries under the Comprehensive Coconut Nursery Scheme certain practical difficulties were experienced. These were carefully considered and the following suggestions are put forward for improving the work and maximising production.

(a) *Survey:* Periodical survey of the important coconut growing tracts of the State is absolutely essential with a view to fix up localities where the production of coconut seedlings can be concentrated considering the following aspects.

(i) Area under the coconut in the locality.

(ii) Possibilities of increasing the area under the crop.

(iii) Area that requires to be under-planted.

Increase in production can be achieved by the following two ways.

(i) By starting new nurseries in the coconut growing tracts.

(ii) By training and encouraging big garden owners and private nursery men to produce selected seedlings on the lines advocated by the Department.

More nurseries have to be started at selected centres in the coconut growing districts according to the demand for seedlings. The location of these nurseries has to be done on a regional basis, each catering preferably to the needs of a particular region. The big garden owners and private nursery men who are not producing and selling coconut seedlings to the public should be given adequate training on scientific lines. Only those who have undergone the training at the Government nurseries should be licensed and allowed to sell seedlings. The nurseries should be inspected by the Departmental staff at each stage. A start in this direction is desirable at the present juncture.

(b) *Target:* The target of production of selected seedlings at each nursery centre should be fixed at what could be efficiently managed and with the best attention paid to each stage of production. It should be a figure that can be conveniently distributed during the planting season in the tract itself. The maximum limit of production can be fixed at 20,000 seedlings per year while the minimum may be 10,000 seedlings.

(c) *Facilities:* The nursery should be located as near the seednut centres as possible, preferably on sandy soils and should have adequate irrigation facilities. Centres selected for seednut collection should be easily accessible to facilitate easy and quick transport and also reduce the cost of production. It would be a great advantage if the gardens are concentrated in blocks.

(d) *System of distribution:* In order to speed up the distribution of seedlings during planting season, other agencies like the Co-operative Sales Societies, Panchayat Boards, Firka Development Centres, Colonisation Scheme Societies etc., are to be contacted in time and supplies arranged to the growers through them. This would help the small growers to obtain their requirements conveniently.

For successful running of the Government Coconut Nurseries in the State, the above mentioned suggestions deserve careful and serious consideration by the Department.

Summary: (i) There is urgent need to step up the production of coconuts in the State by almost 100 per cent in order to reach self sufficiency in coconuts and its products.

(ii) The demand for selected coconut seedlings is rapidly increasing.

(iii) Two ways of increasing the production of seedlings have been suggested viz., starting more nurseries by the Government and giving adequate training to private nursery men to raise seedlings on scientific lines.

(iv) The importance of periodical surveys, the nearners of production centres to seed-nut centres and of availability of adequate facilities has been brought out.

(v) The target of production of seedlings at each centre should be fixed at an easily manageable figure, say, 10,000 to 20,000.

(vi) The help of other agencies like Co-operative Sales Societies, Panchayat Boards etc., should be requisitioned to effect the distribution.

Development of Cane Varieties in Madras State and Maximisation of Sugar Production *

By

S. V. PARTHASARATHY, M. SC.,
Sugarcane Specialist

The sugar industry in the State is under expansion and is reaching a stage of self sufficiency. Under the present level of per capita consumption and with further expansion of the factories, the State will be in a position to export sugar to other countries. For steady progress of the industry, scientific planning of varietal and cultural schedules, and controlled harvest are essential. The industry in general, shows a tendency for achieving quick profits to the detriment of continued progress in Development. This led to clash of interests between the factory occupiers and the cane suppliers. In this clash, price of jaggery holds the balance of power; with low price for gur the factory occupier can dictate to the cane supplier; with high price for gur, the cane

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supplier keeps off from the factory. Therefore, more time and energy are being spent in balancing this power than in helping the scientists to play their proper role in planning for progress.

After Sugarcane Liaison Farms were started, correct assessment on the performances of new varieties was carried out. By cultivation of early varieties, the cane grower loses nearly 20% in yield while the factory occupier gains to similar extent. The two factors, price and incentive, play an important role in balancing this position.

That the sugar recovery percent in the State is necessarily low as compared to that in other States is incorrect. The cultivation of Co. 419 which is high in yield and lack of planning by the varieties and the indifference of the cultivators to sugar content in cane are the main reasons. The trials carried out in the four Liaison Farms, proved beyond doubt that there are good potentialities for high recoveries. The sugar content in cane as delivered from the Liaison Farm, Kulitalai is high as compared to that in ryots' cane. In this area, Co. 419 is recording very low pol percent cane as compared to the same variety in other areas. That the fault lies in the cultural practices and not with the soil or climate is now demonstrated by the Liaison Farm.

The role played by time of planting, time of harvest, manuring have all been preliminarily assessed by the Research Stations and the Liaison Farms and the Department is ready to play its full role in planning for higher recoveries and sugar production in the State.

In the periodical sugar recovery curve of the factories of the State, raising the first arm of the curve is easy and can be immediately achieved both by varietal and cultural schedules. The second arm of the curve cannot be so easily improved and more fundamental research on deterioration of cane is required.

Acknowledgment: The data reported here are from the Scheme for Research and Development of Sugarcane in the State partly financed by the Indian Central Sugarcane Committee, to which body my thanks are due. My thanks are also due to the managements of Sugar Factories in the State, who co-operated in carrying out mill tests and recording of mill data.

Plant Introduction and Improvement of Grasses and Legumes (Contd.)

By

C. RAJASEKHARA MUDALIAR, M. A.
Systematic Botanist & Professor of Botany,
Agricultural College & Research Institute, Coimbatore

PART — II

The Organisation of Plant Introduction Bureau in Australia: The Division of Plant Industry of the Council of Scientific and Industrial (Plant Introduction Section) Australia, is responsible for the search of a wide range of herbage species for use in the Commonwealth, with particular emphasis on leguminuous herbage species. On Plant Introduction in Australia, Metaggart (1940) says that the first white settlers in Australia had to bring food stuffs into the country for living; vegetables, fruit crops, grasses and legumes, used in pastures are all introductions; along with these useful plants, unfortunately several hundreds of noxious weeds were also introduced. He refers to seven clearly defind principles for introduction of plants:—

(1) A climatic, soil and vegetational surveys to determine the ecological environment.

(2) The search for desirable plants, by exploration in similar climates of the World.

(3) Imported moterials to pass through quarantine.

(4) Preliminary testing in conveniently placed testing centres to determine their potential value under Australian conditions.

(5) Seed multiplication for wider and more detailed trial.

(6) Detailed trial of selected species under normal Agricultural practice and comparison with standards.

(7) The successful species to be given over to State Departments and other agencies for widespread tests.

The stock of Introductions in Australia in 1940 totalled 6686, including 1406 grasses, 1250 legumes, 72 miscellaneous herbage plants, 2800 wheat etc. All introductions are first placed under quarantine to test diseases and pests. Preliminary testing is undertaken at 3 centres, namely, Canberra, for Mediterranean type of climates, Lawes for sub-tropical introductions, and 'Fitzroyvale' for more Tropical types.

As in most cases very small supplies of seed are received, it is only possible to make first studies on individual plants or in plants in rows. Sometimes plants will not set seed if there is difference in light or

dark periods, or in heat or rainfall. Frequently the seed sample is not a pure line and considerable variation between plants occur. It is necessary to observe all such facts and to study the type of growth of plants in a preliminary rather than diagnostic way; they are also checked taxonomically. Selected grasses and legumes are subjected to plot study and to grazing and mowing in order to determine longevity, palatability, and productivity.

New Zealand: Allan (1931) records that the introduced plants in New Zeland steadily increased from 1855, when Hooker recorded only 60 species, in 1870 the number rose to 292. In 1906 Cheesman has recorded 576 species. In 1931 the number stood at 930, half as many as indigeneous species. The author emphasis the need for a thorough study of the systematics of the alien flora, so that really pernicious plants may be destroyed even in the beginning, before they become regular pests. The author gives instances of half-a-dozen plants which have become pests and concludes that the alien flora has to be more intensively examined at the time of introduction.

The United Kingdom: In his letter dated 4—12—1952 P. S. Hudson, the Director of the Commonwealth Bureau of Plant Breeding and Genetics, School of Agriculture, Cambridge, says that there is no Bureau of Plant Introduction in the United Kingdom as such. He says that the 1946 Conference of the Commonwealth Agricultural Bureau set up a Committee to deal with plant expeditions but was unable to provide sufficient funds for the Committee to undertake active work in the field of plant introduction and the maintenance of plant collection, then again the 1950 review conference of the Commonwealth Agricultural Bureau decided that in view of the fact the Food and Agricultural Organisation (F. A. O.) of the United Nations had taken up the question of World Catalogue of Genetic Stocks it would be unnecessary for the British Commonwealth to engage in similar activity; the Bureau has co-operated with the F. A. O. upto the present in the work of the World Catalogue. Thus it will be seen that an organisation like the one in U. S. A. or Australia is not existing in the United Kingdom.

Regarding the introduction of plants in British Colonies, the Colonial Office issued a digest of the legislation for introduction of plants which the Colonies adopted. The Colonies of west Africa have entered into a Plant Exchange Convention; a similar Convention now links the Union of South Africa, Southern Rhodesia and the Belgian Congo; in respect of East African, Colonies also arrangements of a similar nature have been approved.

Philippines: Manas, Y, Cruz, et el (1939) considers that due to the work of Plant Introduction by the Bureau of Plant Industry, a large number of plants are being grown in island. As examples, Citrus, avacade,

Strawberry onions, Cabbages, Cauliflower, tobacco, Para rubber etc., are mentioned. Napier grass of Tropical Africa was introduced from Hawaii in 1916, *Paspalum dilatatum* from Australia in 1907. Teosimte from America in 1908, Guinea grass, a native of Tropical Africa from Hawaii in 1907, Sundan grass from Amrica in 1925. The author finally concludes that plant introduction has brought in several valuable economic plants for the island.

Rhodesia: Mundy (1932) records that with a few exceptions, the standard strains of seed grown in Rhodesia are the results of introduction. The methods followed have been to grow each introduction for at least two years on small plots of 1/50 of an acre or less in area; when the results are satisfactory, cultivation has been extended to larger plots for a further period of 5 years.

India: The importance of Plant Introductions to our country has been stressed by Scientists from time to time. Dr. Pal (1946) after discussing at length the crops that have been introduced in America, Russia and other places, says that the work of Plant exploration and introduction is vested in well equipped Buoeaux in countries like U. S. A. and Russia, and that a similar bureau in India is long overdue. Parthasarathy (1953) says that advanced countries like the U. S. A., Russia, and Australia have well organised Plant Introduction Bureau and that the establishment of a similar Bureau in India is long overdue. He further states that this matter has been brought to the notice of the authorities concerned, but due to financial considerations, it is being postponed. He concludes by saying that with the present day International Co-operation in respect of inter-change of plant materials the advantage of establishing a Bureau needs no emphasis, that the full assessment of the utility of the genetic stocks in the different regions of India will be facilitated by the functioning of such a Bureau.

Plant Introduction in India, to start with, was slow and haphazard and was carried on by different Institutions and individuals.

(i) Royal Botanical Gardens, Sibpur.
(ii) Botanical Garden, Ootacamund.
(iii) The Botanical Survey of India.
(iv) Agri-Horticultural Garden, Madras.
(v) Lloyd Botanical Garden, Darjeeling.
(vi) Agricultural Departments of different States.

In 1935, the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India stressed the need for on Organisation on the lines of U. S. A. or U. S. S. R. In 1941, the subject was again brought up and need for the Organisation was reiterated. In 1944 at the instance of

the Indian Council of Agricultural Research, the Division of Botany, Indian Agricultural Research Institute submitted a scheme for the establishment of a nucleus organisation for the introduction of new economic plants, pending establishment of a full fledged bureau. The Scheme was sanctioned for a period of 5 years from April 1946 as a wing of the Botany Section of the Indian Agricultural Research Institute. Import of useful plants has been carried on; the work of plant exploration is carried on a limited scale. More than 3000 plants have since been introduced by this nucleus organisation.

A list plants introduced in Delhi is given by Pal (et al)-1949. The following are among the important plants recorded by the authors:

Wheat: In *Triticum vulgare* and *Triticum spelta* about 200 improved selections were obtained from Australia, Sweden, Kenya, Japan, U. S. A, Palestine, Canada, Formosa, Argentina, Kabul, and Brazil for such useful characters as rust-resistance, high yield etc.,

Barley: *(Hordeum vulgare):* About 60 selection of Barley were received from U. S. A., Canada, Australia and other places.

Rice: A variety from Russia said to be suitable for growing on steep lands was received.

Pulses: From China, Philippines, U. S. A, Australia etc., Soya bean, lathyrus, Pisum and green gram were obtained.

Oil seeds: Among the oil yielding plants 72 collections which include also Flax, Safflower, Castor etc., were obtained.

Fibre Plants: Cotton from U. S. A., *Abutilon aricenuae* (China Jute) from China etc., were introduced.

Tobacco: Selections from Philippines and U.S.A. were introduced.

Forage grasses: Giant star grass a native of Africa was introduced through the Royal Botanical Garden, Kew, Richmond.

Melinus minutiflora: (Molassus grass, was obtained from Venezuela. This grass has been introduced by some planters in Anamallais and is spreading rapidly. Mosquitto repellent character claimed for this grass in its native country could not be seen in this country. But this promises to be a good fodder grass for the hills.

Napier Grass: *(Pennisetum purpureum)* was introduced from the Royal Botanical Gardon, Kew.

Kikyu: *(Pennisetum clandestinum)* was introduced from Kenya.

Grasses received from the U. S. A. Soil Conservation Nursery.

Bontelona cartipendula — a drought resistant grass.

Tall fescue : *Fesouca elatior, var, Arundinacea.*

Giant Panic grass: *(Panicum antidotale)* — This has also been introduced in this state in 1942, and it is growing to be a good drought-resistant grass.

Paspalum dilatalum — A native of South America has spread in several hill stations.

Bromus inermis and **Phalaris tuberosa** — Graasses suitable for hay and pasture have done well in Ootacamund.

Sporobolus airoides is one of the best grazing perennial grasses for Alkaline tracts; similarly *Sporobolus cryptandrus* suitable for sandy open ground was obtained from U. S. A. and Mexico.

Dactylis glomerata for hay and pasture has been found to be valuable for dry hill slopes and high elevations.

Agropyron cristatum (Crested wheat grass) aud *A. sibiricum* are valuable hy and pasture plants for arid situations.

Among the grasses received from Australia the following deserve mention :—

Phalaris tuberosa *Dactylis glomerata, Lolium perenne* (Perennial Rye grass.

The following grasses were received from South Amrica :—

Teosinte *(Euchlaena mexicana), Paspalum dilatatur Auxonopus suffultus*, perennial creeping grass suitable for permanent pastures.

Grasses for soil conservation: Eragrostis curvula; E. lehmanians; E. chloromelas (this is one of the important introduced grasses for soil conservation in U. S. A.)

Fodder and forage legumes: The following are among the important fodder legumes that were obtained for trial :—

Lespedeza striata (Annual) from U. S. A.

Lespedeza striata (Prrennial) U. S. A.

Barrel Clover: *(Medicago tribuloides).*

Kudzu vine (Perennial) *(Pueraria hirsuta* — a native of Japan and China.

Tropical Kudzu (Pueraria phaseoloides) from U. S. A.

Medicago alba (White Sweet Clover).

White Clover (Trifolium repens).

Lotus corniculatus (Birdsfoot Trefoil).

Trifolium pratens (Montgomery red clover).

Sesbania macrocarpa.

Desmodium discolour — Perennial — best legume for cattle pasture, on good soil in Brazil.

Medicinal and Insecticidal Plants: Medicinal and insecticidal plants include among others.

Henhave — *Hyescyamus niger, Derris malaccasis, Mentha piperila.*

Wild relatives of Crop plants: Among the wild relatives of crop plants, 10 of wheat, 2 of Russian wild Rye and about 12 of Tomato were obtained.

Indigenous Collections: Among the indigenous collections mention may be made of, *Apluda aristata, Chrysopogon montanus* (drought resistant perennial grass), *Cenchrus ciliaris, Cenchrus setigerus, Eragrostis gangetics, Rhynchosis aurea* etc.

Madras: In Madras State the work of plant introduction is of recent origin, though from time to time sporadic attempts have been made to get exotic plants for acclimatisation. In 1947 the Government sanctioned a scheme for conducting experimental trials of exotic and indigenous plants in Agricultural Research Stations, distributed in different parts of the State. Five centres were selected for trial, namely Ootacamund, Wynaad, Aduthurai, Siruguppa and Anakapalle ; the first two places were intended for plants that can thrive in higher elevations with a fair amount of rainfall, the third place Aduthurai was selected to represent deltaic tracts ; Siruguppa to represent black soils of the interior districts with low rainfall and Anakapalle on the east coast representing rich red loamy soils with average rainfall. A list of economic plants to be introduced from foreign countries was prepared. The list comprised 11 groups of plants, and included medicinal plants, fodder plants, hedge plants, fuel and timber plants, ornamental plants etc.

Plant Introduction Trials in the Five centres of Madras State.

In the five centres of trial already mentioned, namely Ootacamund, Wynaad, Aduthurai, Siruguppa and Anakapalle, the work commenced by the end of 1947 progressed gradually with the acquisition of more materials for study. A Short note about the work carried out in each centre is given below.

I. **Anakapalle:** During the period of about two years trial in this centre about 40 plants, both exotic and indigenous were under trial; these consisted of about a dozen medicinal plants namely (1) *Terminalia chebula* (2) *Alpinia galanga* (3) *Strychonos nuxvomica* (4) *Terminalia tomentosa* (5) *Cinchona* Spp. (6) *Datura fastuosa* (7) *Artemesia indica* (8) *Hemidesmus indicus* (9) *Plumbago zeylanica* (10) *Schleichera trijuga* and (11) *Kydia calycina.* All excepting 5, 7, 8, and 9 showed good growth.

Among the other twenty economic plants tried in this centre, *sterculia companulata, Dalbergia latifolia, Acacia sundra, Albizzia stipulata, Commiphora stolonifera* etc. were found to be satisfactory.

The plants that have shown outstanding performance in this centre are the following.

Corchorus capsularis and *C. olitorius* (Bengal jute) The crop raised during October to July under irrigated conditions has recorded excellent growth. The fibre obtained was also found to be excellent with a good lustre.

Boehmeria nivea: (Ramie fibre crop also has shown remarkable growth.

Ochroma lagopus (Balsa — Aeroplane wood) native of Central America — This gave the best results. The plants have recorded on an average 15 ft height and a girth of about 14 inches.

Green Manure Plants: Among the green manure plants, *Tithonia diversifolia, Crotalaria striata, Tephrosia candida* and *Tephrosia vogeli* were found to be good.

II. **Wynaad:** In this centre about 65 economic plants were under trial, of which the performance of the following deserves mention:

Scented geramiums (Pelargonium spp.)—This was very satisfactory. One year old plants measuring about 3 to 4 feet in height.

Mentha piperita: The growth was very good.

Albizzia moluccana: One year old seedlings measured about 10 ft. in height and found to be best for this tract.

Albizzia lebbeck and *A. stipulata*: Was found to be best, having grown satisfactorily Eucalyptus citriodera was found to be best having grown 6 ft. in about 8 months.

Eucalyptus rostrata: Ten months old seedlings have grown up to 4 ft.

Eucalyptus crebera: The growth was found to be satisfactory though not as good as the previous two species.

III. **Ootacamund**: Among the thirty plants under trial at Ootacamund the following were found to be satisfactory.

Scented geramium (Pelargonium odoratissima)—The height of one year old plants was recorded to be 3 to 4 ft.

Salix babylonica (Suitable wood for Criket bat etc.) One year old seedlings grew up to 2 feet.

Mentha piperita: This is one of the most successful of introduction.

Beta vulgaris: Both the Kashmir and Californian varieties were found to be very successful.

Canna edulis and *Lavendula vera:* These were found to grow luxuriantly.

IV. **Siruguppa**: The work of plant introduction in this centre was carried on for a period of about one year, but subsequently the scheme was closed down as the station was not found suitable for trial of many of the introductions. The economic plants, tried in this centre included medicinal plants hedge plants, avenue trees, timber trees, green manure plants, etc. The general growth of the introductions was not satisfactory.

V. **Aduthurai**: Trials in this Station included more or less the same plants that were distributed to Siruguppa. Among plants of economic importance, *Ochroma lagopus*, *Tectona grandis*, *Albizzia moluccana*, *Pterocarpus marsupium*, *Dalbergia latifolia* and *Veliveria zizanioides* were successful. A few fruit plants were also successful.

Plant Introduction work at Coimbatore and Other Agricultural Research Stations of Madras State. In addition to the trials at the five centres already indicated plant introduction work was continued at Coimbatore and other Agricultural Research Stations. The work in these centres fell under the following categories: (1) Green manures, (2) Cover crops, (3) Fodder grasses and forage plants and (4) Essential oil yielding plants etc.

1. **Fodder Grasses**: Many indigenous and exotic species were tried. Among the exotic types *Eragrostis*—tef. var *invit*, *Eragrostis lehmaniana*, and *Eragrostis curvula* from U. S. A., and *Phalaris tuberosa* from Australia were found to thrive well under Coimbatore conditions. Among the exotic grasses tried at Nanjanad and Nilgiris *Dactylis glomerata Eragrostis curvula* and *Eragrostis chloromelas* were found to progress satisfactorily. *Bromis inermis* and *Festuca eliator* tried at Ootacamund were reported to be frost resistant. All the five grasses tried in the Nilgiris have been received from U. S. A. Conservation Bureau.

2. **Legumnous forege plants**: *Glycine javanica* a local collection proved to be highly drought resistant and thriving well at Coimbatore. The introduced legumes, *Centrosema pubescens, Pueraria javanica* and *Calopogonium mucunoides* were tried in all heavy rainfall tracts. The last two have established remarkably well in Anamallais, Wynaad and in many centres in the West Coast. *Calopogonium* and *Pueraria* have already been introduced in Rubber Estates with tremendous success. *Trifolium* species from Africa, Australia and other sources are under trial at Nanjanad, Ootacamund, Kallar, Burliar, Araku valley etc. *Indigofera endecaphylla* though indigenous to India, seeds have been obtained from Delhi; this has established already in heavy rainfall tracts such as Araku valley and Anamallais.

3. **Green manure plants**: The following have established very well.

Crotalaria anagyroides: This is said to have been introduced in Java in the year 1919 from Brazil to serve as a fibre plant, but on account of its excellent qualities as a green manure it is being extensively cultivated in the Tea Estates. In the Tea Estates it is one of the major leguminous plants cultivated for green manure purposes. Its performance in the plains is not satisfactory.

Crotalaris striata: Its performance in the plains is much better than the hills. In the West Coast it is one of the important green manure plants. This plant has also been observed to withstand salinity.

Crotalaria usaramœnisis: This is one of the recent introductions at Coimbatore. Its performance has been very satisfactory.

Indigofera tevsmanii: The seeds have been recently obtained from Ceylon and distributed to the Agricultural Research Stations all over the State. Its performance was observed to be best in Pattukottai, Anakapalle, Pattambi, Nileshwar and other places. This has also been found to establish easily by cuttings.

Gliricidia maculata: A native of tropical America, has been introduced in the Tea Estates as a shade tree in Indio-China, Ceylon, Indonesia and other parts. In Ceylon it is extensively cultivated both as a shade tree for plantation crops and as a green manure plant in newly cleared rubber estates, for applying green leaf to coconut plantations or to the rice fields. Though it is not exactly known as to when this plant was brought over to India it is gathered that the planters in the Nilgiris have introduced it about 20 years ago. The first trials in the Agricultural Department of this State were conducted about a decade back in the Agricultural Research Stations all over the State. Its performance at the Paddy Station at Maruturu, when it gave one cutting every two months during the rainy season attracted attention. It is now one of the major green leaf manures for the rice fields in this State.

Sesbania speciosa: This was first introduction in India in Madras State in 1935 from seeds supplied by Mr. H. C. Sampson, Economic Botanist, Kew, London from seeds collected at Kenya, South Africa. In the first year's trial at Coimbatore it appeared to be promising. This is also one of the major green manure crops for the rice fields of the State.

Cassia hirsuta: Native of tropical America. It has been found to thrive well in dry areas as green manure. Under heavy rainfall this has been found to respond well.

Cassia nigricans: A wild plant found out in one of our Botanical surveys in Tirunelvely district; this has been found to thrive well in dry rocky areas.

Indigofera hirsuta: This has been found to be a good green manure plant for the West Coast.

Crotalaria verrucosa: This comes up well under all soil conditions, this has been observed to withstand salinity to a remarkable extent.
Rothia trifoliata: In one of our Botanical surveys in the West Coast, this plant was observed to thrive well under extreme saline conditions.

4. Essential Oil Yielding Plants:

(a) *Cymbopogon spp:* In our Botanical surveys several species of Cymbopogon were observed to grow wild, particularly in the west coast and hill slopes. Lemon grass oil is being extracted from *Cymbopogon flexuosus;* the quality of the oil has been observed to vary from place to place; it is thought that this may be due to the admixture of different varieties. With a view to work out the taxonomy of the different species, collections from different parts of the State are being planted at Coimbatore.

(b) *Ocimum kilimanjaricum (O. Camphora):* This was first introduced from seeds obtained from Dehra Dun. From the trials at Coimbatore only a few plants survived. From the seeds collected, more extensive trials were made at Cinchona (Anamallais), Yercaud, Wynaad, Pattambi and other places. Its performance was found to be best in Cinchona, Yercaud and Wynaad. Samples of camphor and camphor oil extracted were found to be very satisfactory.

(5) Plants of outstanding Commercial importance and their introduction:

From the performance of plants so far introduced it is clear that many of them have been found to be useful acquisitions, and many more such introductions have to be made to improve our crops. By plant introduction several plants have become crops of great commercial importance. A few of the introductions which have become crops of commercial importance are given below.

Pepper: Is a native of Malabar. This history of pepper is interesting reading. Hill (1941) records that it was first exported from Calicut in A. D. 64 to Rome and during the middle ages the price of pepper was exhorbitant the high cost of pepper was one of the inducements to the Portuguese to search for a sea passage to India in order to break down the Italian monopoly in this trade. It is recorded that when Vasco da Gama finally succeeded in finding a sea route to India anchored off the Coast of Calicut, it was the attraction of pepper and the fabulous money he expected to get, that made him undertake the most hazarduous voyage. The Discovery of cape of Good Hope is also in a way the outcome of the search for pepper. About the year 1500 pepper cultivation was first taken up in Malaya and thence spread to other East Indies group.

Groundnut—(Arachis hypogea): A native of Brazil is now one of the major commercial crops of South India. *Arachis nambiquare* and *A. rasterio*, have been introduced from S. America. Hybridisation work with *A. hypogea* was taken up and these are under various stages of trial.

The Cashew nut (*Anacardium occidentale*)—a native of South America was introduced in South India in early days probably by the Portuguese; South India now supplies the major part of the world demand.

Cinchona—was first introduced into India, Jamaica and Ceylon in 1861 through the agency of Kew gardens, where it was taken from Peru in South America. It is now one of the important commercial drug plants of South India.

Para rubber (*Hevea brasiliensis*)—This was introduced in 1876 from Brazil through Kew gardens, into Malaya, Ceylon and other tropical Asian countries, and it is the important source of revenue for Malaya Ceylon and other places. This has been extensively cultivated in Ceylon, Java and other places, and forms an important source of revenue.

Tea: The introduction of Tea from Assam and China to Ceylon and other parts of India has transformed vast areas of these countries into flourishing 'Tea Estate', and is a very important source of revenue.

Fruits: In South India, Merton stocks introduced from England provide the most promising rootstock of the apple. Winterstein, Rome Beauty, Alsops early and Edward VII are all introductions from Australia.

Kishmish seedless grape vines from Baluchistan have been introduced in several parts of India, particularly Madurai districtt, with phenomenal sucess.

'Gros Mitchel' banana variety, an introduction from West Indies, is one of the heaviest yielders, coupled with a delicious taste and aroma.

Millets: Among the annual fodders *Sorghum verticillatum, S. arundinaceum,* and *S. sundanense,* have been introduced from Africa for fodder purposes. Among the perennial fodders, S. halepense (Jhonson grass) has been successfully introduced. Many Para Sorghums have also been introduced in the Millets Station, Coimbatore for breeding purposes. Several grain pennisetums have been introduced from Africa to serve as genetic stocks for hybridisation work. Hybridisation between *Pennisetum polystachvon* (Thin Napier) and *Pennisetum typhoides* (Cumbu) has already yielded one of the best fodder grasses.

Coffee: Spp—The introduction of coffee spp. from Abyssinia to other parts of the world such as Brazil, South India, Ceylon etc., has considerably increased the revenue of these countries.

Sisal (Agave)—A native of Central America is now extensively planted in Kenya and is a staple product in East Africa.

Clovers—from Spice islands are the Chief commercial products of Zanzibar.

Cotton has been introduced to various parts of the tropics and is now a very important source of revenue for Sudan, Uganda Nigeria and several tropical countries. India also has imported long stable cottons from Egypt and America and has already evolved suitable strains for large scale multiplication.

Rice: Introductions from Burma, Japan, Russia China and other centres have enriched the collection of rice types. Hybridisation between the local types and the exotic ones is already under way.

Sugarcane: Sugarcane workers are unceasingly striving to collect the *Spontaneums* from all over India with a view to harness the desirable wild characters into the cultivated species. Phenomenal success has already been achieved by crossing the wild *Saccharum spontaneum* with the cultivated species and producing canes resistant to some of the common sugarcane diseases. Pal (1946) loc cit states that sugarcane production in Java which was faced with extinction due to the ravages of the disease, *serch* was saved by the introduction of a disease-resistant variety called *Chunnee.*

Medicinal Plants: Chopra (1952) records that moro than 2,000 plants alleged to have medicinal properties have been enumerated in the literature of ancient India and of the plants listed in the British and other pharmacopœias a very large proportion either grow here naturally or can be cultivated without much difficulty. India is an epitome of

climates and an emporium of medicinal plants and it is argued that exotic medicinal plants should thrive here under suitable conditions of soil, season and climate. *Ipecaiuanha* introduced in the 19th century is a valuable drug. *Pyrethrum*, a potent source of vegetable insecticide, has also been successfully introduced in Nilgiris, Kashmir and Assam. *Lavendula officinalis* (Lavender), Mentha piperita (Mint) and *Glycyrrhiza glabra* (Liquorice) have been successfully cultivated in different centres. Chopra (loc cite) concludes that the cultivation of exotic medicinal plants has a promising future in this country and the work done so far has produced remarkable results.

In this connection it may be stated that a scheme for trial of medicinal plants in this state has been approved by the Indian Council of Agricultural Research and awaits the final sanction of the Government. The scheme contemplaies trial of medicinal plants suited for the hills at Coonoor and those suited for the plains at Coimbatore. The Scheme includes such commercially important plants as *Accacia senegal*, Wild, *Cephalis ipecacuanah*, A. Rich, *Chenopodium ambrosioides*, Linn., *Citrullus colocynthis*, Schard., *Derris elliptica*, Benth; *Glycyrrhiza glabra*, L., *Hyoscyamus niger*, L., *Mentha piperita*, L. *Ocimum camphora*, *Polygala chinensis*, L; *Rauwolfia serpentina*, *Styrax benzoin*, Dryand; *Swertia chirata*, Ham, etc.

Research Note

A Note on the Absorption and Retention of HCN by Oil Seeds

By

K. R. NAGARAJA RAO, B. sc., (Hons).,
(Agricultural Research Institute, Coimbatore.)

Introduction: Conservation of agricultural produce like food grains, pulses, oilseeds, etc , has been a problem from time immemorial since the loss caused by insects is sometimes colossal. Infested stocks often require a drastic measure of treatment by way of fumigation. Calcium cyanide, Carbon-di-sulphide, Methyl bromide, Killoptera, etc., are some of the fumigants in vogue. Of these, the first mentioned chemical, though highly dangerous if inhaled, is about the most popular in this State by virtue of its high efficacy, cheapness as well as ease in its application. But the most important hazard involved in the use of this fumigant is that the poisonous element is absorbed and retained by fatty material, moist food stuffs, vegetables, etc., rendering their consumption dangerous. It is even surmised that the absorbed HCN may undergo a chemical reaction with the fatty acids forming stable compounds with are not easily got rid of by aeration or sundrying. There are very few publications on the absorption and retention of HCN by seed material having a high oil content. A few exploratory trials were, therefore, undertaken to study the advisability of using Calcium cyanide in the treatment of oil seeds.

Material and Methods: Ten pound samples each of castor, cotton and groundnut (kernels) thoroughly sundried, were fumigated with Calcium cyanide A dust (containing 42% of active ingredients) at the rate of four pounds per 1000 C. Ft for 24 hours. The treated seeds were preserved under different conditions in the laboratory. Representative samples of the treated and control lots were drawn and sent to the Government Agricultural Chemist for estimation of residual HCN immediately after fumigation and again 30 and 60 days after. Simultaneously their viability was also tested. In all, three sets of experiments were conducted and the results are furnished below.

Regarding assessment of results, the Government Analyst, Guindy was consulted about the safety limit of HCN. He has stated that according to Lehman, the tolerance limit of HCN is 10 to 12 parts per million and that 60 parts would be a fatal dose. He is also of the opinion that this limit depends to a certain extent upon the age of the person who consumes it and the quantity so consumed either at a time or in the course of a few days.

Details of work done: In the first set of experiments, the fumigated lots were kept exposed separately in shallow trays inside the laboratory. The results chemical analysis are presented below.

Seed material	Amount of residual HCN expressed as parts per million.			
	Immediately after fumgn.	30 days after fumigation	60 days after fumigation	Range during storage
1	2	3	4	5
Cotton	14	22	11	11—22
Castor	14	21	28	14—28
Groundnut kernels	6	13	19	6—19

From the range of residual HCN (Col. 5) it may be seen that all the treated samples had retained the poisonous element far above the tolerance limit. The experiments were, therefore, relaid with a view to study the variations, if any, in the HCN contents under different conditions of preservation viz., exposing the material in shallow trays inside the laboratory, sundrying once a month for six hours and keeping the lots as above and storing inside small bags. The data gathered are furnished below.

Seeed material and treatment	Amount of residual HCN expressed as parts per million				
	Immediately after fumgn.	30 days after fumgn.	60 days after fumgn	Range during storage	Range in the seed material as a whole
1	2	3	4	5	6
Cotton :					
Exposed in trays	19	18	22	18—22	14—23
Sundried once a month	19	18	23	18—23	
Stored in bags	19	14	22	14—22	
Castor :					
Exposed in trays	11	nil	6	nil—11	nil—19
Sundried once a month	11	nil	19	nil—19	
Stored in bags.	11	8	16	8—16	
Groundnut kernels :					
Exposed in trays.	4	6	14	4—14	nil—14
Sundried once a month	4	6	nil	nil—6	
Stored in bags	4	7	13	4—13	

Taking the entire range of HCN into consideration (Columns 5 & 6) the data presented above have confirmed that the absorption and retention of HCN is much higher in the case of cotton and castor than in groundnut.

As facilities were not available for a more elaborate lay out and analysis of a larger number of samples, confirmatory trials had to be undertaken on a modest scale. Only two samples-cotton and groundnut kernels-were used, limiting the treatments to fumigation and storage in bags and keeping them in open inside the laboratory. Sundrying was given up. The data gathered are presented in the statement.

Seed material and treatment	Amount of residual HCN expressed as parts per million				
	Immediately after fumgn	30 days after fumgn.	60 days after fumgn.	Range during storage	Range in the seed material as a whole.
1	2	3	4	5	6
Cotton :					
Exposed in trays	25	28	14	14—28	14—41
Stored in bags	41	23	25	23—41	
Groundnut kernels :					
Exposed in trays	6	7	6	6—7	6—28
Stored in bags	28	15	11	11—28	

Note :— Untreated seed materials were also analysed in the three sets of experiments and found to be free of HCN.

The results presented in the above table are in general agreement with those of the previous tests.

It is, however, interesting to note that the quantities of residual HCN recorded in the second and third analysis (Columns 3 & 4) are higher than the initial

figure (Column 2) in a majority of the cases (particularly under castor in the second statement) under the three sets of experiments. It is proving very difficult to offer any explanation for such variations, since particular care was taken in drawing out representative samples. Analysis of a larger number of such samples and working out the range of variation, correction factor, etc., and studies on the correlation between the moisture content of the seed and the HCN present during different periods of storage may probably throw some light on this aspect.

Effects of HCN fumigation on the viability of seeds : In all the three sets of experiments, tests on the viability of seeds indicated no difference in the treated lots as compared with the Control.

Conclusions : The studies conducted at this section have shown that oilseeds when fumigated with Calcium cyanide have the property of absorbing and retaining HCN beyond permissible levels. It is, therefore, clear that HCN is not a material to be used for fumigating oil seeds. The treatment, however, did not affect their viability. When fumigation of such material becomes necessary, safer fumigants like 'Killoptera' may be used though the cost of treatment with this chemical will be more (about double the cost) than that of Calcium cyanide.

Acknowledgements : The author records his thanks to Sri S. Ramachandran and Sri. V. Tirumala Rao, Government Entomologists, for their guidance and help in the preparation of this note. Thanks are also due to Sri. M. Sanyasi Raju, Government Agricultural Chemist, for so kindly undertaking the estimation of residual HCN.

Review

Ordish, G, "Untaken Harvest", Constable & Co., London, 171 pages XII, 1952. 15 sh.

Mr. Ordish's book is a welcome addition to the literature on crop diseases and pests. He has employed a strange title to his book and has adopted a novel method of approach. The book has an introductory chapter on the causatic agents and the methods of control of pests and disease in general. In the succeeding chapters the author discusses the losses caused by these diseases and pests in various crops and countries and their economic effects on the producer and the consumer and the problems that arise on these accounts. The loss caused by pests and diseases has been evaluated in terms of the extent of land that would have been left uncultivated to bring about the reduction in production. The present methods of plant protection and the disabilities that stand in the way of utilising our knowledge of crop protection to the best advantage are analysed in detail. A brief history and statistics of the trade in pesticides (mostly insecticides) is also provided.

This is a very interesting book and will be of immense value to all plant pathologists and people interested in plant protection. To those who aim at increasing crop production this book will show vividly the limitations introduced by pests and diseases. The need for compilation of accurate statistics of crop losses in all countries is emphasised. The possibilities of increasing production still further by greater use of the remedies available are indicated.

T. S. R.

Gleanings

A Short Note on the Use of Groundnut Shell as Manure: In areas where groundnuts are largely grown, the shells or hulls are mostly burnt as fuel, The ash which is rich in potash is sometimes used as manure. More often, perhaps, it is thrown away and wasted altogether. The utilisation of the shells as fuel results in the complete loss of nitrogen and organic matter which should properly be returned to the soil to increase its fertility.

The composition of an average sample of groundnut shell is given below:

Moisture	8·8 %
Loss on ignition (organic matter) ..	86·7 %
Nitrogen	0·97%
Phosphoric acid (P_2O_5) ..	0·19%
Potash (K_2O)	0·90%
Lime (CaO)	0·82%

It is well known that our soils are extremely deficient in organic matter and that the available supplies of organic manures are hardly sufficient to meet the needs of a fraction of the cultivated area. The beneficial effects of organic matter both on the light and heavy soils and their importance for the proper functioning of the micro-organic population of the soil which bring about various beneficial changes are well known to need emphasis. It is therefore of the utmost importance to conserve all available supplies of waste organic matter and utilise them for manurial purposes. The need to utilise the droppings of cattle as manure instead of burning them as fuel has been repeatedly emphasised. The argument applies with equal force to waste organic matter of all kinds including groundnut shells.

Groundnut shells have good capacity for absorbing urine and may therefore be used as bedding for cattle along with litter and the material soaked with urine turned into the manure pit.

On account of their cellulose content, groundnuts undergo rather slow decay when turned into manure. It is therefore advisable to mix it with other organic wastes capable of more rapid decay and convert it into manure by using the simple methods advocated by the Department.

The adoption of this procedure will serve to save 85% of organic matter and 1% of nitrogen which would be wasted if the shells are used as fuel.

In areas where owing to scarcity or high cost of other sources of fuel, the use of shells as fuel cannot be helped, the ash which is rich in potash should not be discarded but thrown into the manure pit or utilised directly as manure, especially in areas which are poor in potash or where crops whose potash requirements are high are grown.

Weather Review — For the month of May 1953.

RAINFALL DATA

Division	Station	Total rainfall for the month in inches.	Departure fromnormal in inches	Total since 1st January in inches	Division	Station	Total rainfall for the month in inches.	Departure fromnormal in inches	Total since 1st January in inches
Orissa & Circars	Gopalpur	1·5	—0·6	3·8	Central Contd.	Vellore	3·1	— 0·8	4·0
	Calinga-patnam	3·0	—0·4	4·1		Gudiyatham*	1·0	— 2·5	5·5
	Visakha-patnam	2·3	—0·3	4·4		Salem	4·3	— 0·3	8·3
	Arakuvalley*	3·8	—0·4@	7·0		Coimbatore (A. M. O.)*	2·8	— 1·0	11·9
	Anakapalle*	2·6	—0·2	2·9		Coimbatore	3 7	— 1·2	11·7
	Samalkot*	2·5	—0·9	3·4		Tiruchirap-palli	1·6	— 1·0	8·3
	Kakinada	1·0	—0·5	1·2					
	Maruteru*	0·7	—0·5	0·7	South	Naga-pattinam	0·0	— 1·6	5·7
	Masuli-patnam	£	—1·3	0·i		Aduturai*	0·1	— 2·8	4·9
	Guntur*	0·7	—2·1	1·2		Pattukottai*	0·0	— 1·8	6·6
	Agrl. College, Bapatla*	0·1	—1·8	0·5		Mathurai	0·9	— 1·8	10·9
						Pamban	0·0	— 1·0	3·6
	Agrl. College, Farm, Bapatla*	0·1	..	1·0		Koilpatti*	1·7	— 0·4	7·4
						Palayam-cottai	0·0	— 1·6	7·9
	Renta-chintala	0·0	—2·5	1·1		Amba-samudram*	0·6	— 1·5	9·7
Ceded Districts	Kurnool	0·0	—1·1	0·1	West Coast	Trivandrum	0·6	— 8·2	7·1
	Nandyal*	0·3	—3·3	1·7		Fort Cochin	3·5	— 8·2	17·3
	Hagari*	0·1	—2·2	1·2		Kozhikode	1·0	— 7·9	6·0
	Siruguppa*	0·1	—1·7	1·9		Pattambi*	2·3	— 5·2	4·7
	Bellary	1·5	—0·4	2·7		Taliparamba*	1·2	— 6·6	1·9
	Cuddapah	0·2	—1·3	0·3		Wynaad*	3·8	— 2·1	10·9
	Kodur*	0·1	—3·0	1·4		Nileshwar*	1·3	— 8·2	2·3
	Anantapur	0·1	—1·9	1·6		Pillicode*	1·3	— 7·0	6·2
						Mangalore	0·5	— 7·2	1·1
Carnatic	Nellore	0·2	—0·9	0·3		Kankanady*	0·6	— 8·0	2·1
	Buchireddi-palem*	0·0	—2·7	0·5	Mysore & Coorg	Chitaldrug	0·3	— 2·6	3·2
						Bangalore	1·9	— 2·3	7·8
	Madras (Meenam-bakkam)	0·0	—1·0	1·7		Mysore	3·9	— 1·7	9·1
						Mercara	1·0	— 4·2	4·4
	Tirur-kuppam*	0·0	—3·5	1·4	Hills	Kodaikanal	3·1	— 3·3	14·3
	Palur*	1·0	—3·6	2·7		Coonoor*	2·7	— 0·7	24·4
	Tindivanam*	0·5	—3·9	4·2		Ootacamund *	5·3	+ 0·1	10·9
	Cuddalore	0·0	—1·0	3·2		Nanjanad *	2·5	— 2·1	10·9
Central	Arogyavaram (Chittoor dt.)	1·3	—1.3	2·7					

Note :—

1. * Meteorological Stations of the Madras Agricultural Department.
2. @ Average of eight years data for Arakuvalley is given as normal.
3. Average of ten years' data is taken as normal.
4. X The Farm was started only in 1951.
5. £ Rainfall one to four cents.

Weather Review for the month of May, 1953

The severe cyclonic strom which lay in the east-central Bay of Bengal on the last day of April, 1953, weakened and passed inland across the Burma coast on 1—5—1953. Unsettled conditions pevailed over the east central Bay and neighbourhood on 5—5—1953 but they became less marked on the next day itself. A weak cyclonic circulation peristed over Chota Nagpur, the Gangetic West Bengal and the adjoining areas from the beginning of the month up to 10—5—1953. This was replaced by a surface trough of 'low' over South Bihar and the adjoining areas on 11—5—1953; this became less marked after two days. Simultaneously, another surface trough lay over east Uttar Pradesh and neighbourhood and became unimportant. An advance of Monsoon Current was taking place in the South-east Bay of Bengal and the adjoining South Andaman Sea, on 15—5—1953. A weak cyclonic circulation persisted over Sub-Himalayan West Bengal and neighbourhood for two days from 18—5—1953. The monsoon strengthened over the south Andaman Sea and South Tenasserim on 24—5—1953 and advanced to north Andaman Sea and the adjoining areas on the same day. On 27—5—1958 the monson was still restricted to Tenasserim, the Andaman Sea and the South-east Bay of Bengal and was weak. The Monsoon showed slight signs of strengthening by the end of this month in the Andaman Sea and neighbourhood.

During this month a series of eight Western disturbances passed over the extreme north of the country in succession.

Day temperatures were generally above normal over the Madras Region and especially over the coastal Andhradesa with Rentachintala recording 116°F on 29—5—1953 followed by Ongole and Nellore recording 114°F on 11—5—1953.

The noteworthy rainfalls and the zonal rainfall for the month have been furnished hereunder.

Noteworthy falls for the month

S. No.	Date	Name of place	Rainfall for past 24 Hrs.
1	4—5—1953	Pattambi	1·95″
2	6—5—1953	Alleppey	2·70″
3	31—5—1953	Palghat	2·30″
4	,,	Kallakurichi	1·90″

Zonal Rainfall for the Month

S. No.	Name of Zone	Rainfall for the month	Departure from normal	Remarks
1	Orissa and Circars.	1·41″	—0·66″	Below normal.
2	Ceded Districts	0·30″	—1·86″	Far below normal.
3	Carnatic	0·24″	—2·37″	,,
4	Central	2·54″	—0·30″	Below normal.
5	South	0·41″	—1·56″	Far below normal.
6	West Coast	1·61″	—6·86″	Far below normal.
7	Mysore and Coorg	1·77″	—2·70″	Far below normal.
8	Hills	3·40″	—0·20″	Below normal.

Agricultural Meteorology Section,
Lawley Road P. O., Coimbatore,
Dated: 1st May, 1953.

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

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,, Venugopala Rao, A.	Soil Survey Asst. Tanjore	A. D. Alur
,, Venkataraman, B.	A. D. Omalur	A. D. Salem
,, Venkatanandachari	Asst. in Paddy Pulla	Agronomical Asst., Samalkot
,, Venkataramiah	On leave	P. A. to D. A. O. Chittoor

Agricultural College and Research Institute Library, Coimbatore

LIST OF ADDITIONS DURING THE MONTH OF APRIL — MAY 1953

1. BLACKWELDER (Richard E) .. Generic names of the Beettle family staplylinidae. Ist edition 1952. United states National museum Bulletin 200.

2. COMMONWEALTH ECONOMIC COMMITTEE .. Survey of trade in agricultural machinery. Ist Edition 1952. Commonwealth Economic Committee.

3. CROCKER (William) and BARTON (Lala V) .. Physiology of seeds. Ist Edition 1953. Chronica Botanica Book Co.

4. HARRINGTON (J. B.) .. Cereal breeding procedures. 1st Edition 1952. F. A. O. Development paper 28.

5. HARROLD (L. L.) and DREIBELBIS (F. R.) .. Agricuitural Hydrology as evaluated by monobith Lysimeters. 1951 U. S. D. A. Tech. Bulletin 1050.

6. HUDGINS (Helen N) *etal* .. Bibliography of literature on potash, as plant nutrient. Ist Edition 1953. American potash Institute.

7. INDIA PLANNING COMMISSION .. First five year plan—Final plan, 1953. Publication division Government of India.

8. PATERSON (John W) .. Science in Agriculture. Vth Edition 1952. Longman & Co.

9. PEARCE (S. C.) .. Field experimentation with fruit trees and other perennial plants. Ist Edition 1953. Commonwealth Horticulture and Plantation crops Bureau. Tech. Comn. 23.

10. RAJAGOPALAN (K.) .. Studies on drought resistance in rice, 1952. Madras University Thesis.

11. REEVE (E. C. R.) and WADDINGTON (C. H.) *Eds.* .. Quantitative inheritance. Ist Edition 1952. Agricultural Research Council, London.

12. SHEPHARD (Harold H) .. Chemistry and action of insecticides. Ist Edition 1951. Mc Grew Hill Book Co.

13. SMITH (J. Russell) .. Tree crops—a permanent agriculture. Ist Edition 1950. Devin Adairt Co.

14. STAMM (G. W.) .. Veterinary guide for farmers. Ist Edition 1950. Windsor Press.

15. TIMES OF INDIA .. India and Pakistan Year book and who's who. 1952—'53. Times of India Publication.

16. WARE (J. O.) Origin, Rise and development of upland cotton varieties and their status at present. Ist Edition 1953. University of Arkansas.

T. S. R.

College Notes.

B. Sc. (Ag.) Results, April 1953

The following is the list of Successful Students in the B. Sc. (Ag.) Final Examination held in May 1953, at Coimbatore:—

1. Aravindaksha Menon M., 2. Ganesha Pai Mizar K., 3. Sitapathy S., 4. Subarayulu M., 5. Achuthan V., 6. Alagappan Pillai S., 7. Balagopalan A., 8. Balakrishna Rao K., 9, Chami A., 10. Chellappan N. P., 11. Chengappa H. A. 12. Dandapani A., 13. Francis S. P., 14. Fernandez A., 15. Ganesh Pillai S., 16. Gopalakrishnan B., 17. Govindarajan M., 18. Jayaraman M., 19. Jayasankaran C. N., 20. Korukutty C. K., 21. Krishnamurthy V., 22. Mahadevan S., 23. Mahadevan Pillai K , 24. Manamohan Lal S., 25. Meenakhisundaram P. C., 26. Nanjayan K., 27. Narayanan K., 28. Ramanathan P., 29. Ramasubu G., 30. Ranganathan S. R., 31. Ratnasabapathi N., 32. Rodrigues J. R. J., 33. Selvaraj Carvelio A., 34. Sennayan P., 35. Sivappah A. N., 36, Soundararajan R., 37. Srinivasan A. V. S., 38. Srinivasan K. R., 39. Subbaya K. K., 40. Subramanian K., 41. Thamburaj D., 42. Tomy P. J., 43. Balakrishnan M. P., 44. Govindaswami T. N., 45. Koragu Bhandari K., 46. Rangaya B. G., 47. Ratnasabapathy V.
