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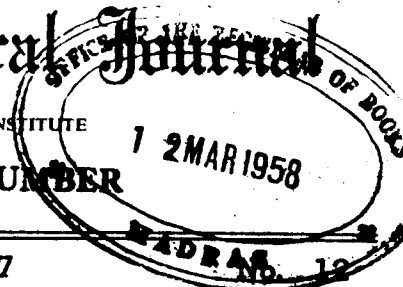


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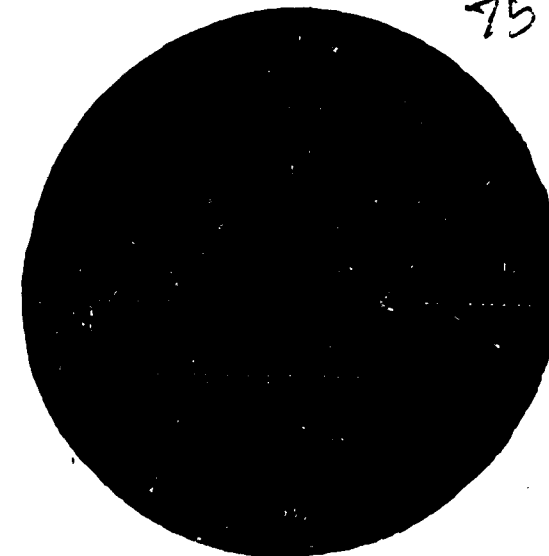
AGRICULTURAL RESEARCH INSTITUTE

GOLDEN JUBILEE NUMBER



Vol. XLIV

December 1957



75

AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE, COIMBATORE

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AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE
COIMBATORE, S. INDIA

The Madras Agricultural
Journal

1957 - December

VOL. 44. NO. 12.

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Announcement

INDIAN COUNCIL OF AGRICULTURAL RESEARCH THE RAFI AHMED KIDWAI MEMORIAL PRIZES FOR AGRICULTURAL RESEARCH.

The Indian Council of Agricultural Research has with a view to creating an incentive for research workers and to recognising outstanding and allied subjects, decided to institute 11 prizes of the value of Rs. 5,000/- Prizes for Agricultural Research and one prize will be awarded annually for outstanding research work done in India in each of the following subjects:

- | | |
|---|---|
| 1. Agronomy | 7. Animal breeding |
| 2. Agricultural Engineering | 8. Animal Nutrition (including Physiology and biochemistry) |
| 3. Agricultural Chemistry | 9. Animal Diseases |
| 4. Agricultural Botany | 10. Dairying and |
| 5. Agricultural Zoology (including Fisheries) | 11. Agri. and Animal Husbandry Economics and Statistics. |
| 6. Horticulture | |

2. These prizes will be in the form of gold medals or cash or both and the first prize in each subject will be awarded for outstanding research work done in the country either individually or jointly during the calendar year 1957 i.e. 1st January to 31st December 1957 and thereafter for such research work carried out during each subsequent calendar year.

3. The award of each of the prizes shall be based on significant advances in human knowledge in a particular subject as revealed by books, monographs or papers published in the name of the candidate or any other and inventions made by him. The selection of a candidate for the award of a prize will be made on the recommendations of a judging Committee consisting of eminent scientists appointed for the purpose by the Indian Council of Agricultural Research. The award of a prize may be made to more than one research worker and the prize money divided amongst them in such proportion and manner as may be decided by the Council.

4. All researcher workers, engaged in research work in India in the fields of agriculture, animal husbandry and allied sciences are eligible for competing for these prizes. Applications should be submitted in *quintuplicate* in the prescribed form which can be had free of cost from the Addl. Secretary, Indian Council of Agricultural Research, Queen Victoria Road, New Delhi. Candidates working in Research Institutes etc., should submit their applications through the Head of the Institute/Department etc. Others may submit their applications direct.

5. All applications should be sent in a sealed cover and addressed to the Addl. Secretary, Indian Council of Agricultural Research, Queen Victoria Road, New Delhi so as to reach him not later than the 30th April 1958. The cover of applications should be superscribed as under:

"Application for the award of the Rafi Ahmed Kidwai Memorial prize for research in

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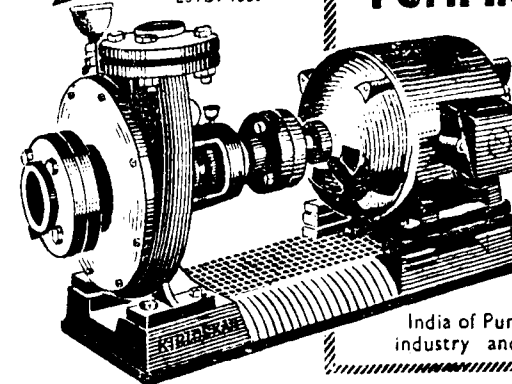
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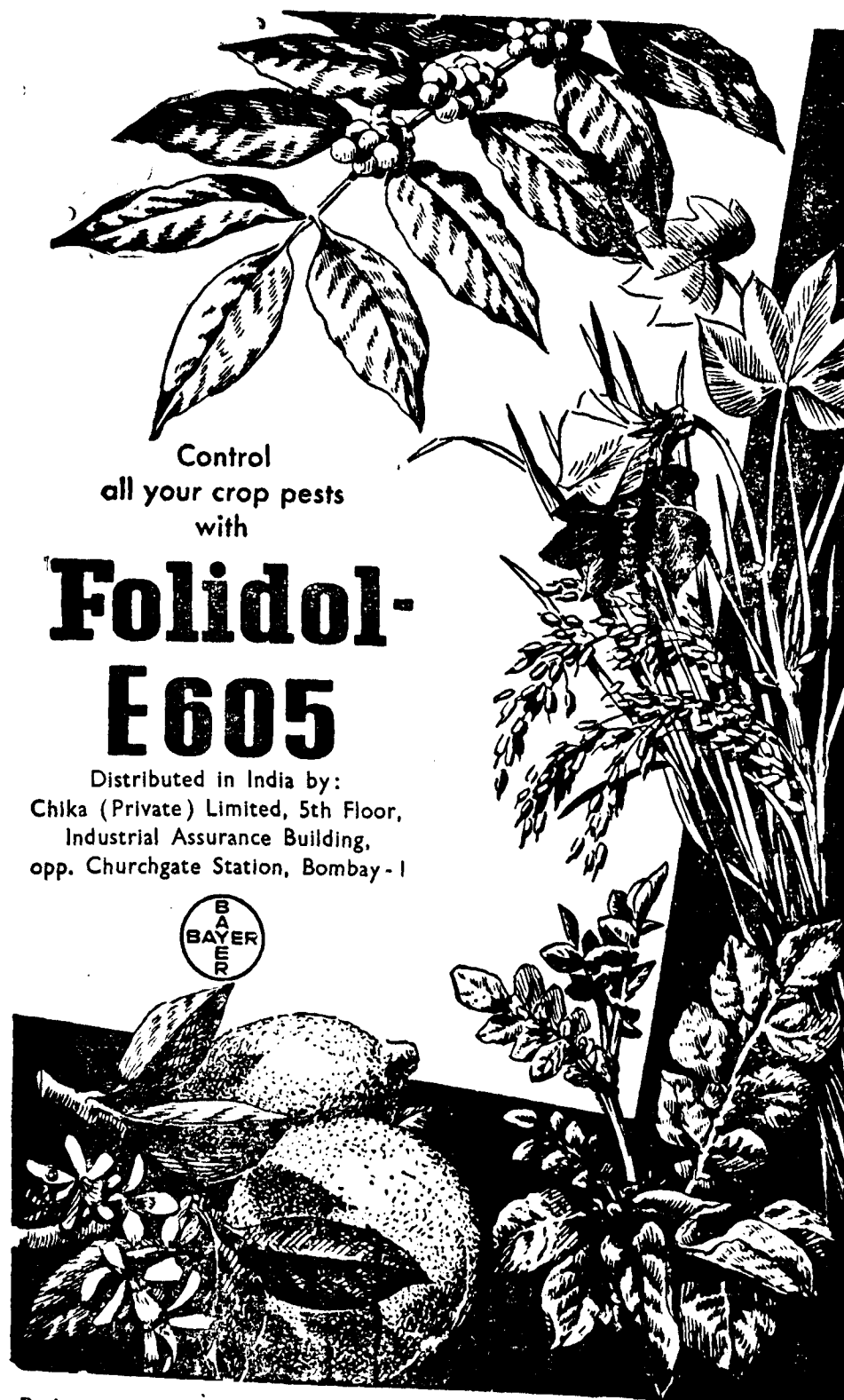
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Announcement

The Managing Committee of the Madras Agricultural Union have resolved, as a special case, that the members of the Union be charged one-fourth the cost of preparation of blocks instead of half the cost as hitherto for the blocks if any, in the articles contributed by them to the Madras Agricultural Journal. Other contributors will, as usual, be charged half the actual cost of block-making.

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The Madras Agricultural Journal

GOLDEN JUBILEE NUMBER

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Editorial

Golden Jubilee of the Agricultural College and
Research Institute, Coimbatore.

FIFTY YEARS MARK AN IMPORTANT MILESTONE in the history of any institution. In the case of the Agricultural Research Institute at Coimbatore the occasion of the Golden Jubilee is, indeed, more significant and memorable because it is one of the oldest institutions of its kind in India with a record of service and achievement which can legitimately be claimed as second to none in this country.

The last fifty years have been an epoch not merely in the advances made towards scientific farming practices but also in the change of attitude of the farming community towards agricultural research. The classic achievements in sugarcane research under Barber and Venkataraman were conceived and nurtured in the cradle of this institution. Today the institute has to its credit more than 150 improved strains of crops evolved at Coimbatore and its substations besides a host of other improvements in all spheres of agricultural production.

There is nothing like *status quo* in agriculture or agricultural research. With the popularisation of strains of high yielding crops there is bound to be a great drain in the fertility of the soil. Deficiencies of several food elements in the soil are also likely to result. The optimum dosage of each fertiliser or nutrient element requires to be determined; crop quality has to be maintained or improved upon; consumer preferences have to be kept in view and newer methods of fighting crop diseases have to be devised. Though much has been achieved in the past fifty years, there is, therefore, yet much to be done in the future. This research institute with its attached Agricultural College has contributed its share towards the agricultural prosperity of the State and the country and it is not an unreasonable hope that the role would be far more significant in the years to come.

K. C. NAIK.

*The Editorial Board extends its warm thanks to Dr. K. C. Naik, Principal, Agricultural College and Research Institute and President of the Madras Agricultural Union for his kind permission to reproduce parts of an article contributed by him to the 'Hindu' of September, 3, 1957, as a very appropriate editorial for this issue of the Journal.

GOLDEN JUBILEE CELEBRATIONS

3rd SEPTEMBER 1957

Integration - Future scope : By the general awakening and the rapid strides that have since been made in the extension side of agriculture, it cannot be claimed that the integration of the three aspects has been fully achieved. The several National Extension and Community Development Blocks have only helped in intensifying the agricultural propaganda and providing the ryot with all the requisites necessities. The sudden expansion in the propaganda side required a large number of qualified personnel and so the education side had to enlarge to meet the demand for large number of hands. But this has resulted in the deterioration of quality. The need for selection of the right type of young men and educate them well to efficiency in the field of agriculture requires no special emphasis. Agricultural education must comprise of all the subjects in which the common ryot is interested or is expected to take interest in the interest of the nation. This will in itself present several problems from the selection of suitable candidates to undergo the course, bearing in mind always the welfare of the entire nation, to the selection of teachers to impart the course. The agricultural student must be introduced to several branches of agricultural research and the extension features. Now-a-days the student takes up agriculture course after trying in vain to enter either medical or engineering college. The selection of particular course is not according to the natural aptitude of the candidate but by the incentive offered by the future prospects of pay. It is a plain fact that agriculture has been placed at the lowest rungs of the ladder in this respect, and naturally enough it is not possible to impart the energy, interest and enthusiasm in the agricultural graduate to the extent required. It is essential that only the best candidates are selected for the agricultural course. The improvement in agriculture requires to be always continuous. The results of the labours of the agriculturist end with the harvest of the crop. The crop is not always there as a building to gaze and admire. The memory is short in the public sector and only the hard and continuous effort of the extension worker can place agriculture on a better footing.

The agriculture extension worker has not been given the right place in the various developmental activities. He has been placed below the rank of those who are not appreciative of the needs of agriculture. It has been reported in the several evaluation reports and has also been felt by several outstanding persons that the development in the Blocks manned by the agricultural graduates are far superior to those operated by others. But, yet, Government is still hesitating to implement the recommendations regarding posting of agricultural graduates as Block Development Officers.

The Golden Jubilee of the Agricultural College and Research Institute was celebrated on 3rd September, 1957. The celebrations were inaugurated by His Highness Sri Jaya Chamaraja Wadiyar Bahadur, Governor of Mysore. In welcoming His Highness, Sri M. Bhaktavatsalam, B. A., B. L., M. L. C., the Hon'ble Minister for Agriculture said:

Your Highness The Maharaja and Governor of Mysore, Ladies and Gentlemen,

On the occasion of the celebration of the Golden Jubilee of this, one of the premier Research Institutes in the country, it may not be out of place to make a brief reference to the history and progress of this Institute, which by the way, will be virtually the history of scientific Agriculture itself in this part of the country.

Fifty years back, Agriculture as a science had no status worth mentioning in this state or the country. It is true that a small nucleus Farm existed at Saidapet near Madras, but this was more for demonstration and testing of exotic implements rather than for research. At that time there was no improved strain in any crop, the value of fertilisers was not realised to any tangible extent by the farmers of the State, and control of crop pests and diseases was an unknown factor. Agricultural education was relegated to the background and confined to the under-graduate level. It was in 1907 that the first planned curriculum of studies was implemented by the Board of Agriculture of the State and even then it was below the University level.

The incidence of repeated famines and great vicissitudes in the country focussed attention on the need for a more organised study of scientific agriculture. This led to the establishment of the Coimbatore and Pusa Institutes of Agricultural Research based mainly on the recommendations of Dr. James Voelcker.

In Coimbatore, systematic research may be said to have commenced with the appointment of the first team of expert staff consisting of the Government Agricultural Chemist, Govt. Economic Botanist and the Agricultural Expert in 1906. As was forecast by the Governor Sir Arthur Lawley and Mr. A. E. Castle Stuart, Member of the Board of Revenue, Land Records and Agriculture, during the opening of the Institute in 1909, the expert staff has now expanded to cover a larger and very many of the then unknown fields of agricultural science.

WELCOME SPEECH

The Golden Jubilee of the Agricultural College and Research Institute was celebrated on 3rd September, 1957. The celebrations were inaugurated by His Highness Sri Jaya Chamaraja Wadiyar Bahadur, Governor of Mysore. In welcoming His Highness, Sri M. Bhaktavatsalam, B. A., B. L., M. L. C., the Hon'ble Minister for Agriculture said:

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The foundations laid by those first experts and ably carried through by the subsequent stalwarts in the different fields in the last fifty years have gained a name and a fame for this institute unparalleled in the country. The world famous work on sugarcane had its origin and cradle at this Institute and formed an integral part of it till 1924, when it became a separate All India Institute. It is with pardonable pride therefore, that this Institute claims to have provided the prerequisites in the shape of men and material for the outstanding successes achieved subsequently in the field of sugarcane improvement, such as to be reckoned as a classic example of the fruits of Agricultural Research comparable to that in any other part of the world.

With the progress of time in these fifty years there has been a steady expansion in all the research organisations of this Institute, so that we have now a dozen well-equipped Research Sections dealing with most of the major crops and sciences in Agriculture.

Time will not permit me to catalogue all the achievements of this Institute. This Institute has brought out a monumental work a few years back as the "MEMOIRS OF THE DEPARTMENT OF AGRICULTURE, MADRAS", in which these achievements have been crammed to the maximum extent possible in about 1000 pages of closely printed matter.

I cannot, however, help referring to the outstanding achievements of this Institute, such as in the sphere of crop improvement, where alone the Department has been able to cover about 50% of the area under paddy, almost an equal area in millets, 80% of the area in the case of irrigated Cambodia cotton and over 95% in the case of sugarcane. The State takes pride of place in the country in the use of artificial fertilisers, which incidentally, is far less than the actual demands. In the sphere of plant protection, with the advent of the synthetic insecticides and fungicides the Department is now in a position to control most of the crop pests and diseases.

I do not say for a moment that we have been able to solve all the problems of our farmers. The Institute has certainly done a great deal during the past 50 years and more but there is much more yet to be done. It is because of the recognition of this fact that this Government have formulated comprehensive plans for intensified activities in the fields of Research, Extension and Education. The laying of the foundation stone by Your Highness

to-day, marks an important milestone in the planned development of Agricultural Education in the State. Before long, this Government hopes to take an important step forward, for the intensification of Research, both at the Graduate and Post-graduate level. Extension work, which is the final phase of the utilisation of the results of Research is also receiving its due attention in the Community Project areas and in the rest of the State. Only recently, all the important Districts of the State have been bifurcated to bestow adequate attention on this important field of activity.

Your Highness would have noticed that the subject selected for symposium this year to be held on 5—9—1957, is 'Integration of Research, Education and Extension'. With the active co-operation of our American T. C. M. Experts under the able guidance of Dr. F. W. Parker, the Government are having under their active consideration a plan to bring about an effective co-ordination between the three wings of the Department and to strengthen the Research wing in some aspects, so as to be able to discharge their functions adequately and effectively. The plan contemplates the setting of a semi-autonomous body at Coimbatore in order to bring within its scope the pursuit of fruitful research in all crops and subjects, including Home science, to ensure the education and well-being of Farmers at all levels and of all ages under a coordinated agency.

I believe I have said enough to show that though this Institute has covered a lot of ground it has still to play an increasingly more active and important role in the future. Fifty years is but a short span in the lifetime of an Institute, particularly in the sphere of Agriculture, where man's capacity has to be balanced with Nature's vagaries. It is well known that in certain crops a new strain may take anywhere from 10 to 40 years to evolve and popularise. A new pest or disease often upsets all calculations. The needs of an improved strain for manures and fertilisers are not necessarily the same. These offer a constant challenge to the research workers and it is my hope that this Institute, which has already to its credit good many outstanding achievements, will continue to serve the science of Agriculture and the agriculturists of this State and the country as a whole, more and more effectively in the years to come.

Your Highness, the building for which you are shortly to lay the foundation stone is the natural corollary to the keen interest of the State and the Central Governments to expand the facilities for

higher Agricultural education in the State. Our existing College built in 1926 was meant to cater to a student strength of 48 only. With the growing needs for higher Agricultural education the same buildings are being utilised now to deal with an annual student strength of 162. Under the second Five Year Plan the Government of India have come forward to meet a substantial share of the expenditure and capital outlay towards the building and equipment for catering to the increased strength in our Agricultural Colleges. With a sanctioned provision of 38.05 lakhs, Rs. 20 lakhs have been earmarked for an additional College Building and hostel. To conform to the architectural design of building within the campus, we have decided to put up this new building as an exact replica of the Freeman Building to the north of it. I have now the honour of inviting your Highness to lay the foundation stone of this Golden Jubilee building and to deliver the inaugural address of the Golden Jubilee celebration, as well as declare open the Golden Jubilee Exhibition, which is housed in the main lobby of the Research Institute.

MESSAGES

At the conclusion of the welcome speech by the Hon. Minister the Principal Dr. K. C. Naik read excerpts from some of the messages received.

Your Highness, Hon'ble Minister for Agriculture, Ladies and Gentlemen,

During fifty years of existence of this Institute a galaxy of eminent persons have had opportunities to shape the policies and add to this Institute's contribution to agricultural science and practice. We are fortunate in having received messages from some of these personages on this occasion, as also from a few of our most distinguished administrators and beloved leaders of the nation. With permission of your Highness, I shall now read excerpts of these messages.

DR. S. RADHAKRISHNAN, *Vice-President of India.*

I am glad to know that the Agricultural Research Institute, Coimbatore will celebrate its Golden Jubilee from 3rd to 7th September in completion of useful service for the last fifty years, and that the Governor of Mysore will lay the foundation-stone of the

Golden Jubilee building on that occasion. I send my best wishes for the success of the function and hope that the Institute will continue to do good work by way of research and help development of agricultural production which is the main target of our National Plan.

SIR C. V. RAMAN, F. R. S., N. L., *Director, Raman Research Institute, Bangalore.*

The celebration of the Golden Jubilee of the Agricultural Research Institute, Coimbatore is a great occasion. Having had many personal contacts with the Institute and the Officers who have worked on it, it gives me great pleasure to congratulate the Institute on its magnificent record of work during all these years. I do not think it will be necessary for me to recount all the achievements of the Institute. They are very well known and have added to the stature of India in the world of science. I feel sure that the prosperity and progress of the Institute will be a matter close to the heart of the authorities who control the destinies of the State of Madras, and that they will do their utmost for it. The laying of the foundation-stone of the Golden Jubilee Building by His Highness the Governor of Mysore is itself an earnest of their solicitude for the future of the institute. Once again, I wish to associate myself with the rejoicings on this happy occasion.

SRI A. J. JOHN, *Governor of Madras, Raj Bhavan, Guindy, Madras-22.*

The Research Institute started in 1907 has completed 50 years of useful service in the advancement of scientific farming practices. It has contributed greatly towards the agricultural prosperity of the State. The Institute is classed as the premier institute of its kind in India. In the years to come, the institute has a very important role to play in the development of Agriculture in the country.

THE MAHARAJA OF BHAVNAGAR, *Former Governor of Madras.*

Agricultural Research discovering the means for higher yields of crops is the prime requisite for the prosperity of India and I am sure this Institute will, as in the past, succeed in achieving this goal.

SRI K. KAMARAJ, *Chief Minister of Madras.*

I send my greetings and best wishes to the Principal, other members of the staff and the students of the Agricultural College and Research Institute, Coimbatore on the happy and auspicious

occasion of its Golden Jubilee. This great institution has a record of achievement to its credit during the past fifty years of its useful existence of which every one connected with it can be legitimately proud. These fifty years have witnessed revolutionary changes. The country has become free and independent and the State now is no longer a police State but a Welfare State. Agricultural development is no longer a kind of colonial development. It is now the main plank in the struggle of this nation against the evil forces of poverty and hunger. I have no doubt that the authorities of the Agricultural College and Research Institute have adapted themselves to the changed times, and have realised their immense responsibilities. If they play their part well, the agriculturists in this State will come to regard this institution as their real guide, philosopher and friend.

* * *

SIR T. S. VENKATARAMAN, Kt. C. I. E., D. Sc., 58, Theagaraya Road, T. Nagar, Madras - 17.

The now world-famous Sugarcane Breeding Institute was originally conceived in the fields and laboratories of your Institute. During its earliest babyhood it was nursed by the scientific man power and the laboratories of your Institute. Since that time your Institute has brought into being other research stations connected with all the important agricultural crops of the State. As time rolls by your Institute is bound to occupy a leading place in the Agricultural Institutes of the World.

* * *

SHRI A. M. THOMAS, Deputy Minister for Food and Agriculture, Government of India, New Delhi.

The Agricultural Research Institute, Coimbatore, can legitimately be proud of its impressive record of achievements in the field of agricultural research during the last half a century. I have no doubt that in the years to come the Institute will continue to make useful contributions to the cause of Indian agriculture and enhance its reputation still further. I wish the Golden Jubilee celebrations all success.

* * *

SIR S. V. RAMAMURTHY, Member, Planning Commission, "Venkata Vilas" Cathedral Post, Madras 6.

I congratulate the Agricultural Research Institute, Coimbatore on the attainment of its Golden Jubilee. I have been interested in the work of the Madras Agricultural Department ever since 1915

I held demonstrations of its then best known results such as planting of single seedlings of paddy and use of daincha as green manure. At a Rural Improvement Conference I held, young agricultural officers delivered lectures who later worked with me in different capacities as Director of Agriculture and Development Adviser. No appointment that I held gave me greater enjoyment than that of Director of Agriculture. Agricultural Science is not only practically valuable but has been to me philosophically satisfying. In chromosome numbers, Nature shows itself to be as competent an arithmetician as man. In quality and output of scientific work the Research workers of Coimbatore have been behind no such group anywhere in the world. Where they have been handicapped is in the adoption of their results by the people. The Community Project and National Extension Service Movement is calculated to reduce such handicaps. The scope of agricultural Science in India is enormous. If agricultural production is raised by 50% as fully possible, there will be revolution not only in the internal economy of India, but also in its international position. I wish the Agricultural Research Institute, Coimbatore all success both in the development of science and its application to the life of the people.

* * *

DR. C. P. RAMASWAMY AIYAR, Madras.

I have always taken an abiding interest in the activities of the Agricultural College and the Research Institute and I am fully cognisant of the fine pioneering work carried out by it in the direction of improving and intensifying production. The present prosperity of the textile, sugarcane and other industries are, to no small extent, due to the scientific assistance and stimulus afforded by the Research Institute and the remarkable men who have worked under its auspices.

I wish the celebrations all success.

* * *

SRI P. T. RAJAN, M. L. A., "Palayam House" Tallakulam Post, Madurai.

I am happy to hear that the Agricultural College is celebrating its Golden Jubilee on the 3rd September, 1957. It gives me immense pleasure as one who had been Minister of Agriculture for some years and some members of whose family had been alumni of the institution in the early stages when it was located in Saidapet, to say that the College has helped to achieve immense progress in the field of Agriculture within the last twentyfive years. One can be proud of its achievements and as such I wish the function every success.

DR. B. P. PAL, M. SC., Ph. D., (Cantab.), F. L. S., F. N. I., F. B. S. HON. MEMBER, GENET SOC., JAPAN, *Director, Indian Agricultural Research Institute, New Delhi.*

The Agricultural Research Institute, Coimbatore has reached a milestone in its history. On behalf of the staff of the Indian Agricultural Research Institute as well as my own I send to it our sincere congratulations on its progress and achievements during the half century of its existence. On this occasion the Agricultural Research Institute, Coimbatore can legitimately look back on its brilliant record of work with a sense of fulfilment and pride. Those responsible for guiding and conducting research work of the Institute can derive satisfaction from the fact that the fruits of their labours have benefitted a large body of people of the State.

In the context of planned development of the country, the value of all research in agriculture has to be judged by its fruits, viz., that of growing two blades of grass where only one grew before. I am glad that the Agricultural Research Institute, Coimbatore, has made its contribution in this direction not only in the State of its location but the benefits of the research work done here have been enjoyed by other States as well.

I hope the Institute will grow from strength to strength and its progress in future will be as striking and glorious as it has been in the past.

SIR A. L. MUDALIAR, M. D., LL. D., D. SC., D. C. L. (Oxon). F. R. C. O. G., F. A. C. S., *Vice-Chancellor, University of Madras, Madras - 5.*

The Government of Madras have with commendable forethought started the Research Institute in close association with the Agricultural College and both these institutions have functioned as models of their kind for a long time. It is a matter of gratification that His Highness the Governor of Mysore has acceded to the request to inaugurate the celebrations and to lay the foundation stone for the Golden Jubilee building. With his blessings, I trust that the Agricultural Research Institute will prove even more productive of great ideas and research on good lines in the field of Agriculture.

DR. B. N. UPPAL, *Agricultural Commissioner, Indian Council of Agricultural Research, Queen Victoria Road, New Delhi.*

The brilliant work done by a long line of investigators during the past fifty years is a glorious record of achievements, which has won for Coimbatore an honourable place in the annals of Indian

agriculture. The foundations of the now famous Co. canes were also laid at the Institute. Coimbatore's contributions to the agricultural progress of the Madras State have indeed been remarkable in the field of crop improvement and also in other branches of agricultural science. The Institute has thus had a most successful career in the past, and I have a firm belief that in due course it will grow into a great agricultural university of the South.

DR. M. S. RANDHAWA, *Vice-President, Indian Council of Agricultural Research and Additional Secretary to the Government of India, New Delhi.*

The celebration of the Golden Jubilee of the Agricultural Research Institute, Coimbatore in September 1957 is a great event in the development of agricultural research in the country. During the past 50 years, Agricultural Research Institute Coimbatore has made outstanding contributions in the field of agricultural research, which have won for it an honourable place among the premier agricultural research institutes of the Country.

I trust that the Coimbatore Institute will continue to maintain its high traditions in the years to come. I wish the Golden Jubilee celebrations all success.

SRI A. B. SHETTY, "*Kadri Hill*" *Bijai, Mangalore - 4.*

The Agricultural Research Institute at Coimbatore has contributed in a remarkable manner to the development of agriculture in Madras State. The use of improved varieties of seed, proper application of manures and fertilizers, effective control of pests and diseases and such other measures to increase production have become a part of the agricultural practice of enlightened cultivators. The celebration of the Golden Jubilee of your Research Institute and the Exhibition you are having in connection with it will serve to extend among the farmers valuable knowledge regarding new discoveries and their application to the practical problems of cultivation. This occasion is bound to give further stimulus to the programme of agricultural research on which the Madras State have embarked with central aid under the provision made for it in the Second Five Year Plan. I trust Research Services will receive hereafter encouragement and support in a more ample measure since they have to plan an increasingly important role in speeding up the pace of agricultural development in the coming years.

SRI P. P. I. VAIDYANATHAN, BAR-AT-LAW, I. C. S., *Secretary to Govt. Food and Agriculture Department, Fort St. George, Madras - 9.*

I had all along been eagerly looking forward to the pleasure of participating in the Golden Jubilee celebration of the Agricultural College and Research Institute, Coimbatore. But, I have had to deny myself of that pleasure at the last minute as I have to be away at New Delhi on official business. Both as Director of Agriculture and as Secretary to Government, Food and Agriculture Department, I have come into close contact with the work on the teaching and the research sides of this great institution and I am aware of the excellent traditions which it has built up and its fine record of work during the last fifty eventful years which has justly won for it name and fame both in this country and abroad. I am confident that this institution has a glorious future of continued progress and ever increasing usefulness to the agriculturists of this State whom it seeks to serve.

SRI M. S. SIVARAMAN, I. C. S., *Adviser, Programme Administration, Planning Commission, Government of India, New Delhi.*

The graduates of the College and the Research workers of the Institute have throughout taken lead in the matter of Research and agricultural advancement in India and I am sure that they will continue to keep up the past reputation and achieve grater things required in an expanding economy.

SRI K. RAMIAH, D. SC., F. N. I., "*Swathi*," 552, XIX Cross Road, Malleswaram Post, Bangalore - 1.

I look back with great pride and pleasure that I belonged to the research staff of this Institute between 1914 and 1937. In my later career outside Madras as well as outside India under FAO of United Nations I have had opportunities to visit several agricultural research institutes. I can confidently say that the work of the Coimbatore Institute is well recognised and appreciated everywhere.

There was a time when standard of work at Coimbatore was considered on a par with that of the all-India institute at Pusa. Immediately after World War II there was perhaps greater emphasis on activities other than research, I am happy to find that the Coimbatore Institute is once again coming into its own in the field of agricultural research. The all-India Institute now in Delhi has grown enormously and is playing an important part in the agricultural research programmes of the country. For a country of the size

of India with its varied conditions and problems there is scope for several Pusa Institutes, and Coimbatore can well develop into a premier institute for South India. The need for greater agricultural production in the country should mean enlargement and intensification of research programmes, and there is no doubt that Coimbatore will make significant contributions to our knowledge on the fundamentals of agricultural sciences.

New laboratories and additional facilities by themselves do not make an Institute great. Much depends upon the standard of investigations and results obtained. I would like to take this opportunity to send an appeal to the present and future research staff of the Institute to give their very best not only to maintain but also add to the reputation of the Coimbatore Institute which stands already high both in and outside India.

SRI M. R. BALAKRISHNAN, F. A. O. *Expert, C/o Royal Irrigation Department, Bangkok, Thailand.*

It gives me very great pleasure to send my message of good wishes to the good old college, my Alma Mater (my mother) to whom I owe a great debt for all the love and attention bestowed on me during my youth and adolescence. Our College has become a world Institution and in the international sphere, our graduates have done meritorious service for humanity in the field of agricultural research and increased production. Enclosed is a contribution for the College Day expenses, to be used as per your discretion.

Dr. F. W. PARKER, *Chief Agriculturist, Technical Co-operation Mission, New Delhi.*

The Coimbatore Agricultural College and Research Institute can well be proud of its record of past fifty years. Evidence of its fine work is seen in all parts of India, for, Coimbatore trained men and Coimbatore research are not confined by state or national boundaries.

The record of achievement of the past are only a token of the future for the College and Institute. The demands of free India for well trained men and women, for agricultural research and for agriculture and home science extension far exceed requirements of the past. Coimbatore will certainly have a very important role in meeting this need.

I understand the Madras Government has well developed plans for the expansion and development of the College and Institute.

Laying the corner stone of the Jubilee building is only the beginning of the development program. The U. S. Technical Co-operation Mission and the University of Tennessee are glad to be associated with the College in this important development.

Please accept our best wishes on this important occasion.

INAUGURAL ADDRESS

The Maharaja of Mysore then delivered his inaugural address, excerpts from which are reproduced below

Mr. Bakthavatsalam, Ladies and Gentlemen,

"I thank you for inviting me to be in your midst on this festive day. The Golden Jubilee celebrations of your great Research Institute which I am about to inaugurate mark an important milestone in its eventful career. When the seed was sown for the starting of it as an Agricultural School in 1876, the objective set forth was defined as experimental work aimed at increasing yields and the improvement of livestock in the country.

Besides the extensive central farms, within which the Research Institute and Freeman buildings and the laboratories are located, the close association of the Research Institute with the College emphasizing the correlation of Agricultural science to their practical applications and the intensely practical character of the course of education wherein, more than book learning the candidates actually handle ploughs and animals and participate in all farm operations, are unique features of the Institute. Since the outbreak of the II World War and because of the urgency and importance of Agricultural operations, new responsibilities have been shouldered by this Institute and new departments like the post-graduate diploma Course in Horticulture have been opened for men and women who specialize in Botany and Agriculture.

The importance of Indian Agriculture arises not merely from the fact that it furnishes the means for the subsistence of one-eighth of the human race, but also because of the fact that it provides raw materials for India's as well as the World's industries. The growing deterioration of the food situation after the War and the increasing dependence on foreign imports of food throw into sharp relief the problems of reconstructing the whole frame-work of agricultural

economy. The Bengal Famine, to quote an example, touched the very foundations of national agricultural economy and demanded a policy of complete re-orientation in an over-all planning. Zamindari system was to be abolished, the system of land tenure was to be reformed and greater emphasis was to be placed on fundamental research and on the technical aspects of agricultural development. The preponderating importance of agriculture in India's national economy has been realized and the Government is determined to stop imports and make the country self-sufficient by multipurpose river valley projects and irrigation projects.

Agricultural Institutes, Agricultural Research Stations, Food and Technological Institutes, and Agricultural Research Laboratories, are being organized by the Central Government in different centers of the country, in order to examine the food situation and food production, and to investigate and carry on research on problems of agriculture. Defective preparatory tillage, primitive cultivation of land, poor quality of livestock, lack of adequate supply of good seeds, diseases, harm from insects and pests, soil erosion, exhaustion, lack of proper manuring, sub-division and fragmentation of holdings, deficit economy, overcrowding of people on farm land, lack of subsidiary industries, defective organisation in cultivation and marketing and a host of other factors call for urgent national attention today.

Apart from reforms in technical aspects of agriculture, what is of the greatest importance is the institution by the Agriculture Department of local investigation councils to ascertain the irrigation requirements of each district. This work has to be supplemented by continuation and extension of experimental research as has been done here, aided, by chemical science in reference to new crops, methods of cultivation, and soil manures; further-more, there is the need for the spread of general and agricultural education and the preparation of suitable text-books in the regional languages for the purpose, and to propagate new knowledge derived by research for the benefit of the common villager.

It is no longer a problem of providing cheap finance, irrigation facilities, marketing organization and other aids to the agriculturist, but rather one of re-orientating the whole economy right from the bottom upwards. Technical advances do have their place in any plan of agricultural expansion, but it is urgent to realize that our agricultural economy cannot be lifted to a higher plane of efficiency without breathing new life, and hope into the hearts of the actual

cultivators. Our education, be it agricultural or scientific, needs a little re-orientation to meet our newer requirements consequent on the attainment of *Swarajya*. The courses of study and the text-books must relate to life in the neighbourhood of the country. Students in our educational institutions should feel that they have now the good fortune of being the citizens of free India, and that there is a tie of kinship between them, the agriculturist forming the agricultural proletariat. The country entirely depends on science and institutes of this kind to raise Indian agriculture to a pre-eminent position in solving India's food problems.

All recognize that research has made a great contribution towards increasing India's agricultural knowledge. But it is only when the results of the laboratory are transferred to the fields for application that scientific agriculture will have achieved its objective. The Indian peasantry go their traditional way and the teachings of science have failed to be effective. In our country, a stage has been reached when the machinery for gaining more knowledge is working better than the machinery for utilising it."

Proceeding His Highness stressed the necessity for closer co-operation between the student of agriculture and the agriculturist. He expressed satisfaction that the students at this College participate in all farm operations, actually handle animals, fit up ploughs and work them on dry lands, as well as in wet paddy fields. They dig and cart manure, form plots, work the moles, irrigate the fields, nurse seedlings, transplant and harvest the crops, cart and harvest the produce and in fact take part in every farm operation.

In conclusion His Highness said that :

"Our thanks most assuredly, on such an occasion, go to the many pioneers who made the inception of the Institute a reality by their hard labour and devotion to a cause dear to their hearts. May the Institution inculcate in students and staff that strong sense of social responsibility which is so very essential for the citizens of Indian democracy. May the Institute flourish and prosper more and more".

His Highness then laid the foundation of the Golden Jubilee Block of the College by unveiling a marble tablet.

VOTE OF THANKS

DR. K. C. NAIK, *Principal and Joint Director of Agriculture then proposed a vote of thanks. He said :*

"It is now my privilege to propose a hearty vote of thanks to Your Highness for gracing this occasion and for performing several functions connected with this Institution.

As the Governor of one of the most advanced States in the country beloved by the people in the State and beyond, for erudition, sympathy and paternal care of the people, everyone here is well aware of Your Highness, solicitude towards the welfare of Agriculturists, who from the bulk of the people in Mysore as elsewhere. We are indeed fortunate to have your Highness's in our midst today, to commemorate an event of the greatest importance in the annals of this Institute.

To our Hon'ble Minister for Agriculture, it will be inadequate to express our gratitude for the abiding interest he has been taking in all matters pertaining to this Institute. This new building which has to be erected shortly and the foundation of which has just been laid by Your Highness, and the unprecedented developments programmed for intensified research, education and extension activities in this State, are all due to the active sympathy, interest, and drive of the Hon'ble Minister for Home and Agriculture. In all these, he has been assisted by the Secretary, Food and Agriculture Department with such ability and zeal that only those who are in the know would be able to vouch for. We are sorry that he is not amidst us today, for unavoidable reasons. The Director of Agriculture, though new to the Department has displayed already such solicitude and interest that we look forward to a promising era of progress under his guidance. To all these, I tender thanks on behalf of the members of this Institute.

A function of this magnitude is impossible without the active co-operation of a large number of my colleagues here and staff of some of the local sister Institutes, as well as a few officers and the gentry of Coimbatore. I regret time does not permit me to mention them individually and express to them our deep debt of gratitude. I have therefore to content myself by expressing my gratitude to one and all of them collectively.

To all the ladies and gentlemen who have so kindly responded to our invitation, my grateful thanks are also due."

The function then concluded with the singing of the National Anthem.

GOLDEN JUBILEE SPORTS

6th SEPTEMBER, 1957

List of Events and Prize Winners.

100 M.	1. P. K. R. Nambiar 2. Kuppuswamy 3. Selvanayagam	} Saidapet Old boys Cup
200 M.	1. P. K. R. Nambiar 2. Kuppuswamy 3. S. Pichai	
400 M.	1. K. Ramaswamy 2. V. Muthu 3. George Verkey	} Prince of Wales Cup
800 M.	1. V. Muthu 2. K. Ramaswamy 3. Amal Raj	
1,500 M.	1. V. Muthu 2. K. Ramaswamy 3. Vijayan Nair	} Anstead Cup
110 M. Hurdles	1. P. K. R. Nambiar 2. Selvanayagam 3. K. Ramaswamy	} Ramaswamy Sivan Cup
200 M. Hurdles	1. Kuppuswamy 2. Selvanayagam 3. V. Muthu	} Nagan Gowda Cup
Long Jump	1. P. K. R. Nambiar 2. Ahmed Shah 3. S. Pichai	
High Jump	1. Jagadeesan 2. P. K. R. Nambiar 3. Kulandaiswamy	} Tadulingam Cup
Pole Vault	1. K. M. Ganapathy 2. C. Kesavan 3. P. K. R. Nambiar	
Hop, Step & Jump	1. P. K. R. Nambiar 2. Ahmed Shah 3. Gopalakrishna	
Shot Put	1. P. K. R. Nambiar 2. Joe Mathias 3. T. M. Kandaswamy	

Discus Throw	1. P. K. R. Nambiar 2. G. C. Perumal 3. Varadhan	
Javelin Throw	1. K. Ramaswamy 2. Joe Mathias 3. P. K. R. Nambiar	
Hammer Throw	1. Varadhan 2. Gopalakrishna Rao 3. M. J. Tom	
Cross Country Race	1. V. Muthu 2. Vijayan Nair 3. K. Ramaswamy	} Norris Cup
Obstacle Race	1. K. C. Medappa 2. Ramesh Pejathaya 3. Kulandaiswamy	

Individual Championship Cup (Vengail Krishnan Nayanar Cup)
awarded to Sri P. K. R. Nambiar.

Track Event Championship Cup (M. R. Balakrishnan Golden
Jubilee Cup) awarded to Sri V. Muthu.

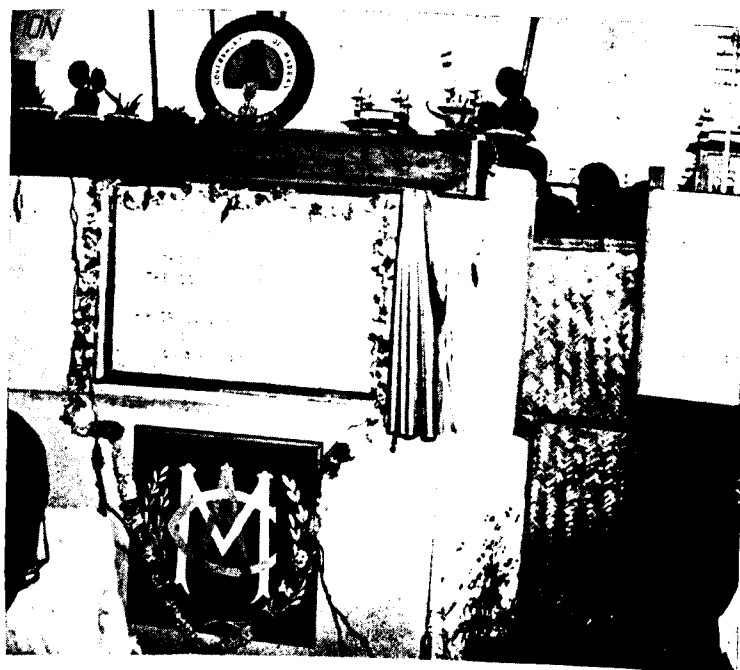


His Highness delivering the inaugural address



Sri Bakthavatsalam's Welcome Speech

Photo — Agrl. Information Officer



The Foundation Stone of the Golden Jubilee Block

Photos — Agrl. Information Officer



Principal Dr. K. C. Naik reading messages

Photo — Sri P. R. Damodaran



GOLDEN JUBILEE SCENES

On the occasion of the Golden Jubilee many enlightened Agriculturists and Institutions have made generous donations to the Union. The Union gratefully acknowledges these donations.

DONATIONS RECEIVED ON THE OCCASION OF THE GOLDEN JUBILEE

1.	SRI SAMBAMURTHY, Shrothiandar, Villupuram	Rs. 500 -
2.	.. T. KONDA REDDIAR, Radhapuram P. O., (via) Vikravandi, S. Arcot Dt.	.. 500 -
3.	.. N. VEERARAGHAVALU NAIDU, Srivillikuppam, S. Arcot Dt.	.. 500 -
4.	.. SRIMATHI A. CHELLAMMAL of Karadibavi, w/o Sri R. V. Aligiriswami Naidu, 7/4, A. T. K. Colony, Coimbatore	.. 500 -
5.	.. G. RAMASWAMI NAIDU, Governing Director, Sri Karthikeya Spinning & Weaving Mills, Coimbatore	.. 500 -
6.	.. G. GOPALA CHETTIAR, Pollachi	.. 500 -
7.	.. C. K. N. S. NAGARAJAN, Mirasdar, Valavanur, S. Arcot Dt.	.. 500 -
8.	.. M. R. BALAKRISHNAN, B. A., B. Sc. (Ag.), F. A. O., Expert, c/o Royal Irrigation Department, Bangkok, Thailand	.. 500 -
9.	M. S. VASANTHA MILLS, LTD., Coimbatore	.. 500 -
10.	SRI A. L. LAXMINARAYANA REDDIAR, Omandur, S. Arcot Dt.	.. 500 -
11.	M/s. RAMAKRISHNA MILLS COIMBATORE LTD., Ganapathy Post, Coimbatore	.. 500 -
12.	SRI M. D. RAMASWAMI REDDIAR, Mirasdar, Orathur, (via) Mundiampakkam, S. Arcot Dt.	.. 100 -
13.	.. A. M. R. KALINGA RAYAR, Zamindar of Uthukuli, Coimbatore Dt.	.. 100 -
14.	.. C. V. BASHYAM, "Dharma Vilas", Coimbatore	.. 100 -
15.	.. P. VARADARAJAN, Coimbatore	.. 100 -
16.	.. G. GOVINDASWAMI	.. 100 -
17.	.. J. VARADACHARI, Coimbatore	.. 25 -
18.	M/s. THE TUDIALUR CO-OPERATIVE RURAL BANK, LTD., Tudialur, Coimbatore Dt.	.. 25 -
19.	SRI A. T. DEVARAJA MUDALIAR, Coimbatore	.. 15 -
20.	.. A. T. KRISHNASWAMI MUDALIAR, Coimbatore	.. 10 -



Photo Sri K. Rajagopalan

GUARD OF HONOUR



Photo Sri K. C. Chandu

GOLDEN JUBILEE EXHIBITION



PADDY

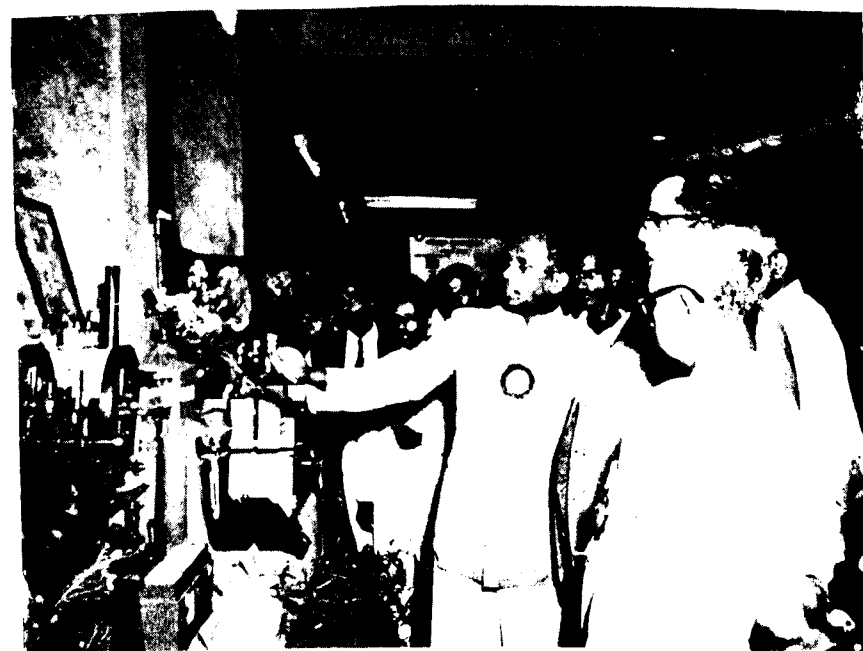
Photo Sri K. Rajagopalan



Mycology



Entomology



CHEMISTRY

Photo Agrl. Information Officer



Botany

Photos -- P. R. Damodaran

DONORS

SRI S. SAMBAMURTHY
Shrotriampdar of Kattukuppam
Villupuram



SRI G. RAMASWAMY NAIDU
Governing Director
Sri Karthikeya Spinning & Weaving Mills
Coimbatore



SRI N. VEERARAGHAVALU NAIDU
Mirasdar
Siruvallikuppam

Sitting (left to right):

Dr. K. Ramakrishnan, Sri M. Basheer, Sri L. Neelakantan, Dr. A. Mariakulandai, Sri T. R. Narayanan, Sri T. Nataraj,
Sri A. Venkatesan (Director of Agriculture), Dr. K. C. Naik (Principal), Sri M. Bhavanishankar Rao (Vice-Principal),
Sri A. Abdul Samad, Sri C. Balasubramanian, Sri V. K. Appaji, Srimathy Girija Balasubramaniam.

Standing 1st row (left to right):

Sri P. S. Narayanaswamy, Sri J. Saktharam Rao, Sri A. H. S. Sarma, Sri A. R. Seshadri, Sri S. Kanakaraj David,
Sri K. T. Narayanan, Sri R. Ananthapadmanabha Pillai, Sri S. G. Aiyadurai, Sri S. Varadarajan, Sri K. C. Chandy,
Sri R. Ratnam, Sri K. S. Shetty, Sri Sundaresan, Sri T. Santhanaraman.

Standing 2nd row (left to right):

Sri A. Subramaniam, Sri Lakshmanan, Sri S. Rajaratnam, Sri Leo Swamikan, Sri K. Balakrishnan, Sri V. Ramakrishnan,
Sri C. M. Bhakthavatsalu, Sri G. V. Ramana, Sri G. Tulasidas, Sri Sivanappan, Sri T. V. Subramanian,
Sri T. M. Venkataraman, Sri S. Madhava Rao, Sri Ramachandra Rao, Dr. V. Rathnasabhapathi.

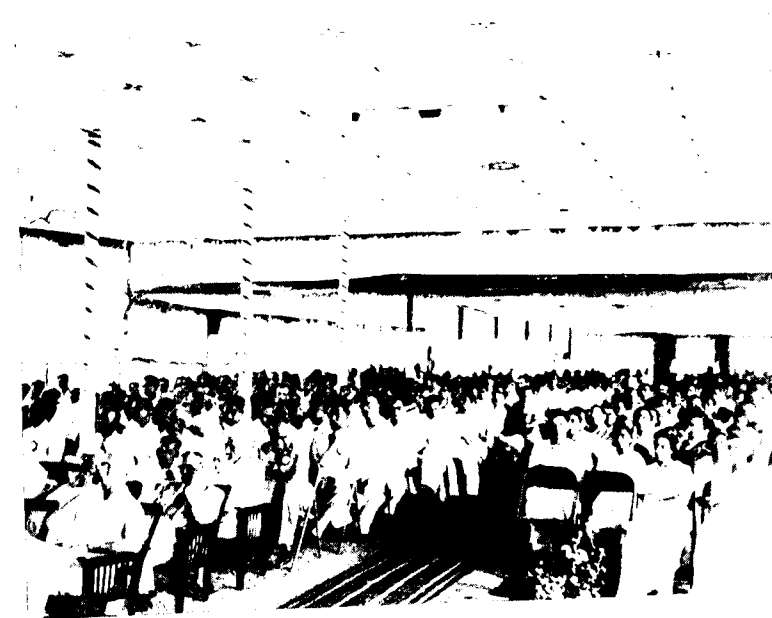
Standing 3rd row (left to right):

Sri Mukundan, Sri Ramakrishnan, Sri Krishnan.

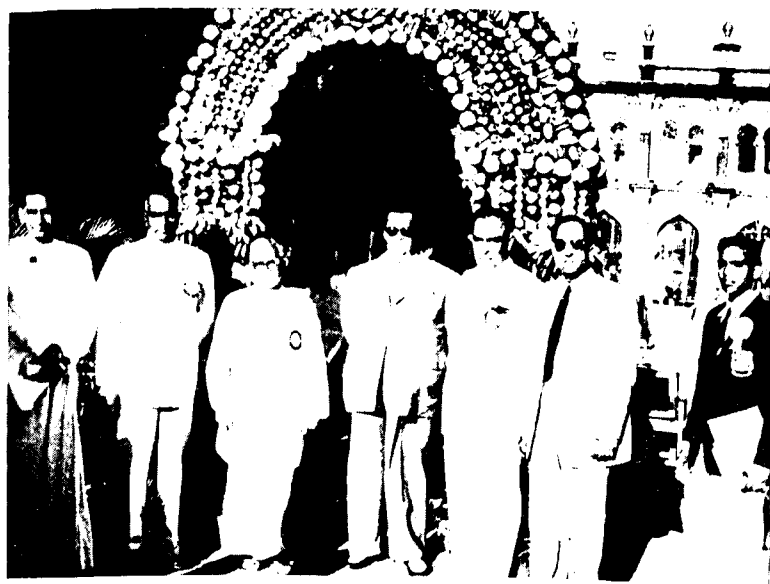


The guests at tea

Photo - Agrl. Information Officer

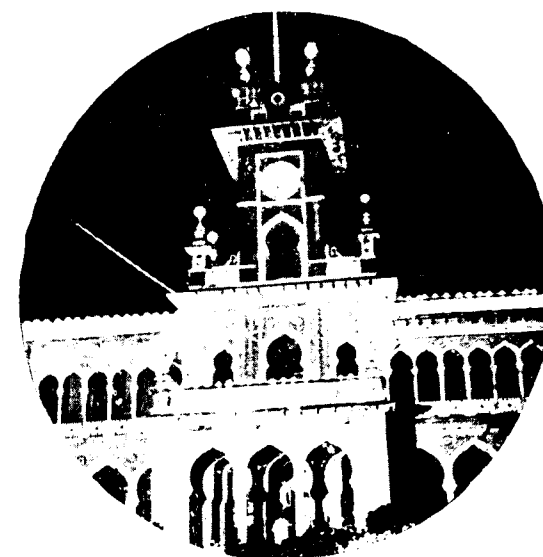


A Section of the audience



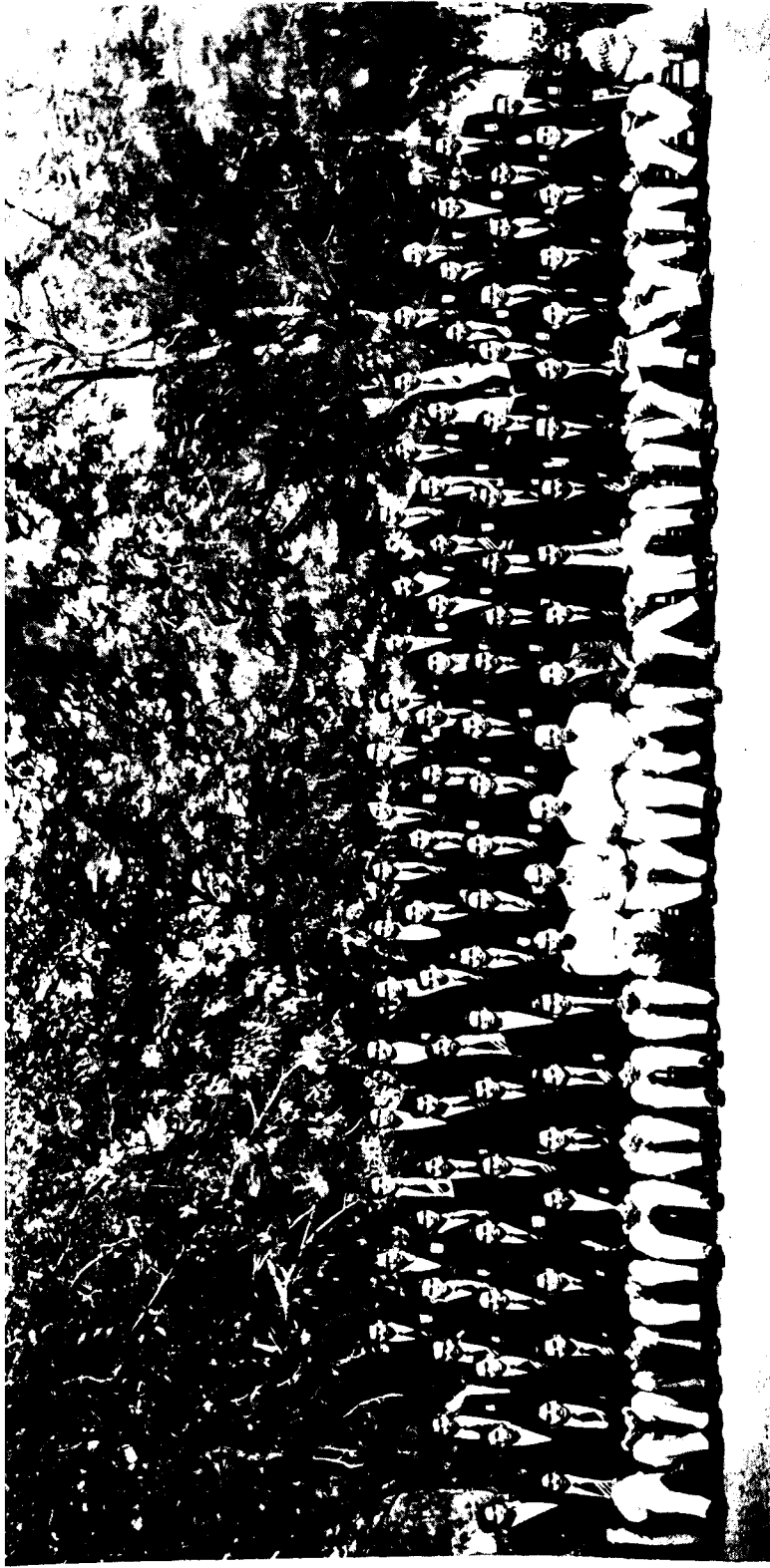
The "Fruit arch"

Photo - Sri K. Rajagopalan

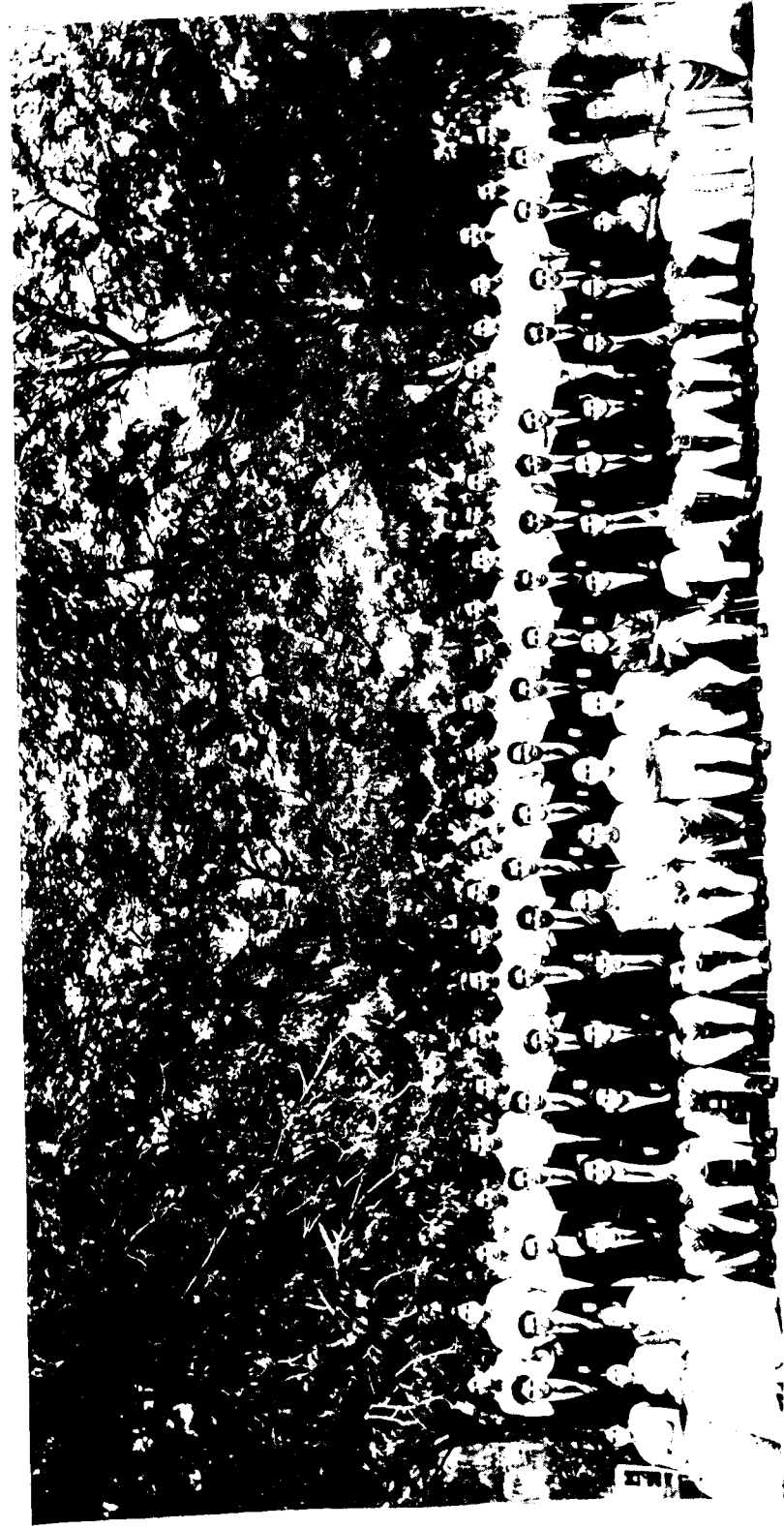


The Institute clock tower flood-lit

Photos - Sri P. R. Damodaran



VOLUNTEER CORPS



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THE 40th COLLEGE DAY AND CONFERENCE

The 40th College day and Conference was held at 9 a. m. on 4th September, 1957. The Conference was presided over by Sri T. S. Avinashilingam Chettiar, B. A., B. L. and was inaugurated by Sri Nallasenapathy Sarkarai Manradiar, the Pattagar of Palayakottai. The Hon'ble Minister for Agriculture, Sri M. Bakthavatsalam, B. A., B. L., M. L. C. also graced the occasion by his presence and kindly made some introductory remarks at the commencement of the Conference.

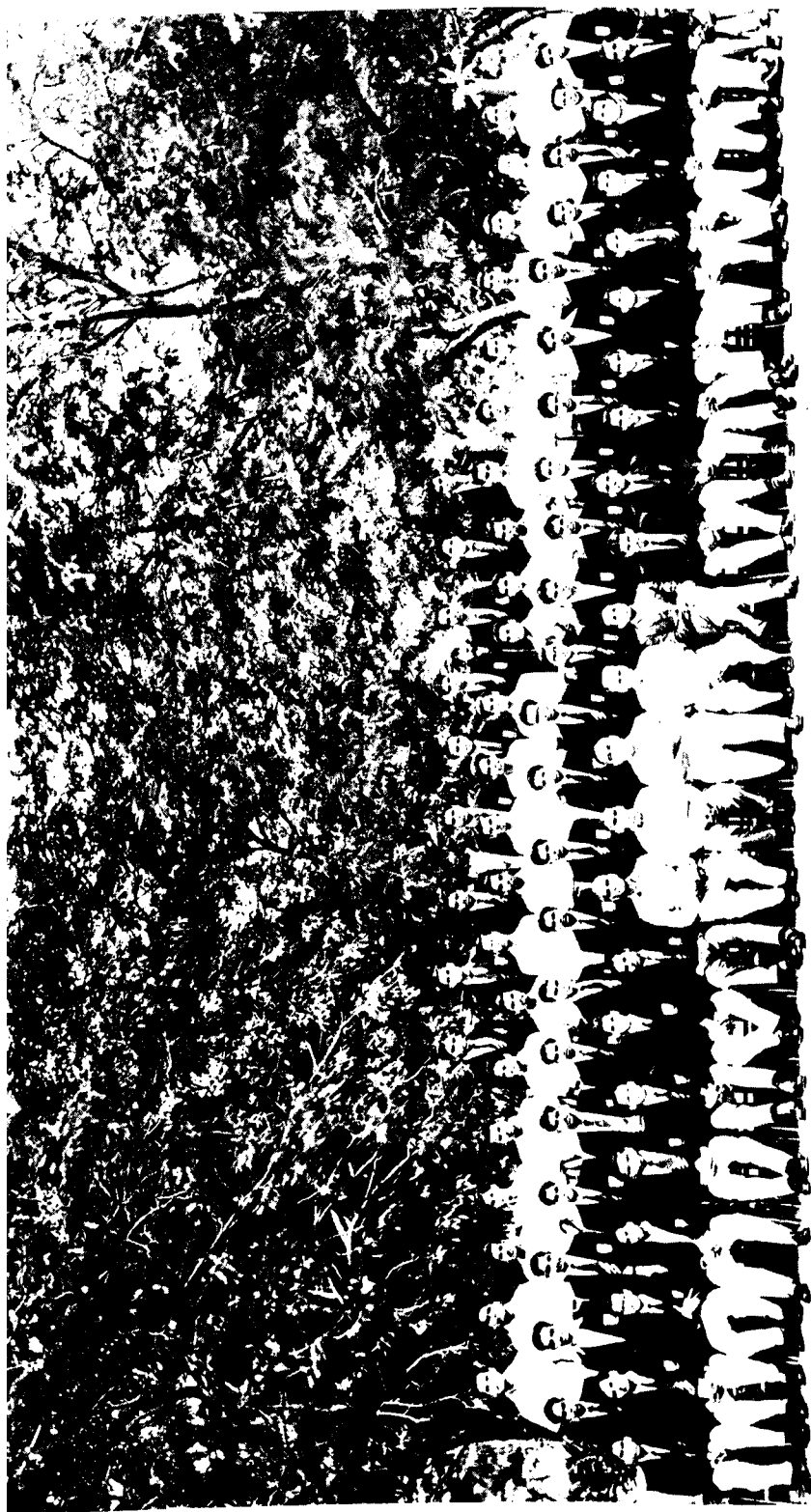
The Conference opened with a welcome speech by Dr. K. C. Naik, Principal and President of the Madras Agricultural Union. Dr. Naik said :

Esteemed President, Hon'ble Minister for Agriculture, distinguished guests, Ladies and Gentlemen,

This 40th College Day and Conference, synchronizing as it does with the Golden Jubilee year of the Research Institute, attains a significance far above ordinary. It is a most happy augury for this Conference that we have been able to secure as President no less a distinguished Educationist, Social Worker and leader of men as Sri T. S. Avinashilingam Chettiar. We are all grateful to him for so readily responding to our invitation.

In Pattagar of Palayakottai, we have an eminent animal breeder and agriculturist of all-India fame. It is our good fortune that he too readily consented to address this Conference. I need hardly say that by honouring Sri Avinashilingam Chettiar and the Pattagar of Palayakottai, we are only honouring ourselves.

In this memorable Golden Jubilee year I am happy to state that this College too has had a proud record of many achievements to its credit. In the academic sphere, we were able to break the spell which had gripped this College for about a decade, by securing a First Class pass in the final B. Sc. (Ag.) class, the credit for which goes to Sri Sreerangaswamy. One of the alumni of this College and now an Officer of this Department viz., Sri V. Santhanam, Assistant Cotton Specialist, Koilpatti has been awarded the degree of Ph. D., of the Madras University for his work on "Heterosis in Tobacco". In the sphere of extra-curricular activities, our distinctions are no less spectacular. During the year the College won three hockey trophies - the league championship shield, Government Arts College



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40th COLLEGE DAY & CONFERENCE

4th SEPTEMBER 1957

cup and the Asher cup. Sri P. K. Ramachandran Nambiar, final year student has made history by securing two most coveted championships of the year, one being the Inter - Collegiate championship at Coimbatore and the other - the State championship at Madras in the sports meet held to commemorate the centenary of the First War of Independence. He has achieved a good many distinctions in the academic sphere too, as will be seen from the prizes which will be shortly awarded to him. Yet another distinction is the breaking of the 31 - year old College record by Sri V. Muthu of the final year, who set up a new record of 34 minutes 26 seconds in the five miles cross country race. Not to be out done by mere men, our girls too have had a notable record. Kumari Vijayalakshmi Moosad of the Second year has had the enviable distinction of securing the first prize for her superb acting in an English play in the Inter - Collegiate Dramatic competition held during the University Centenary celebrations at Coimbatore. All of you will have an opportunity to see her acting along with other lady colleagues this evening in this very pandal.

The year that has passed has seen many radical changes in our research and administrative set up. For the first time in the history of the department, the integration of research and education in the whole State has been achieved by centralising these duties under the Principal and Joint Director of Agriculture (Research). This institution is therefore, among the first to implement one of the important recommendations of the Joint Indo-American Team. Pre-professional course was introduced for the first time during this year, though the students are now attached temporarily to the three Arts Colleges in the State. Post-Graduate research has gained an unprecedented tempo with 41 persons now on the rolls. The increased admissions in the College have entered the Second year of operation with 162 students in each of the first two classes. To cope up with this large number of students, the Government have permitted us to take over the old Nirmala College buildings at R. S. Puram, to house about 100 students. This hostel was fitted in record time, thanks to the personal interest taken by our Secretary for Food and Agriculture Department and the Director of Agriculture, and the very earnest efforts of our Institute Engineers. Two buildings have also been taken over for housing the Gardeners' course and the Young Farmers' course trainees.

In all these expanding activities on the teaching and research side, we have had the most active help and backing of the Tennessee Survey Team under the dynamic leadership of Dr. Long, Group

Leader at Bangalore and Dr. Parker of the T. C. M. at Delhi. Our two American Experts - Professor Sharp and Professor Fay - have so closely identified themselves with our aspirations that we look forward to a period of very fruitful work in active collaboration with them. All these various intensified activities are blossoming forth to an era of further developments, for which a blue-print has been prepared under the indefatigable leadership of our Hon'ble Minister for Home and Agriculture, Secretary, Food and Agriculture Department, Madras and the Director of Agriculture.

It has been said that 'institutions make men and men make institutions'. So long as we have the leadership of such an eminent and distinguished personage as our Hon'ble Minister for Agriculture, this institution is bound to be set on the road towards unparalleled prosperity, capable of rendering increasingly useful and sustained service to our agriculture and agricultural community in this State and beyond. To him this institution will be indebted for ever for having laid the foundation and thereby ushering a new era of unparalleled opportunities for progress. In the implementation of this new programme, we are most fortunate in having as our Director, a person of such amiable and genial temperament with a rare devotion to duty, and a Secretary in Food and Agriculture Department with a passion for effecting improvements in all directions.

With these words, ladies and gentlemen, I have the privilege and pleasure of extending a most cordial welcome to one and all of you who have signified your interest with this Institution and its activities by gathering in such large numbers for to-day's function.

The Hon'ble Sri M. Bakthavatsalam in his Introductory Remarks said :

We are happy to have in our midst Sri Nallasenapathi Sarkarai Manradiar, Pattagar of Palayakottai today. I must thank him for having accepted our invitation so readily at short notice, to inaugurate the Fortieth College Day and Conference. I must thank Sri T. S. Avanashilingam Chettiar who has kindly consented to preside on this occasion. Yesterday the foundation-stone for the new Golden Jubilee Buildings was laid. This marks the beginning of the further expansion and upgrading of the Research and Teaching facilities of the Agricultural College and Research Institute, Coimbatore under the Second Five Year Plan.

Every year we have a symposium during the annual College Day Conference, on a subject of topical interest. This year the subject "Integration of Agricultural Research, Education and

in stature. As the scope and range of its activities got steadily expanded, it ceased to be a students' organisation and became the forum for establishing contact between the various categories of its members such as extension and research workers, executive and administrative officers of the department and non-official agriculturists. Through the medium of this journal and holding of annual conferences it has ensured co-ordination in planning and stimulated the acquisition and propagation of knowledge pertaining to agriculture. Due to the above growth in the activities of the Union it was found necessary to rename it as 'Madras Agricultural Union' instead of 'Madras Agricultural Students' Union'.

The Madras Agricultural Journal: This Journal is published every month by the Union. It continues to be a popular vehicle for the publication of results of research done by Scientific-workers both in and outside India. The fact that articles published in this journal are being abstracted and reported in the leading Scientific journals, of the world testifies to its fairly high standard. Further it has on its exchange list a large number of periodicals, both Indian and foreign.

Market Committees' Chronicle: Market Committees' Chronicle continued to be published during the year under report as a supplement to Madras Agricultural Journal. I take this opportunity to thank the State Marketing Officer for the kind help rendered by him in this connection.

Finance: I regret to say that the financial position of the Union continued to cause anxiety. The position has however been eased considerably due to the annual subsidy of Rs. 1800/- graciously granted by the Government of Madras. We are grateful to our Hon'ble Minister for Home and Agriculture for this kind help. The Marketing Committee, in the State also contributed a total of Rs. 1,000 - annually to this organization towards the publication of "The Market Committee Report". In this connection I am glad to express our appreciation of the splendid efforts made by the final year students (1957-'58) of this College to improve the financial position of the Union, by arranging a benefit performance and similar activities.

College Day and Conference — 1956: The 39th College Day and Conference was celebrated between 7th to 11th August 1956. The Conference was inaugurated by the Hon'ble Sri M. Bhakthavatsalam, Minister for Agriculture to Government of Madras. Sri R. M. Sundaram, I. C. S., the then Director of Agriculture presided over the function.

A symposium on 'Modern Trends in Indian Agriculture' arranged by the Union was presided over by Dr. J. S. Patel, Additional Agricultural Commissioner, Planning Commission, New Delhi. A number of scientific workers participated in the Symposium and the proceeding of the conference were subsequently published in Madras Agricultural Journal.

Patrons: I am glad to announce this year that as many as thirty Patrons have come forward to become the Patrons of our Union. This is the highest number ever to be enrolled as patrons in a single year. I have great pleasure in welcoming them to our fold. I am thankful to all those Officers of the Department especially Sri C. R. Seshadri, Joint Director of Agriculture, Madras; Sri V. K. Appaji, Sugarcane Specialist, Cuddalore and Sri K. H. Subramaniam, District Agricultural Officer, Coimbatore who are responsible for the large number of enrollment.

Elocution Competition: An elocution competition in English open to all the students of the college was conducted in the auspices of the Union during the year. The Subject was "Atom in Agriculture". The 1st and 2nd prizes went to: Miss. Vijayalakshmi and Sri Krishna Ballal respectively.

We are very grateful to Dr. D. A. Rama Rao Principal, Forest College, Sri T. Natarajan, Prof. of Agriculture and Sri T. R. Narayanan Prof. of Botany for acting as judges.

Retirements: During the year under report the following members of the Union retired from active Government Service. 1. T. Rajagopala Iyengar, compost Development Officer. 2. V. Satagopan Hq. Deputy Director of Agriculture. 3. P. A. Venkateswara Iyer, Joint Director of Agriculture and 4. Dr. N. Krishnaswamy, Government Cytogeneticist. I wish to place on record our appreciation of the part played by them in the growth and activities of the union. Dr. N. Krishnaswamy was an office bearer of the Union in various capacities, and helped materially in its growth. I wish them all peaceful and happy retired life.

Obituary: We record with deep regret the demise of Sri P. Kunhirama Menon, Additional Lecturer in Chemistry. Our heart felt condolences go to his bereaved family.

Acknowledgments: It is now my pleasant duty to thank all those who have helped the Union in various ways during the year. We are extremely grateful to Hon'ble Sri M. Bhakthavatsalam,

Minister for Agriculture for inaugurating the College Day and Conference last year and to Sri R. M. Sundaram the then Director of Agriculture for presiding over the function and to Dr. J. S. Patel, Additional Agricultural Commissioner, Government of India for initiating the 'Symposium' on Modern Trend in Agriculture. Thanks are also due to Wing Commander Nandi for having presided over the sports day celebration and Mrs. Nandi for having distributed the prizes to the Winners.

I wish to place on record our deep debt of gratitude to Dr. K. C. Naik, Principal, Agricultural College, Coimbatore, who has been taking keen personal interest in all the activities of the Union and has given the benefit of his valuable guidance in all matters. I also wish to thank all the ladies and gentlemen who had helped in various ways in the successful conduct of the College Day and Conference of 1956.

Inaugural speech of Sri Nallasenapathi Sarkarai Manradiar, the Pattagar of Palayakottai.

Mr. President, Hon'ble Minister for Home and Agriculture Principal, Ladies and Gentlemen,

It is an honour for me to have been invited to address this distinguished gathering. I am not a stranger to this institute. My revered father, who was a leading animal breeder of this country and an important land owner, was closely associated with this institute. He was a great patron and benefactor of agriculture and animal husbandry in India. With the same spirit and feeling, I am glad to take part in this very important function. I consider that this invitation which the Principal and the President of the Madras Agricultural Union has extended to me is a recognition of the part, my family has played in some way or other in the development of agriculture and animal husbandry in the State.

The Coimbatore Agricultural College and Research Institute during its fifty years of existence, has earned for itself a name and fame which has become nation-wide. Agriculture, I need hardly say, forms the real backbone of our country and its development would pave the way for national prosperity. For uplift of agriculture, this institute has contributed a number of persons. I feel that the eminence of this Institute is due to an army of persons who have passed through it.

There is existing a gap between research in agriculture and practical farming. I feel that the gap can be filled up only when the researches done here are first tested in large numbers of farms

of independent ryots and transmitted into practice. Agriculturists cannot, of course, be easily induced to change their habits and practices in their method of cultivation or in the maintenance of their cattle. They do not easily give up their habits coming down through ages. They may not seem to be educated in the modern sense; but they are intelligent and will readily take up to new methods, if once they are convinced of the advantage by adopting them. There were days when people had to be coerced for inoculating their cattle in order to protect them from contagious diseases. Those days are gone and now people readily allow their cattle for being inoculated. Agriculturist are now using increasingly artificial fertilisers for manuring their fields and improved strains of seeds for both food and cash crops. These and other instances will go to show that agriculturists will take to new methods of cultivation, if once they are convinced of their advantage.

Hence it is of utmost importance that the result of the researches made here are brought home to agriculturists. Before such a course, I say that the researches should be tested in a large number of independent farms. I am confident that independent farmers will agree with me and readily come forward to afford all facilities to the research workers for such tests. By this, I feel that much of the present misunderstanding and public criticism will vanish.

We often hear the criticism that our agricultural graduates are not real practical farmers. I wonder if these people making such false criticism ever realise the folly of their argument. Would we like our system to be opened by a surgeon who has just passed out of the Medical College? Can we expect an Engineer who has just secured his B. E. degree to construct a bridge over the Cauvery or the Bhavani? College education is one thing and practical experience is another. It is only by hard experience in a work-shop or in a hospital or in a farm that one becomes competent and confident to take up the particular avocation. Students of this college must go to the rural parts, make personal contact, move closely with agriculturists; talk to them about the results of the researches and knowledge they acquired, for their being usefully adopted by them. The students will also have practical lessons on agriculture and animal husbandry and will have much to learn from the agriculturist. Thereby the students will have a chance to study the practical side of agriculture and thus they enrich their knowledge. In short, I

mean that sufficient opportunities for our agricultural graduates to become efficient practical farmers should be provided through an intensified apprenticeship course. I am not sure whether this College is provided with such opportunities. I would appeal to our Agriculture and Home Minister and his Government to devote some thought and attention to my suggestion.

There is no appreciable demand from farmers too, to undergo practical training in this institution in any of the other Government farms. Even, here, the fault does not lie with the Agricultural Department but more with the system that is in practice.

Our farming community is of three categories. There are a few land owners interested in agriculture, not because of any love for agriculture, but because of the revenue it brings to them. There is a second category who, are treating agriculture more as a side vocation. There is a third category who have to depend solely and wholly on agriculture. The majority of our farmers are those falling on the third category. They have difficulties in finding necessary capital to make the requisite improvements. They are either landless or tenant farmers. The extent of scientific improvements they can secure depends, not only on their holdings, but also on those who finance them the Government or the private money lender or the landlord himself. It may therefore be seen that scientific agriculture in our country does not depend upon science alone but on many other factors. Unless we give necessary means for every farmer to take up scientific improvements, it is naturally difficult to accept and adopt the advice of the Agricultural Department. Therefore I feel that social and economic improvements of the farmer is a pre-requisite for scientific improvements. These are the matters for the administration to think of. If, therefore the scientific advice is not being accepted by the cultivators, the fault shall not be on the scientific agricultural workers.

The barrier between research and the farming community is disappearing with the growth of education, particularly technical education in agriculture. This College, I understand, admits now about 162 students a year. If even one in 100 graduates per year goes back to the land, it will take centuries for our farming community to be manned by trained agriculturist. I consider that our education in agriculture is comparatively inadequate. Our national plans for improvement of agriculture can become effective only when our agricultural education is extended and intensified to a far greater extent than at present.

40th COLLEGE DAY AND CONFERENCE



Prize distribution

Inaugural Address by the Pattagar
of PalayakottaiPresident Sri Avinashilingam's
concluding remarks

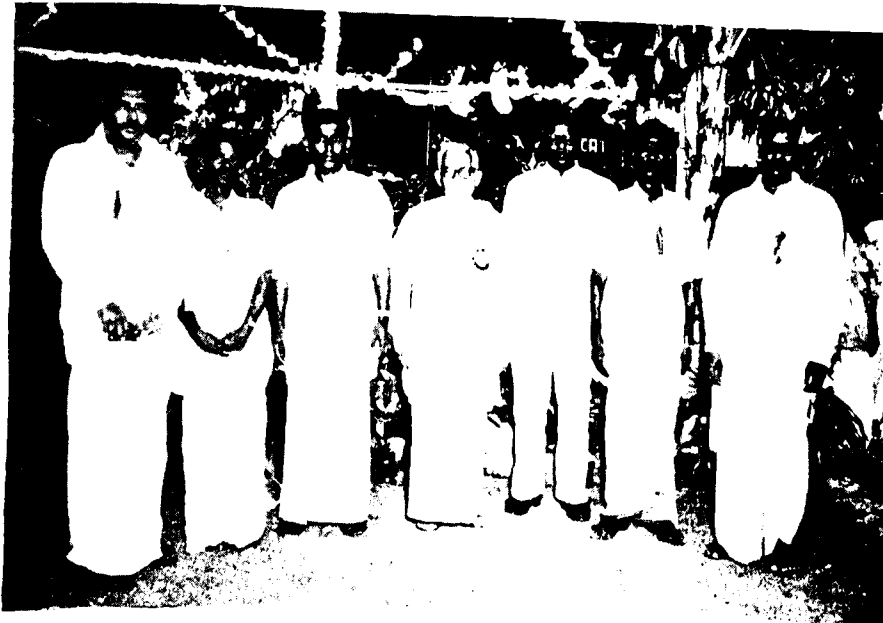
Photos - Sri P. R. Damodaran

FARMERS' DAY



Sri Veeraraghavalu Naidu receiving the All India Prize for having produced 115 tons and 1130 lbs. of sugarcane per acre

WINNERS OF PRIZES IN THE CROP COMPETITION With the Minister for Agriculture and the Director of Agriculture



Left to Right:

Sri G. Purushothama Naidu Sri P. K. Ponnuswamy Gounder
Sri R. Sivasubramania Pillai Sri M. Bakthavatsalam (Minister for
Agriculture) Sri A. Venkatesan (Director of Agriculture) Sri Irulandi Thevar
Sri Veeraraghavalu Naidu

Photos: Agrl. Information Officer

The 40th College Day and Conference

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On an occasion like this, it is a matter for gratification to hear that this Madras Agricultural Union, with its meagre resources, has been able to serve the cause of agriculture with full devotion for forty years today. Institutions like this, which work without profit, for such long time, deserve all praise. Their success is entirely due to the merits of the cause they serve. As a representative of the farming community, I appeal to my brother farmers that such associations like this deserve our full support.

I am glad that this Union is celebrating its 40th anniversary along with the Golden Jubilee of the Research Institute. May this Union and this Institute grow from strength to strength to render increasingly greater service to the agriculture of this State. This is my heartfelt wish and prayer.

I thank you all for hearing me patiently and attentively and I reiterate my thanks to the Madras Agricultural Union for giving me this opportunity today.

President's Concluding Remarks:

The President Sri T. S. Avinashilingam Chettiar in his address paid a tribute to the great research work carried on at the Coimbatore Agricultural Research Institute. He, however, stressed the necessity to carry this technical progress to the villages and spread it there. This he said could only be done if we produce literature in our own language which could be understood by the ordinary ryot. Considering the rapidly growing population of the country one could realise the immensity of the problem of raising the agricultural production by forty per cent as laid down by the Planning Commission. Foreign experts, however, considered that this target was not impossible of achievement if the people took to scientific farming. In this connection the President pleaded for the active co-operation of women in agriculture and the necessity for the inclusion of home science in the curriculum of Agriculture. He stressed the necessity for adequate technical personnel and the importance of imparting practical training in Agriculture. He said that the existing cultivable area of the college should be augmented by the addition of 200 to 300 acres.

In conclusion Sri Avinashilingam pleaded for the creation of a university in the campus of the college where were located an engineering, agricultural, forest and home science colleges.

LIST OF PRIZE WINNERS

Name of Prize	Awarded to	Purpose
1. The Robertson Prize	Sri S. R. Sreerangaswami (Passed out in 1957)	For the best student who obtains the highest number of marks in the subject of Agriculture in the Final Examination B. Sc. (Agriculture) degree and qualifies for the Degree at the first appearance both in the Second and Final Examinations.
2. The Clogstoun Prize	Sri S. R. Sreerangaswami (Passed out in 1957)	For the best student who obtains the highest number of marks in all the College Terminal Examinations and passes all the B. Sc. (Ag.) Degree Examinations at first appearance.
3. The Kees Prize	Sri M. Guruswami (Passed out in 1957)	For the best student who obtains the highest number of marks in Agricultural Chemistry of the Final Examination of B. Sc. (Ag.) and takes the degree without failing.
4. The Dewan Bahadur R. Ranganatha Rao Prize	Sri S. R. Sreerangaswami (Passed out in 1957)	For the best student who obtains the highest aggregate number of marks in Practical Agriculture in all the College terminal Examinations and in practical Agriculture of the Final Examination of B. Sc. (Ag.) and takes his degree at the first appearance and has not failed in any examinations.

Name of Prize	Awarded to	Purpose
5. The D'Silva Memorial Prize	Sri T. K. Ramachandran (Final Year B. Sc. (Ag.))	For the best student who obtains at first appearance the highest number of marks in Animal Hygiene of the Second Year B. Sc. (Ag.) Examination for the Degree and qualifies himself for a pass in the Examination.
6. The Goschen Prize	Sri T. Venkataraman (Final Year B. Sc. (Ag.))	For the best student who obtains the highest number of marks in Agricultural Zoology of the Second Year of the B. Sc. (Ag.) Examination and passes the first and Second examinations at the first appearance.
7. The Anstead Prize	Sri K. M. Ganapathy (Final Year B. Sc. (Ag.))	For the student who stands first in class II in plot cultivation (wet, dry and garden) and passes the first and second year B. Sc. (Ag.) examinations at the first appearance.
8. The Rao Bahadur K. S. Venkatarana Ayyar Prize	Sri T. S. Manickam (II Year B. Sc. (Ag.))	For the best student in the First year class in the B. Sc. (Ag.) course.
9. The Sampson Agricultural Botany Prize	Sri S. R. Sreerangaswami (Passed out in 1957)	For the best student who obtains the highest number of marks in the subject of Botany in the Final Examination for the B. Sc. (Ag.) degree and qualifies himself for that degree at first appearance in all the three examinations.

Name of Prize	Awarded to	Purpose
10. The Dewan Bahadur L. D. Swamikannu Memorial Prize	Sri S. R. Sreerangaswami (Passed out in 1957)	For the best student who takes the B. Sc. (Ag.) Degree passing all the three annual examinations at the first appearance and who secures the highest number of marks in the aggregate in all the three examinations put together.
11. The Food and Agricultural Organization Prize	Sri T. S. Manickam Second Year B. Sc. (Ag.)	For the best student who obtains the highest number of marks in Chemistry in both the College Terminal and University Examination of the First Year B. Sc. (Ag.) put together.
12. The Food and Agricultural Organization Prize	Sri T. S. Rajamani (Final Year B. Sc. (Ag.))	For the best student who obtains the highest number of marks in Agricultural Chemistry in both the College terminal and University Examination of the Second Year B. Sc. (Ag.) put together.
BOOK PRIZES		
13. The M. K. Nambiar Prize	Sri S. Jayaraj (Final Year B. Sc. (Ag.))	For the best student who obtain the highest marks at the second B. Sc. (Ag.) examination at the first appearance.
14. The Gupta Memorial Prize	Sri P. K. Ramachandran Nambiar (Final Year B. Sc. (Ag.))	For the best student who secures the highest number of marks in the subject of Agricultural Engineering in the Second Examination of B. Sc. (Ag.) at the first appearance in the subject

Name of Prize	Awarded to	Purpose
SPECIAL PRIZES		
15. The best out going graduate of the Golden Jubilee Year	Sri S. R. Sreerangaswami	For securing the First Class pass in the Final Year B. Sc. (Ag.) degree examination of 1957.
16. The best sports-man of the Golden Jubilee Year	Sri P. K. Ramachandran Nambiar	For securing Inter-Collegiate Championship at Coimbatore and the State Championship at Madras in the sports meet held to commemorate the centenary of the First War of Independence.
17. The best student speaker of the Golden Jubilee Year	Kumari Vijayalakshmi Moosad	First Prize
18.	Sri Krishna Ballal	Second Prize
19. Golden Jubilee shield of Chemistry Section	Sri T. Seshagiri Rao	Best worker in Chemistry Section in 1957.

AWARD OF RESEARCH DEGREES

The following members of the Union have been awarded the degrees noted against each by the University of Madras.

1. Sri V. Santhanam, Ph. D., for a thesis "Heterosis
Asst. Cotton Specialist, in Tobacco"
Koilpatti
2. Sri N. Ranganathachari, M. Sc., for a thesis "Marketing
Additional Lecturer in of Cotton in Coimbatore
Agriculture, Coimbatore district"
3. Sri T. S. Muthukrishnan, M. Sc., for "Studies on Coccids
Asst. in Entomology of South India"

Our Congratulations to them!

SYMPOSIUM ON INTEGRATION OF AGRICULTURAL RESEARCH, EDUCATION AND EXTENSION

5th SEPTEMBER 1957

WELCOME ADDRESS

by

The Principal, Dr. K. C. NAIK

On behalf of the Madras Agricultural Students' Union, I extend a hearty welcome to the President, who has so kindly agreed to guide the deliberations today. As the Regional Head of the Botanical Survey of India and as a Scientist and Teacher of great profundity and wide experience, his help and guidance in this Symposium will indeed be of great value. The Madras Agricultural Students' Union is grateful to him for his readiness to preside over this Symposium.

I also observe that the Symposium has attracted quite a few representatives of our sister research institutions in this State and a sprinkling of some enlightened members of the farming community from this State and also from outside. The interest evinced in this Symposium by all these is a source of no little strength to us. I have great pleasure in extending a warm welcome to all those who have gathered here.

It is hardly necessary for me to justify the choice of the subject for today's symposium. There may or may not be any divergence of interest between research, education and extension in agriculture. All the workers in these branches are no doubt animated by the same ideal and objective to serve Indian Agriculture. How far the integration of the efforts of all these is feasible or practicable, may be a matter of opinion. It is to gather views from all, at least most of you, on this important question that this is being held. I have every hope that the discussion will be fruitful and beneficial not only to those who have assembled here, but even to those outside this hall, having any interest in agriculture and its progress.

With these few words, may I renew the expressions of our cordial welcome to you, Sir, who have so kindly made it convenient to guide our deliberations today.

OPENING SPEECH

by

Dr. K. SUBRAMANYAM, Ph. D. (Cornell), D. Sc., F. B. S.,
Regional Botanist, Southern Circle, Botanical Survey of India

While Inaugurating the Symposium on "Integration of Agricultural Research, Education and Extension" held on 5th September, 1957.

Ladies and Gentlemen,

I take this opportunity to thank the Director of Agriculture, the Principal and Members of the staff of the Agriculture College and Research Institute, Coimbatore for having given me an opportunity to preside over the Symposium entitled - Integration of Agricultural Research, Education, and Extension.

The Agricultural College and Research Institute, Coimbatore, which is now recognised as one of the foremost established centres for Agricultural Education and Research is celebrating its Golden Jubilee. It is therefore in the fitness of things that with its vast experience in this field, a Symposium of this nature has been arranged as one of the important items of the Golden Jubilee Celebrations.

At the outset I wish to state that this problem of Integration of Research, Education and Extension is of vital importance and more so in Agricultural Education and Research. In Agriculture the main issue is a methodical and proper study of the growth and development of plants - particularly the crop plants. Basically man and animals are still dependent on plants for their subsistence. For, plants are the sole creators of food, clothing materials and other ancillary services that make man's life on this planet possible and happy; man and other animals are merely "cultivators, transformers, processors or purveyors". When we consider the other manifold uses of plants and plant products including their service in building and conserving soil, in controlling floods and erosion and increasing aesthetic enjoyment of life, we can assert, without fear of contradiction, that Botany holds a foremost place among sciences. The science of Botany is of fundamental importance to the Agricultural sciences. Botany is to agricultural sciences as mathematics is to physical sciences. Botanical science can bestow upon man better varieties of crop plants and can show the best methods of protecting them against diseases and hazards.

It is well known that the bulk of our population lives on the margin of subsistence and our problem is how to raise more food and better food. So the integration of research and education in Agriculture must be such as to give due importance to the problem of raising more quantities of foodstuffs. The next problem will be extension of this integrated research and education to the cultivator who, in turn, by applying the results of research, can practically make use of them in the field for getting better yield in crop plants. The botanical sciences, with the rapid progress they are making and profiting by advances on other related sciences, can solve this problem. But to accomplish this there must be adequate provision for research, including basic research, to discover facts and formulate principles; for experimentation to determine when, where and how they can be applied profitably; and for education to incorporate them into practice and capitalize on their value.

Some of the important directions in which Botany as a science can aid in the integration of agricultural research, education and extension are briefly discussed in the following few paragraphs.

Plant Breeding: Although there are scientific methods of increasing the returns from the land, "there is only one which makes no demands on the purse, or the skill, or the intelligence, or indeed anything more than the obedience of the cultivator. It is therefore the only one which requires no change in the general system of land management. The method is plant breeding". It is therefore the method which must have the widest possible application in poor India. Hence the greatest importance should be attached to this field of study and the integration of this aspect of research with education, particularly in Agricultural Colleges.

Man from early times began to gather seeds from fields and to plant them for his own use; by a slow and crude process he built up the major agricultural types of plants that we have to-day; he took the plant that seemed to yield the most and increased them and discarded the others. Even to-day the plant breeder uses the method of simple selection, and the sorting out of the best from the mixture of varieties grown by the farmer, especially in countries which are agriculturally not highly developed, has been an important method of crop improvement. After this sorting out, further progress is possible by the method of hybridisation. Formerly crossing was restricted to combinations between varieties or closely related species because wider crosses often gave rise to sterile hybrids,

which, except in the vegetatively propagated plants, could not be used further. To-day, however, plant breeding, which used to be regarded as more an art than science, is no more "a game of chance played between men and plants". It has by its own advances and with the help of discoveries in genetics, cytology, physiology and mycology, elevated itself to the position of a recognised science and the modern plant breeder is a highly trained technician. We can remould the heredity of plants; by using drugs and X-rays and other devices, we can make plants larger or smaller, quicker or slow growing, annual or perennial. We can also by suitable chemical treatment make sterile hybrids fertile.

Scientific crop breeding became possible in India as elsewhere only after the rediscovery of Mendel's laws of inheritance in 1900. Thus in the words of Hunter and Leake (1933), "for the first time the plant breeder was offered an opportunity of producing new plants better suited to the many and varied requirements of agriculture and commerce in an orderly manner". The foundations of plant breeding work in India were laid by such pioneers as the Howards, Barber, Leake, Gammie, Venkataraman and others and as a result of their labours and those that succeeded them, a large number of improved strains of a wide variety of crop plants is now available. These have been produced chiefly by the time-honoured methods of simple selection and hybridization and the main direction in which improvements has been attained is higher yield and quality of produce. Thus as the result of a well planned programme of triple hybridization between *Saccharum officinarum*, *S. barberi* and *S. spontaneum* the Coimbatore Sugarcane Breeding Institute has evolved several new varieties which are more suitable than any of the parents. The noble cane contributes satisfactory juice value and the medium cane the capacity to grow under sub-tropical conditions. The wild species imparts to the hybrids the qualities of disease resistance and the ability to grow even under unfavourable conditions.

What has been done with sugarcane can also be done with other crops. But while the sugarcane is easily propagated by vegetative means, this is not the case with most other plants of hybrid origin. The so called "mule-plants" are characteristically sterile and do not produce viable seeds because during the process of meiosis or reduction division (which occurs before gamete formation) the chromosomes of one parent are unable to pair with those of the other parent.

An accidental discovery that a duplication of chromosome set could make the sterile hybrid fertile, followed by another of the value of colchicine in bringing about such doubling, vast possibilities have been opened up for the large scale production of new species and varieties through interspecific and intergeneric crosses. To mention only one instance, the Swedes have evolved a new grain crop by crossing wheat (*Triticum vulgare*) with rye (*Secale cereale*). The plants thus obtained have greater hardiness and higher yield combined with the ability to thrive in regions where ordinary wheat would be a failure.

Plant Introduction: Another problem that has close relation to Plant Breeding is Plant Introduction. Many of the present principal crops which flourish well in some parts and enter trade are all introductions from other regions of the world. It is a striking fact that, until comparatively modern times the Old World and the New World had few cultivated plants in common. The great majority of the cultivated plants of the two hemispheres are represented by entirely different genera and before the days of Columbus many cereal and leguminous crops cultivated in the Old World were unknown in America, while many American crop-plants had not been introduced to the Old World. Thus for instance, rubber, which is mainly grown in the Far East, originally came from the Amazon region of South America; Sugarcane, which is perhaps the dominant crop of the West Indies, came from the East. *Cinchona*, a native of South America, is largely cultivated in the Dutch East Indies. Potatoes came to Europe from South America.

It has been found that, in the case of many crop plants, wild or little known allied species or varieties exist in several cases and these are resistant or immune to the devastating diseases which attack their relatives or they possess some other attributes which render them desirable material for breeding. If the genes conditioning the disease-resistance and other desirable attributes of the wild or semi-wild species could be incorporated in the commercially cultivated varieties of crop plants by hybridization, many of the pressing problems of crop production would be solved. To facilitate such work, modern plant breeders are constantly on the search for new genes for use in plant breeding. To achieve this object, the agricultural departments of several countries, notably Russia, U. S. A. and Germany, have organised expeditions to different parts of the world to make collections, in their probable places of origin, of as many varieties of crop plants and their wild allies as possible.

The study of the probable origin of cultivated plants discloses the important fact that most of them have come from restricted zones in the Old and New Worlds. Among the most important of these areas are the regions between the foot of Western Himalayas and the Hindu Kush, certain parts of China, Asia Minor and Abyssinia in the Old World; and Central America (including Southern Mexico) and Peru, Bolivia and Chile, in the New World. In their respective centres of origin, cultivated plants display a wealth of varietal diversity which is not to be found elsewhere. As we proceed outwards towards the periphery of the region of maximum diversity, forms with recessive characters become more evident. Thus the researches of Vavilov, the best known authority for the origin of cultivated plants, and his co-workers have shown that the region of north-western India and south-eastern Afghanistan is the place of the origin of the soft and club wheats and also of many other field and garden crops, e. g., rye, pea, lentil, beans, flax and carrot. The 28-chromosome group of wheats has had an entirely separate centre of origin, in Abyssinia. Tobacco probably originated in South America. The potato plant probably had more than one centre of origin. While the island of Chiloe and the neighbouring island of the coast of Chile are probably the centres from which the common cultivated potato originated, many cultivated and wild species have originated in the Peru-Bolivian tableland.

As an instance, where Plant Introduction has played a significant role in crop improvement we can cite the case of potato. Potato breeding has been revolutionised by the discovery in Central and South America of a large number of cultivated species, (hitherto unknown and totally distinct from the common cultivated species, *Solanum tuberosum* Linn.), and wild species. Several of these species possess valuable characters not present in the genetic constitution of *S. tuberosum*. Thus *S. demissum* Lindl., *S. antipoviczii* Buk. and *S. neoantipoviczii* Buk. are immune to the dreaded late blight caused by *Phytophthora infestans* (Mont.) de Bary. *S. acaule* Bitt., *S. demissum*, *S. ajanhuri* Juz. et Buk and few others are frost resistant. *S. rybinii* Juz. et Buk. is resistant to some virus diseases and is also free from dormancy of tubers. *S. phureja* Juz. et Buk. has an unusually high protein content and *S. andigenum* Juz. et Buk. contains genes for high yield, and certain amount of resistance to disease. Potato breeders are busy attempting to transfer the genes determining these attributes to the common commercial varieties. Introduction followed by subsequent breeding has been

responsible for the varieties on which the American-Egyptian extra-long-staple cotton industry is based. Many of America's leading varieties of wheat, oats, barley and rye are derived from introductions from the Soviet Union, Australia and India.

I want thus to emphasise at this stage the paramount importance of Plant Introduction in breeding work; naturally particular attention should be paid to these subjects in Agricultural Research and Education. The integration of this research with education must go hand-in-hand and every possible attempt should be made to popularise the importance of the results of the researches through extension so that the cultivator can give the greatest benefit to mankind.

Plant Physiology: Turning next to physiological studies, it is seen that in the greater part of India, wheat is not irrigated; the success of the crop is dependent upon the amount and the distribution of the light winter rains. The question of drought resistance is therefore peculiarly important in India and there is a need for varieties which can give a good crop of ripe grain with a minimum quantity of water. Some work has been done, but more work is necessary, to obtain additional information regarding the complex of factors that makes for drought resistance. If possible, an attempt should also be made to find an index of drought-resistance which could be employed by the plant breeder.

Perhaps the most interesting chemical modification of plant development is that caused by organic substance of the hormone type (or growth hormones). It is now evident that certain chemical regulators (hormones) are responsible for tropic responses of plant organs to light and gravity, including cell elongation and root growth and also initiating and regulating growth of buds and flowers. Muntzing cites an interesting case of flowering due to a specific substance. There occur annual as well as biennial races of *Hyocymus niger*, the difference being caused by a single gene. However by grafting shoots of an annual plant on a biennial one, it has been possible to induce the latter to flower as an annual. Some of the organic substances or auxins that initiate root formation are being extensively studied and used for propagating cuttings with great success. Recent work has shown that certain of these chemicals can also induce early flowering and promote seed setting in plants.

The production of fruits is ordinarily associated with pollination and it is considered axiomatic that if there is no pollination there is no fruit setting. Beehives are, therefore, specially maintained in

orchards. The banana, Washington navel orange and certain varieties of grapes and cucumbers are well known exceptions. In some other plants which do not possess this ability, seedless fruits can be obtained by treating unpollinated ovaries with growth substances. Tomatoes respond particularly well and hormone sprays are now in regular use by tomato growers in England and the U. S. A. The value of such sprays lies, not in the seedlessness of the resulting fruit, which is of no particular advantage, but in the fact that it is possible to produce crops of tomatoes under conditions unfavourable for natural pollination. In northern latitudes such conditions frequently occur during the early months of the year and in glass houses, the low light intensity preventing proper ripening of pollen. Sprays containing 50 p. p. m. of 2-naphthoxyacetic acid are very helpful. This fruitful field of research is full of possibilities for the future and work on such lines must have a place in agricultural research and education; all the results derived from these lines of work should be properly integrated and passed on to the farmers through extension.

Extension : The final result or end product of this integration of Agricultural research and education is extension. Integration is the popularisation of the results of research among the agricultural population. The populariser is one who "makes old things sound new and new things sound familiar". The research Institute supplies the materials but the success of making them available to the farmer depends entirely on the stuff of which the extension staff is made. In other words, the candidates who enter the College for Agricultural Education and go out for extension work in the villages must be not only intelligent men and women but people who have zeal for hard work and love for the ryot. They must be physically and intellectually of a high order and if these aspects are neglected, extension work is bound to be a failure.

One of the reasons, I am told, why the college does not attract the talented and bright youths is the poor salary that is offered to an agricultural graduate. The best of men and women rush to the Engineering, Medical and other Science Colleges where they are sure of a bright future. May I on this occasion of this Symposium held under the auspices of the Madras Agricultural Students' Union, plead for a better start for a B. Sc. Ag. Certainly, we cannot afford to neglect Agriculture, the most important service which feeds us and if Agriculture is to thrive, extension work must be a cent percent success.

The practical aspect of agricultural education and research can be effected only through this integration and extension. Through such methods as audio-visual education, practical demonstrations,

small exhibitions and lectures in popular style in local languages, extension services should be made easily available to the farmers and ryots of our country. Every attempt should be made for bringing a closer understanding between the farmers and the scientists and professors working in Agricultural Colleges and Research Institutes. While I was studying in the Agriculture College, Cornell University, Ithaca, N. Y., U. S. A., I was attending the advanced genetics and cytogenetics classes. One morning as the class was in progress, a few farmers came to the department and when my genetics professor saw them outside, he went out of the lecture room, greeted them and started discussions with them to solve their agricultural problems. We were all waiting in the class room. After attending to and solving the problems of the farmers the professor returned to the class room to continue his lecture. I saw it on three or four occasions and I was extremely impressed with this. Such opportunities for close and direct contacts between the scientist or the expert on the one hand and the farmer on the other is very essential and every opportunity should be made available for the ryot for such discussions. I consider this would be one of the most effective ways for bringing about this integration of agricultural research, education and extension.

The opportunity to participate in this Symposium is particularly gratifying to me because by a happy coincidence it was ten years ago that we attained our freedom and hundred years ago that our first freedom battle was started. Though we have attained our political freedom we have not yet completely achieved economic freedom. Our revered leaders have been trying through successive Five Year Plans to achieve this end and to raise the national income. We are now in the first phase of the Second Five Year Plan and development of Agriculture is given the foremost place. It is therefore the duty of every one of us to work very hard and set our hands in right earnest to play a worthy part in building a happy India.

Coimbatore, with its fifty years old Agricultural College, a hundred year old Herbarium and other allied institutions like the Sugarcane Breeding Institute, the Forest College and the newly started Botanical Survey of India, all working in perfect co-operation and co-ordination, is eminently fitted for playing a significant role in this Integration of Agricultural Research, Education and Extension.

Thank you. I now call upon the various speakers to take part in the Symposium and I am eagerly looking forward to hear their valuable and interesting papers on the subject of this Symposium.

Integration of Research, Education and Extension in Agriculture

by Dr. K. C. NAIK, B. Ag., (Bom.),
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At a time when our country is passing through an unprecedented period of agricultural or rural development towards the building of a welfare State, one thing more than another that provides the pre-requisites for success is a co-operative endeavour on the part of the educationalist, scientists, and extension personnel of the Agriculture Departments. Agriculture has been rightly stated to be in the midst of a revolution in our country at present. Increasing application of science to Agriculture has become not merely important but essential for our economic survival. The National Plans have as their objective a balanced development not only in agriculture but also of different branches of agriculture itself. These various plans for agricultural development have to be based against the background of general picture of our economic, social and administrative set up.

In this State, as in the rest of the country, land is almost the only source of the farmers' income and this means that increase in crop yields forms the pivot of all plans for increased prosperity of the peasant. It has been estimated by some authorities that during the last two decades, the population grew faster in our country than cultivated areas, dependance on agriculture for gainful employment increased as also the non-earning dependents of farmers and the number of cultivators and cultivating labourers, while the land *per capita* declined. Against this sombre picture, it is not clear if there has been adequate compensation by increased productivity of land in proportion to the increase in the pressure of population on agriculture. If there is no such development, we have to conclude that the land is becoming an increasing source of impoverishment of the masses rather than of promotion of wealth.

Even if the facts point to a different direction, the overriding importance of increasing agricultural wealth in our national economy and for national security, is obvious. The three-fold channels

of agricultural improvement are through research, education and extension service. A review of the present set-up in each of these fields of activity is, therefore, of topical interest and value.

Agricultural research forms now a field where a multiplicity of agencies are at work in the country. The Indian Agricultural Research Institute, the Indian Council of Agricultural Research, a number of Commodity Committees under the Food and Agriculture Ministry, a few Boards under the Commerce Ministry and some National Laboratories are dealing with different and sometimes the same aspects of agricultural research, while in the States the Departments of Agriculture are battling to an extent with similar problems. There are also a few private agencies including a large number of individuals, to whom science or research is a secondary activity in life. To have a multiplicity of agencies is all to the good, but when research is done by a worker in an isolated manner, often blissfully ignorant of the efforts of others, there is bound to be wastage and much overlapping, which the country can ill afford. Research is a life long profession to most in these days, and this not uncommonly gives rise to a tendency to look down upon the work of part-time scientists as of no consequence. We cannot forget that a good part of the world's outstanding scientific contributions were from those to whom scientific pursuits were a hobby and not the main calling. To harness the efforts of all scientific workers into an integrated system is an ideal of Indian Council of Agricultural Research, but it does not seem possible to claim yet that we have reached the ideal.

Scientific ability is not by any means synonymous with intimate experience of plant life and plant husbandry. A gifted agricultural scientist can never rise to his full stature without a good agricultural background, any more than an intelligent practical farmer or an Extension Specialist can claim competence to propound the intricacies of agricultural science merely by claiming competence in his respective vocation. Just as results of research get enriched and scientific ability grows with the practical experience of farming, so does the efficiency of the farmer and extension worker grows with intimate contact with scientific progress in agriculture. Can we say that we have evolved a perfect system to provide for all such attainments in the various types of extension personnel?

Adverting to the field of agricultural education, the divergence and disparity are even greater in magnitude. There are many Agricultural Colleges in the country where only matriculates are

admitted, while in others as in this College, Intermediates in Science are only eligible for admission. The syllabi consequently vary and so are the examination systems and the competence of the agricultural graduates and teachers. The University Grants Commission is charged with the responsibility and resources to bring about an improvement in the standard of University education, but its impact is yet to be felt in the agricultural Colleges. It has been admitted on all hands that no longer is it possible for the agricultural colleges to live a cloistered life and be isolated units amidst surroundings which are fast changing with kaleidoscopic rapidity. It is the desire of all to create our agricultural institutions to be a part of the social, economic and cultural life of the region and be a component part of the society, influenced by it and influencing it. The system of agricultural education has to have a determining influence on the rate at which economic progress is achieved and the benefits which can be derived from it. The pattern of education has, therefore, to be changed constantly to the changing needs and circumstances.

With science developing at a fast pace, it is not easy for any teacher to keep himself abreast with the rapidly accumulating knowledge. Some are tempted to rely on the old stuff and there is no generally accepted method to pull him up if he does so. What to teach is as important, as to how to teach it and when to teach it. A standard or set syllabus and examination system does not aim to bring out the best in each teacher. These are problems of great importance which deserve serious attention. The recent Seminar on Agricultural Education at Trivandrum focussed attention on many of these aspects, but the ills of agricultural education are bound to take time to be solved.

The effectiveness of future development will depend, to a very large extent, on the quality of personnel available for absorption. No efforts should therefore be spared in achieving a high level of competence in those to be trained during the coming years in our Agricultural Colleges. A graduate in Agriculture taking his first degree cannot be expected, however, to have an encyclopedic knowledge of agriculture such as to be a full-blooded or useful research or extension worker straightaway. Extension work involves not only an intimate understanding of practical agriculture and of the particular branch in which the extension worker is called upon to render service, but also the requisite skill in dealing with persons and situations. Fundamental theories taught in a college when presented in an

elementary fashion often lead to the giving away of half-truths. Such half-truths or even facts when incautiously or capriciously put across by an ill-equipped extension worker, leads to confusion, if not worse. It is not uncommon that in the hands of an ill-equipped extension worker, the farmers are therefore treated as guinea pigs.

Let us also recognise the reality that extension work even with a capital E cannot by itself bring salvation, if it is not based on tested facts from carefully planned research. An extension worker does not become more useful just because he has been in the job for a long time. In fact, his value diminishes in proportion to the extent he is divorced from research or results of research. This fact needs to be remembered and recognised if we are to build up the agricultural edifice of a welfare State. Education is a continuous process of acquiring new knowledge and neither age nor profession is a bar to the acquisition of such knowledge. Extension personnel need such continuous flow of knowledge as much as the under-graduate. It is not by rigid differentiation of the sphere of activity that the current of knowledge can be made to flow smoothly, economically and effectively. The inverse of differentiation is integration. It is I believe, the mission of this Institute to bring about such integration between all those apparently divergent fields of activity so that both student and staff efficiency in research, education and extension wings are promoted and maintained at a high level.

Development in all directions can at times lead to a bewildering stage. Credits and subsidies are undoubtedly useful planks in agricultural development, but in the ultimate analysis the stability of agriculture must depend on the efficiency of farming, for which education, research and extension are the means. It is only through these that the scaffolding of subsidies and other aids can be progressively dismantled, and a flexible, self-reliant, prosperous and independent agriculture can be developed to be the strongest element in our national economy.

This pioneer institution which is celebrating fifty years of existence now, dealing with the basic vocation of the largest body of our people, has just begun to feel the vitalising influence of National Planning. New buildings and equipments for about Rs. 38 lakhs from the Central and State Governments with a substantial measure of help from the T. C. M. of U. S. A. are opening new vistas for more

useful role of this Institute to play. Having regard to the requirements of this State and region and the contributions that can be expected by this Institution in future in a planned economy, it is necessary to regulate purposive education, research and extension. That the Government both at the Centre and in this State are fully alive to these, is evident from the fact that a blue print for integration of all these services for more efficient functioning in future has already been formulated. We await the decision of Government on these proposals.

Agricultural Research, Education and Extension as a Farmer Sees Them

by Sri R. M. SAVUR,
Retired Divisional
Inspector of Schools

Farmers and farming existed long before agricultural science was born or even conceived. For the first few decades after the birth of Agricultural science, scientists were merely engaged in finding out why and how certain farming practices worked. In the early stages, therefore, it was the farmers who led the scientist but not for very long. Very soon scientists took the lead and today they have far outstripped farmers and farming practices. However even today not infrequently a more successful practice is developed long before the causes of the improvement in results are discovered. For instance, take the successful practice evolved of placement of fertiliser below the seed or below and a little to either side of the seed. Why and how this works was discovered only several years later by plant physiologist using radio active phosphorus. In any science whatsoever but especially so in agriculture the dividing line between fundamental and applied research is so fine as almost to satisfy Euclid's definition of a line.

Application of Fundamentals: Whatever the science—pure mathematics or agriculture—some day or other the findings of basic research are sure to be put to some practical use. There is, however, always a time lag between the discovery of some basic principle and its practical application. The atom was split some forty years after Einstein's theory was propounded and accepted and several more years passed before the first successful atomic energy power plant was developed for the benefit of man. This gap between theory and its practical application is widest in the sphere of agriculture. Some idea of the magnitude of the time lag can be gained by studying the farm development in the United States, a country in which extension services are most highly developed, efficient and widespread.

American agriculture has from its beginning been entirely of a soil-exploitative type—continuous mono-crop cultivation of maize or wheat or cotton. In considering the advisability of introducing the soil building system of crop rotation farming comprehensively named 'Alternate Husbandry' United States Department of Agriculture

authorities said that to convince the hard headed American Farmer of the advantages of a crop rotation with a grass crop as a pivotal soil-rejuvenating crop it was first necessary to collect ample experimental data of the profitability of such a change in practice. This appeared in a C. A. B. publication of 1944 entitled 'Alternate Husbandry'. In little more than ten years the United States Department of Agriculture experts had collected such a mass of experimental data that these statistics were being freely used in books published as early 1953 (e. g. *vide* 'Farm Management Economics' by Prof. Heady and Jensen). Yet it is stated that even to-day 'True soil building rotations are practiced on only a small percentage of American farms. Animal manures have been quite commonly simply wasted. Backward agriculture is not confined to the rural villages of Africa and Asia. Many a farmer in the United States makes no more use of this valuable source of fertility than do those who burn cow-manure cakes for fuel. Very often the problem could be very simply and satisfactorily solved by the use of a big system of farming. So fixed in the American mind is the concept of the cash crop that a grass land solution to many of the common fertility problems has not even occurred to many agricultural leaders let alone farmers at large.

In a country of highly educated and progressive farmers the gap between basic information and its practical application, to the business of farming is ten years, in ours the gap is hundred years, for our farmers are still in the age of the wooden plough, the *mamooty* and the sickle. The research work in the Coimbatore Research Institute is on a par with the best in the world. It is necessary to consider what are the factors which are responsible for this wide gap between fundamentals and practice and make immediate, earnest efforts to deal with the situation if our plans are to succeed. Merely spending crores to thrust loans and fertilizers on farmers will effect nothing.

The prime-movers in the task of bridging this wide gap are:

1. Teachers in Agricultural Colleges.
2. Research workers and Specialists.
3. Extension Services.

The more ignorant and uneducated the farmers the more efficient should be these three prime-movers. Whenever I have remarked that if farmers should know something about science it is

equally necessary that scientists should know something about farming, I have experienced only derisive smiles or ironically lifted eyebrows accompanied by a contemptuous silence. Farming however is a complex business. What can those know of the complexity of farming who have never cultivated a single acre with money out of their own pockets and made a profit however minute? It is more difficult to be honest with oneself than to be honest towards society. I would suggest that our Professors and Research Workers should do some honest introspection asking themselves the question 'How much do I really know of this business of farming?' and then read some books like 'Farm management Economics' by Professors Heady and Jensen.

That my diagnosis is correct, has been amply confirmed from what I read recently. Professor Jack. R. Harlan Professor of Agronomy, Oklahoma Agricultural and Mechanical College and Geneticist, Agricultural Research Service, United States Department of Agriculture says in his book 'The theory and dynamics of grass-land agriculture'. In this age of specialization those who teach practice tend to ignore basic theory and are in fact, usually unfamiliar with it. Those who conduct research or teach in fundamental areas are generally ignorant of agronomic practice.

Agricultural College students are the recruits for the extension service army. Only if their training is on the right lines of a high quality, can they be of real help to the practicing farmer at large. It is scarcely likely that their teachers themselves have little knowledge of the latest basic information and none at all of the complex business of farming. Due to some vague realisation of this defect in our agricultural education an attempt was made to rectify this by prescribing short period of practical training to final year students. In pursuance of this new rule small batches were sent for practical training not to a successful farmer but to one or other of the so called agricultural Research Stations which are really nothing but seed multiplication stations in which there is neither research nor farming on commercial lines. Needless to say that they return knowing no more of the farming business than when they stepped in these.

The foundation for building a permanent and prosperous agriculture is a sound education in agriculture. It is beyond the scope of this essay to make exhaustive and detailed suggestions. I must rest content with stating for what they are worth my ideas of the barest outlines of a reformed education in agriculture.

1. Education has two aims — the ultimate aim and the immediate one.
2. The ultimate aim should be to fit agriculture students to teach farmers the application of fundamentals to improve the status of their farming and thereby enable them to improve their standards of living by increasing of farm incomes.
3. The immediate aim should be to impart to the students a sound knowledge of basic information and its application to practice and of the principles of farm management and farm management economics. This will necessarily entail a thorough overhaul of our Colleges, our curricula and choosing lecturers not on the basis of exigencies of Government service but solely on their fitness.

Integration of Agricultural Research, Teaching and Propaganda

From the Chemists' point of view

by Dr. A. MARIAKULANDAI and
S. VARADARAJAN.

The title of the subject chosen for the symposium today is of topical interest and quite apt at the present moment. It is apt in the sense that the pros and cons of the subject will be thoroughly discussed and the extent to which the integration of the three aspects pertaining to the science and technology of agriculture can be proceeded with if it is not in existence already, and if it has already commenced and is in existence, how best to improve it.

At this stage a little introspection is necessary and to start with let us first examine the term "Integration" itself, and secondly see how far it is in vogue with reference to the development of agriculture in this state.

The word integration, as is understood, is to combine the separated parts or elements to form an integral whole. Surely the three parts, viz., research, teaching and propaganda have to be integrated for attaining progressive development in agriculture as a whole. In regard to the second point no contradiction is possible if we say that as far as the Madras Agriculture Department is concerned there is already a certain measure of integration of the above mentioned three aspects. The present set-up of the Department is based on the principle of integration of all the three branches. What is required at the present juncture is one of reorientation of the whole system, to gear it to the rapid strides of development of agriculture in the second plan period.

Despite the fact that there is a possibility for divergence of views on the subject, one cannot fail to understand that in a progressive world the ideals of agricultural development are converging towards a common goal, namely, that agricultural progress must keep pace with industrial progress. In all probability ideas will differ about the importance to be given to the one or the other of the aspects mentioned already.

The object in writing this is to put forth some suggestions in the hope that they may provide food for thought and discussion during our deliberations today. The suggestions may or may not evoke

immediate response but it is believed that they will atleast raise ripples, if not waves in the thinking public and the powers that be which may ultimately stir us to achieve the objective we have in our minds.

There is no real antagonism between the function of teaching and that of research. A good teacher has to teach, train research workers and do research himself. Even so a research worker has to teach and train other workers in the technique of observation with an intensive effort and with open but disciplined mind to seek the truth with the aid of the intellect and the devices invented by the genius of man for wresting the secrets of Nature. In the pursuit of science, the search must be disinterested, and motive selfless, the attainment of knowledge being the only goal and reward. An accomplished scientist possesses all these faculties and it devolves on him to teach others to achieve the same attainments in the art and technique necessary to be a good research worker.

In a college which professes to teach science every teacher must do research. By doing so he will rise in the estimation of his students as a person who speaks with authority. But it should be borne in mind that the teacher must have full freedom in the choice of the subject for his study and no quantitative assessment of the work turned out by him should be made. Any little contribution by one who is devoted to teaching should be welcome.

In regard to the research worker, by engaging in teaching he learns the art of presentation of the results of his work. He becomes an expert in spreading the knowledge he gained by research to the public. Virtually he becomes an expert propagandist. In all these spheres of activities the allocation of one's time between the activities will depend upon one's ability as well as the needs of the college, Institution or the department to which one belongs.

Here it is necessary to be a little guarded. We have to exercise a little caution in the implementation of this pattern of integration of the three branches of the advancement of knowledge. We have to deeply consider at what stage or level of agricultural education that the teacher is expected to be a research worker himself and vice versa. Our own view is that it should be at the post-graduate level. At the under-graduate level the teacher has to impart a great deal of basic knowledge and train the students in the fundamentals of the particular field of study. Thus he will be confronted with titanic amount of work and very little time left at his disposal to carry on a piece of research himself.

Under such circumstances a teacher should be chosen with the basic qualification and a lot of experience in teaching to his credit rather than for his high academic attainments with very little experience as, it is the art of putting across to immature minds that is more important than the high attainment of the teacher at the under-graduate level. But at the post-graduate level, there is more of specialisation and those charged with the responsibility of teaching the students, who are invariably a handful and who need guidance rather than actual teaching, the teacher really has plenty of time to devote for his study and for his research project. As such the teacher has to have really academic attainments and qualifications.

In our opinion there should be a separate unit for each branch or faculty of science. There should be a professor for guiding post-graduate research workers. He should not be burdened with routine work, except for a few hours of actual teaching work per week. He must devote the rest of his time to do and guide research. The responsibility of teaching the under-graduate should be left to a separate staff of lecturers under him. For the research branch it should not be as it is at present. A little re-organization may be necessary for greater efficiency and progress. The whole work must be viewed under three aspects as (1) Fundamental, (2) Experimental, (3) Developmental. Fundamental studies comprise original research of a long-range nature, or of a new line which will not have anything to do with immediate or urgent problems. Being of a nature that no immediate results are possible, must be left to a few workers to pursue in peace. Some findings of great import are bound to result from such a study sometime. Regarding the second, experimental, in this field all agronomical work of a co-ordinated nature such as manurial trials, nutrient requirement, fertility status of soils etc. should be tackled. The third is the developmental aspect for which a separate unit is necessary. All the work of an utilitarian nature must come under the purview of this unit, e. g. analytical and advisory, soil testing etc. All these different units must be individualistic in their activity but must be integrated under a chief co-ordinator, who may be the Professor of Chemistry himself. His work will be to decide on policies of research. With such a sort of integration there will be greater efficiency and smoothness to achieve better results.

Happily, the teaching department, which was independent till 1938 was amalgamated with the respective research sections in this Institute thus giving a wide choice of Lecturers to be drawn from the members of the Institute working in different specialized branches.

A little digression on the set-up of research in the country may not be out of place here. At present though there seems to be a lot of orientation and co-ordination of research, yet there are too many bodies which are entrusted with research activities. For example there are the I. C. A. R., I. C. M. R., C. S. I. R., Irrigation and Power research and Universities, the State Government Institutes and several other such bodies. Besides, there are the several commodity committees, such as the Committees for Cotton, Sugarcane Oilseeds and so on. Even though great care is taken in order that there may not be any over-lapping in the research projects undertaken, in practice there is duplication in staff and projects in spite of the recently formed crops Commodity Committees and other co-ordinating agencies.

The time involved in sanctioning any research project is also considerable with the result that the problem chosen for solution becomes out-moded by the time it gets through sanctioned for implementation.

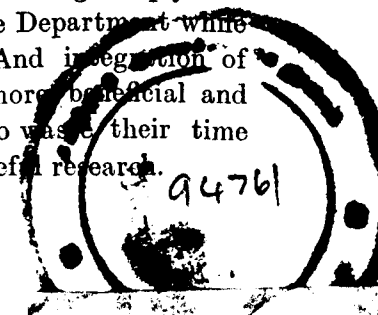
There is yet another aspect, namely, that owing to the fact that several scientific bodies are functioning in different ways there is always disparity in emoluments for research workers under the different fields. This tends to make the qualified jump from job to job with utter setback to the work they should have prosecuted unhindered attaining specialization and fame in one field. Our men are consequently jacks-of-all-trades. To catalogue all the shortcomings in the present system will not be of any avail. Let us dilate upon the pattern of the future set-up for effective co-ordination, speed up execution, and quick achievements. There should be one All India body for Research in all fields with the ramifications necessary for the different aspects of science. This system will be conducive for unification of research with little of duplication as well as unification of emoluments at the different levels and will not induce scientists to hop from post to post to better their personal prospects with adverse results from the point of view of the country at large and the specialization needed for progress. It is futile to attempt to give details on this point, for once the view is accepted on principle the rest can be worked out easily.

Regarding propagation of the results achieved through research it is also integrated but at a higher level. It is a field for the extension staff who may offer some valuable suggestions for a better blending of research and propaganda, the twin wings of the agricul-

tural science. If we may throw out a suggestion we feel that a liaison officer at the Research headquarters is necessary. He should be a person of versatile talents with academic distinctions. He should be in a position to scan the several achievements of the different research sections and sift them to select the best and pass them on finally to the publicity officer for publishing and presenting them to the wider public. The actual research worker or the specialist may not have the time or the patience to translate the results to the lay public. His excitement will subside the moment he reaches the goal in the particular problem in which he works, but before that he will have a hundred other problems to probe into and thus feels little for his achievements and cares much less to publicize it. In fairness to him and to his mental activity and to give him enough time to publish his results to the scientific world he should not be bothered with this extra work.

The Liaison or the Research Co-ordination Officer will be one who has a comprehension of the activities of the various research units and he will be in a position to judge what is useful for the lay farmer. He will also tour the whole State, meet the farmers of the different regions, learn their problems and their difficulties and bring them to the knowledge of the experts.

In regard to the present system of propaganda a suggestion may not be out of place. The personnel in charge of translation of research achievements and dissemination of knowledge of scientific agriculture are invariably people who graduated a long time back and have become a bit archaic in thought and action because of lack of opportunity for them to keep abreast of the vast and rapid developments of scientific knowledge. We do not question their sincerity or talents and most of them are doing their best on the extension side. But, if by a system of rotation such extension people are given a short refresher course of 12 to 15 weeks duration at the research headquarters they will not only develop new ideas and outlook but will better the best they are doing now. For this purpose a regular set of staff at the research centre is necessary who may work under the guidance of the Liaison officer or any other body. These are some of the aspects worth considering deeply for giving a new impetus to the whole working of the Department while integrating teaching, research and propaganda. And integration of research and propaganda as outlined will be far more beneficial and lead to better results than to put the specialists to waste their time which they are expected and ought to spend in useful research.



The future development of agriculture in this state, as is elsewhere, is bound up with the proper co-ordination of all the three aspects that will result by integrating them into one unit with proper liaison wherever necessary. We would suggest that there should be an autonomous organization of a comprehensive nature under which the various units can be engulfed. Such an organization may be styled as A. R. E. E. O. (*Agricultural Research Education, Extension Organization*) and under which the pre-professional, the under-graduate, the post-graduate and the various agricultural training personnel should be taught. Besides there should be scope for running regular but continuous refresher courses for the extension staff of a short duration from a month for the village level worker to three months for the district officers. This same organisation should be charged with the research activities pertaining to the State also. Thus, if in every State an organisation like the one mentioned is established, representatives from each organization can meet at a central place to draw up a programme of work for the country as a whole and also take stock of achievements periodically. Many such machineries for the different fields of science and technology may be set up and the final co-ordination can be effected by having an Academy of Sciences, in which only scientist of great reputation should be admitted. It may seem too idealistic or utopian, but some concerted action is wanted for achieving success and it is not difficult for a country like ours to succeed, for, remember, our freedom was won not by battles but by silent action and it is this ideal that should stir us to action, and action is achievement.

Integration of Research, Education and Extension in Plant Pathology

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It is an obvious truism that research, no matter how valuable and epoch making it may be is useless until it is shared with those who have the ability or desire to utilize its results. It should not only reach the interested scientific colleagues of the investigator but also the 'ryot' for whom it is ultimately intended. Some suggestions as to how this may be achieved in a subject like Plant Pathology are offered below.

Research and Education : The first aspect of passing on information to interested colleagues will be embraced by a broad definition of education. In the present set-up of the Agricultural Department the graduates are drafted for research or extension as soon as they take their science or agricultural degrees. Those who enter the research sections have the opportunity to continue their education while in service. By education it is meant here not only the taking of higher degrees but also the acquiring of specialised knowledge in any particular branch of agriculture. However, it may perhaps be suggested here that this education of the research worker requires to be more systematically canalised in such a way that intensive specialisation in particular fields of research is possible.

Turning to the extension worker, under the present set-up his chances of acquiring advanced technical knowledge are very meagre. Plant protection is a highly specialised branch of agriculture. In recent years very rapid advances are being made in the science of Plant Pathology. This is especially so in the development of newer types of fungicides, improved application machinery, knowledge of specialisation of parasitic organisms etc. Plant protection assistants get very little opportunity, while in service, to acquire specialised knowledge on these newer line of development. The fundamentals of plant pathology alone are taught during the agricultural degree course. Before this knowledge is put to practical use a training in the practical aspects of plant pathology is absolutely necessary. It would, therefore, be desirable to complete the education of the plant

protection staff, that a formal course in Plant Protection is instituted. This course should comprise of regular lectures, practical and demonstration classes and field trips. The information relating to the following aspects should be imparted to the trainees

1. A thorough familiarity with all S. Indian plant diseases with particular emphasis on diagnostic field symptoms.
2. Estimation of disease prevalence and intensity and assessment of loss due to crop diseases.
3. Methods of handling diseased specimens for study and investigation.
4. A knowledge of various groups of fungicides, their dosages, timing of application of fungicides and degrees of tolerance etc.
5. A knowledge of conditions favouring epiphytotics; forecasting such epiphytotics.
6. Hazards of fungicides and antidotes.
7. Application machinery, their uses and care and upkeep.
8. Techniques of publicity and mass contact.

A training on the above lines but perhaps, for a shorter period and with emphasis on some of the aspects alone would be a good equipment for any Agricultural Demonstrator also. It would also be possible to devise a simplified training for the village level worker. The facility of this training can also be made available to the interested educated ryot.

Extension: In countries with a high percentage of literacy great stress is laid in the dissemination of research through the agency of printed popular publications like circulars, bulletins, leaflets etc. Even in such countries great emphasis is laid on an efficient extension service. In our country in view of the low literacy level of the cultivator the printed word has very limited value. It is, therefore, necessary to lay more emphasis on the spoken word and this can be done only by personal contact with the ryot. This obviously involves having a larger number of trained personnel. This would also help the research worker to be kept thoroughly informed of the plant disease situation and problems in the countryside. Another important point to be considered in this context is the limit up to which information can be passed on to the ryot, in his present state of literacy and especially in a subject like

Plant Pathology. We may here compare Plant Pathology with the pathology of man. A great deal of general information regarding the human diseases is part of the general knowledge of most educated men. Yet no one would think of treating himself, except to a very minor extent, without the aid of a trained doctor. In Plant Pathology, however, even the elements of symptomology are not known to most people. The need, therefore, for trained practitioners of plant medicine is even greater than in human pathology.

At present there are two Plant Protection Assistants for each district. This obviously is too inadequate as the average area of cultivated land in each district is about 1.5 million acres. This means that at present each plant protection assistant has to take care of over seven lakhs of acres. It is obviously impossible for one person to bestow personal attention on such an enormous area even for purposes of a cursory survey, let alone carrying out of control measures. The Plant Protection Assistant has necessarily to depend on information supplied by the ryot. Very often it becomes too late for taking any useful control measures as most of the harm would have been done by the time the information reaches him. Most plant diseases have to be prevented rather than cured. For prevention early diagnosis is essential for which a close and continuous watch over the crop is necessary. One should also be very familiar with early symptoms of diseases which are often too subtle and inconspicuous to the untrained eye of the layman. The solution lies, therefore, in having more and more trained plant protection personnel.

Integration of Agricultural Research, Education and Extension

by T. NATARAJAN, B. A., B. Sc., (Ag.)
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The subject chosen for the symposium is appropriate on a memorable occasion as the celebration of the Golden Jubilee of the Agricultural Research Institute, Coimbatore. With several Research, training and Extension Schemes included in the Second Five Year Plan, it is desirable that the several aspects of Agricultural Science are properly co-ordinated for maximum effects.

In all progressive countries research, teaching and extension aspects of Agriculture have been developed though to different degrees. In India also, most of the States now have Research Institutes, Agricultural Colleges and Extension wings in their Agricultural Departments, though a few years back several states had Research and Extension only depending on neighbouring state for training of technical personnel or for results of research.

While the three wings of the State Agricultural Departments have now developed fairly well to the extent necessary for each state, yet the integration between them does not seem to have developed to the extent necessary for their mutual benefit and for maximum utilisation of these for the country's advancement. There is not only need for proper co-ordination between research, teaching and extension of the State Agricultural Departments, but also to bring into the picture the little extension work done by missions and mutts, research and teaching in Universities and other private organisations and Research Institutes of the Union Government located in the State. There should be harmonious co-ordination of activities of the several agencies if the country is to derive the most from these.

It is easy to effect integration between Research and teaching as Research Institutes and Agricultural Colleges are located side by side in a campus if not in the same building. Research Officers can do part time teaching in the College and teachers can similarly do some research work. It is often argued that research officers do not make good teachers and it would be waste of time to detract them from their research work for routine teaching work. While this may be true of very highly specialised Research workers and those

temperamentally unsuitable for instructional work yet it cannot be denied that College Students should have the benefit of current research work through some special lectures. The teachers themselves should be given opportunities for research. The policy regarding integration of research and teaching in the Madras Agricultural Department was changed twice or thrice before 1940. The Professor of Agriculture was also Superintendent of the Central Farm for some years and for some years the posts were held by separate persons thereby even teaching, let alone research, suffered for want of full facilities. Happily this state of affairs was set right in recent years.

Every one will admit that in Agriculture and Animal Husbandry, the results of research for the most part are slow to find practical and especially, universal application. The causes are partly inherent in the problem and partly due to lack of appreciation of the significance in our organisation. Precise and clear cut findings are readily accepted by cultivators but not results which have value in the long run. The farmers are ignorant of the scientific laws while the research works are often ignorant of the inexorable practical laws which a farmer uses in his battle with nature. Research men are men of ability, highly qualified and trained in sciences to be fitted for their work. But frequently and more often than not, they have little practical perspective in the vocation of farming. Application of knowledge in the field with its manifold practical applications bring the research worker into a realm entirely different from that in which he is constantly at work. The extension work is getting specialised with large amount of targetted work to be done under the Plans. The integration of research and extension is more difficult. The Deputy Directors of Agriculture were for some years in the past in charge of Research Stations and have even acted as Specialists. For obvious reasons of specialisation this practice was given up. Some Research Officers were transferred to Extension permanently, not with a set purpose but due to exigencies of service. These methods of exchange would do no good to either of wings as their valuable experience in their own lines will be lost. The present system of training special Extension Officers from research sections as Seed Development Officers, Cotton Extension Officer, Oil Seeds Development Officers and Plant Protection Officers no doubt form a better link between research and extension at a higher level. The link on the lower executive level will be better forged through special research assistants under the

Extension Officers. These assistants have to be changed at short periodic intervals so that they do not stagnate for want of fresh research back ground.

Integration between Extension and teaching is to some extent achieved in respect of Agronomy by the Regional Deputy Directors of Agriculture taking up some classes on Extension for the final year class. This may be strengthened with the proposed development of the Extension Wing in the College. Similar linking of Extension and teaching in other specialities seems desirable.

Co-ordination of the three functions: Research, Teaching and Extension, is much more difficult of achievement in practice. Perhaps co-ordination at higher level of administration is desirable if the branches are not to suffer for want of proper attention. The College Day and Conference, the district work officers conferences, the Farmers' Day Celebrations on Research Farms, have their own part to play in effecting co-ordination of the different branches but much depends on the personalities that come together on such occasions.

Integration of Agricultural Education and Research—Plant Breeder's View

by B. W. N. PONNAIYA, B. Sc. (Ag.), M. Sc.,
Millets and Pulses Specialist and
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Assistant Millet Specialist.

A survey of the development and functions of agricultural extension of the various countries of the world including India has been discussed by Brunner, E. et al in the book (1) "Farmers of the world" and this forms a good background for the present discussion on the subject. The fourteen articles compiled in it give a clear picture of the progress made in extension work in both the advanced and the backward areas of the world. It is observed that extension work has been efficiently felt in advanced countries like U. S. and U. K. where literacy and education are high. It has taught the farmer the knowledge to increase his income and has encouraged him to grow his own food, set a good table and live well. Besides this, the extension section has taught him to appreciate the privileges of the country life, to know something of the world he lives in and to improve his natural talents. The younger generation is also tackled to promote social, cultural recreational, intellectual and spiritual life, to mature them into good citizens. The ambition of extension is to improve the life of villagers of whom a farmer plays the most important part. In the backward countries, unlike the advanced one, extension ideas are thrust on the farmers. The extension work is handicapped due to lack of education and want of research on local problems. The quality of the extension worker is also poor as he is neither a practical farmer nor a scientific worker.

What is the position of our extension? We can place it midway between those of advanced and the backward areas. The agricultural extension worker is usually a product of an agricultural college who has gone out in the district with a fairly good knowledge of theoretical agricultural science. His practical knowledge is not extensive but he widens it by his personal initiative and by moving with cultivators. His touch with latest trends in research however remains inadequate as his movement with the research workers has not been frequent. Because of this bottle-neck he is neither able to bring the problems of the cultivator efficiently to the research worker nor is he able to carry back to the cultivator the achievements of scientific research.

Thanks to the food self sufficiency drive which became imperative to the working of the Five Year Plans successfully, agricultural research and extension have taken up a new phase of life and have been modified on the lines of the advanced countries. The agricultural education also is being re-orientated by conducting seminars by the teaching staff of the various Agricultural colleges of this country to bring about the integration of agricultural education, research and extension. (2) From the plant breeders' angle also this integration is necessary. A few years back improved seeds were mostly of pureline selection. They have now been replaced by seeds evolved by hybridisation involving single or multiple crosses, later purified for economic characters. The recent developments in the use of hybrid strains also have come to stay. In Madras State for instance, hybrid strains in Bajra (Pearl Millet) have been evolved but their spread is rather slow due to want of efficient private organisations for seed multiplication and distribution. In advanced countries like U. S. A., special seedsmen have taken up to the production of hybrid seeds in crops like Sorghum, corn, etc. through special techniques like cytoplasmic male sterility. The cultivator who is educated knows that these seeds are to be obtained only from reliable seedsmen. He is also well informed that the grains he produces from the hybrids are not to be used as seeds as they have the potential danger of reducing the yields if grown in subsequent generations. The value of synthetic hybrid and its possible utilisation through two to three generations is known to him. All these technical details have been brought home to him easily because of his education and the operation of the efficient extension workers and private organisations for seed multiplication who have developed high scientific skill. Similarly every respect of Agricultural Science has some intricate systems which can be learnt only through education and powerful extension.

The literacy in India is getting steadily increased. Hence it is the duty of the Agricultural Ministry to organise agricultural education which is fundamental for the research and extension. The rural universities which combine research, education and extension together, would be the ideal answer to it.

The extension will be a failure unless the American definition of extension "Extension is what extension does" is followed and its success is in the hands of efficient, well paid and contented extension workers who work with altruistic zeal.

REFERENCES

1. Burnner, E. et al *Farmer of the world*. 1954 Columbia University Press. pp. 1 to 208.
2. This refers to the recent Seminar of the Principals and teaching staff of the Agricultural Colleges of the southern states held at Trivandrum in May 1957.

Integration of Research, Education and Extension in Relation to Paddy Cultivation

by A. ABDUL SAMAD

From the days of Adam, man has been striving hard to better his lot, with food figuring as the first and foremost item in his programme, as this is an essential article required for maintaining his very existence. In a broader sense, the different nations of the world have been vying with one another in improving their economy for providing better living conditions. This issue has been followed from generation to generation and to-day Agriculture stands in the economy and prosperity of a nation as a very important subject. In the formulation of India's Five Year Plan, provision for enough food for the people has figured as an item of great import. With the progressive increase in the population and rise in the standard of living of the working classes, leading to an increase in the number of people consuming rice or wheat in post war period, have imposed on the Union, the responsibility of further increased production of rice and wheat to meet the growing demands.

In Madras, where the principal food is rice, the State Government, in spite of launching in recent years a number of major and minor irrigation projects and thereby not only bringing new area under paddy but also increasing the production in the existing regions, it has not been able to raise the production to such a level as to maintain self sufficiency in rice. It has therefore, fallen to the lot of the Paddy section, in main, to tackle from all aspects, the problem in increasing rice production in the State.

The Paddy section has been carrying on intensive research with a view to step up the production of rice in the State but still the rice position is unsatisfactory not because the standard of research that is carried on is imperfect or in any way inferior to the work in other parts of the world, but because the defect lies in carrying the results of research to the farmer. It is understood that it is necessary that the extension staff who have been trained and educated in different aspects of Agriculture, should be in a position to put forth the results of research in an effective way to catch the imagination of the cultivator. In the present set up, the extension officers are doing their best but it is not always their inherent

capacity alone that makes the work easy. If the farmer is not educated enough to understand him, he would find the job extremely difficult. The Agricultural Demonstrator who takes the role of a teacher will be able to carry out his task satisfactorily only when there is adequate reaction on the part of the learner. Therefore, to carry the results of research to the cultivator, it seems necessary that not only that the Agricultural Demonstrator should be educated in the art of extension work, but the farmer should have enough education to understand him. Many a fine example of departmental activity has failed to attract the attention of the peasant, because the teacher was either too timid about calling attention to the departmental achievements or the peasant was not receptive to his call. Good farmers often lacked the technique of teaching others to do likewise. It therefore appears necessary that the farmer should be educated so that he may understand the principle underlying the methods recommended and also be able to make others understand him. This could be effectively carried out if the sons of the farmers are given Agricultural education even from the early stages in the High Schools by employing staff very well trained in Agriculture instead of pressing into service a teacher of natural science as is often seen in some of the schools. It is also desirable that the text books in all the branches of the subject are made available in the regional languages so that the principles involved could be easily understood. At present only some of the high schools in the State are teaching agriculture and as such the progress is rather slow. If only there are sufficient men on the extension side and at the same time if the farmers are also educated, with the available results of research done by the Agriculture Department, the State would have attained self-sufficiency in respect of agricultural commodities much earlier.

The Paddy Section has to its credit outstanding achievements. It has so far evolved seventy two improved strains, 62 by pureline selection and 10 by hybridisation to suit the different parts of the state and for different soil and climatic conditions and these strains have given 10% to 30% more yield per acre than the local varieties, but they have covered only about 50% of the total area under paddy giving an additional production of at least 2.4 lakhs tons of paddy valued at Rs. 8.4 crores. If through propaganda the whole area is covered with improved strains, the additional production would have doubled. For supplying sufficient improved seeds to the farmers, 360 state seed farms are contemplated in the Second Five Year Plan to facilitate rapid spread of the strains so as to cover at least 85 per cent of the area by the end of the Second Plan period.

Of the hybrid strains, there are for *blast resistance*. Blast is a very serious disease causing loss of produce ranging from 10% to 100%. In the Tanjore delta, the granary of South India, this disease is a serious menace. By replacing the susceptible varieties, these strains have covered nearly four lakhs of acres with an estimated extra produce of 0.8 lakh tons valued at nearly 2.8 crores of rupees.

Certain *Agro-commercial varieties* are preferred in the markets for their quality and fetch a premium price and these are usually long in duration. Most of the short duration varieties are not of the preferred quality. The section has produced new varieties combining short or medium duration with good quality rice and these have now become very popular with the cultivators. These have covered about 5 lakhs of acres contributing to an additional production of 0.5 lakh tons valued at about 1.75 crores of rupees.

There are *Introduced and Acclimatized* types like S. R. 26-B from Orissa and Patna varieties from Bengal and these are occupying over 20,000 acres giving high yields.

Besides these, substantial increase in production has been obtained by adopting *agronomic improvements*. Improved practices like economic planting, production and use of green manure and extended use of ammonium sulphate and super phosphate as practised in the modified Japanese method of paddy cultivation, are estimated to be followed in 50% of the area. The additional production from this may be estimated at 2.4 lakh tons valued at Rs. 8.4 crores. If these improved methods could be extended to the whole area, the additional production would be doubled.

In addition, the Section is carrying on intensive research in the evolution of drought resistant strains, short duration blast resistant strains, short duration strains with seed dormancy, high fertility strains, saline resistant strains and strains for deep water conditions.

Madras could very well hope to become a surplus State in respect of rice, if the results of the research are carried to the cultivator in an effective way. Effort is now made by the extension staff in the right direction to teach by example rather than by precept to demonstrate improvements in his own village and under village conditions. Besides demonstrating the results of research in cultivators' holdings, the farmers are induced to see the demonstration

plots and also research stations were improved methods of cultivation are demonstrated. This has been very necessary as the mere words do not appeal to the bucolic mind of the cultivator. If he is uneducated, he is often slow in grasping a point and sometimes becomes suspicious of the intentions of the officials. But there is vast improvement in the attitude of the farmers since independence and the work of the extension staff has consequently become easier.

The extension work will become much more effective and easy if the improved agriculture could be brought home to the farmer not only through magazines, bulletins, posters and circulars, but also through visual aids like motion picture films, film strips, lantern slides, flip books, flash cards etc.

Therefore, it may be said that a solution of the rice position of the State could be made possible only by the integration of research, education and extension.

Integration of Agricultural Research, Education and Extension

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Of late, when public agricultural opinion is full with questions relating to price and markets, work that is in progress in a modest manner at Agricultural Research Institute, is likely to be overlooked or at least regarded as of decidedly secondary importance. It is likely that the world is suffering from overproduction of certain commodities rather than from the reverse, and to that extent the efforts of science to remove the disabilities of the Agricultural production may be regarded as of less importance than efforts to recreate or rejuvenate markets for the sale of Agricultural produce.

On the other hand, if the low prices continue for a certain period, the farmer is concerned in taking all possible steps to produce his goods at the least cost, and viewed in this light, the prosecution of research into the problem of farming is as important as ever.

It can fairly be claimed that the value of Agricultural research is cumulative and that as the years pass the work of Agricultural Research Institutes that have been established in this country progressively increases in proportion to the funds that are to maintain them. Each year, advances are being made that are of enormous potential value to the Agricultural industry. As typical examples it may be said that development of improved strains and plant materials have been profoundly revolutionised by the introduction of certain improved varieties of cotton, Rice Oil seeds and Millets, and that the practical methods of Farmers in their production of various crops have been radically changed and also that the crop pests are being continuously brought under more effective control as a result of the work of the research at the Agricultural Research Institute, Coimbatore, in South India.

The programme of work at all research stations in the State is reviewed every half year by the Government in conjunction with the Agricultural Research Council - a body established comparatively recently, composed of Scientific men - and already the results of this

friendly review has been to secure a greater measure of co-ordination in this work of the various branches of research. The financial position calls for rigid economy of expenditure, but mainly as the result of funds at the disposal of the Indian Council of Agricultural Research at New Delhi, extension in the shape of number of schemes has been possible in the direction of investigation of crop pests. In South India, the Agricultural Research Institute, Coimbatore, has played a great part in the organisation of Agricultural Research during last 50 years under close observation and most careful records kept of everything that happened.

It is sometimes suggested that the value of the Agricultural Research is limited by the lack of adequate means of getting the results to the eye and mind of the farmer. It is questionable whether this criticism has any real foundation. All research in progress can be divided roughly into fundamental work of a somewhat abstruse character on the one hand and investigations having a definitely practical bearing on the other. As to the former, the results are usually published in technical journals and are discussed among the workers themselves, and to others interested, at meetings and conferences, for which ample provision is made. Regarding the latter filtration through educational advisory channels and through the system of local field trials, that permeates the district is necessary before results are handed to the farmers as undoubted improvements on existing methods. The filtration system is extensive as Research workers, advisory officers on the district staff, whose business it is to deal with the farmers' problems, have numerous opportunities for consultation and mutual discussions. Co-ordinated experimental work is frequently organised with its nucleus either at this Research Institute or at agricultural Research Station in the district. When the stage is reached at which the results of research having gone through the severe test of technical criticism from workers in different areas and of field trials in various localities, can be safely commenced to the growers, there are many channels through which the information can flow to him. Research Institute and Agricultural College, have their publications which are usually placed at the farmer's disposal either free or at a nominal charge. These publications contain articles by scientific investigators, give practical information based on the latest knowledge. The Agricultural Department also, through its advisory leaflets and bulletins, and journals plays an important part in the dissemination among Agriculturists of modern knowledge that incorporates the tested findings of Agricultural Research Institute, and other Agricultural Research Stations.

The advisory officers play a two fold part in the scheme of education and research. They link up on the one side with research Institute and on the other with the district extension service, and thereby they keep in touch with Research Institute that may be investigating similar or related problems, and in this way to place at the disposal of the district staff knowledge on which the latter could not otherwise lay his hands so quickly and easily. In the special case of the Plant Protection Officers who are concerned with the field of control of crop pests, the position of the Plant Protection Officers is obviously important. From one point of view, the officers may properly be regarded as a link between fundamental research and the practitioner whose daily work necessarily leaves little time for systematic investigation.

The total number of Plant Protection Officers (Entomology) is one with one Plant Protection Assistant (Entomology) in each district in the Madras State as a part of general advisory scheme. The Plant Protection Officer deals primarily with the control of crop pests and undertakes local investigation into control measures. He keeps in close touch with the Government Entomologist, Coimbatore, to whom he sends weekly, monthly and annual reports on the incidence and control of crop pests in various districts of the State.

Arrangements are again made for members of the staff of Research Institute, and Plant Protection Organisation of Agricultural Department to deliver lectures during the Farmers' Day in various Agricultural subjects especially on control of crop pests at the request of the Agricultural Organisers acting in collaboration with local branches of National Farmers Union.

The present set up and organisation of Plant Protection Service in Madras State is inadequate to meet the problem of pest outbreak in a comprehensive scheme of intensive agriculture. The complexity of the pest control problem is fast increasing with the introduction of numerous potent and dangerous pesticides such as Parathion, Schraden, Folidol, Endrin, Aldrin, H. E. T. P., Texaphene and Clordane etc. These require careful handling. It is quite possible that our insect may develop resistant strains of their species towards BHC and DDT. Thus our research for newer and more effective drugs, along with useful parasites and predators should proceed unceasingly until our crops are free from the ravages of pests. Thus there is necessity for an elaborate organisation of highly trained personnel to combat effectively pest outbreaks. The following suggestions are offered in this regard.

The present Plant Protection Organisation should be at least doubled with two Plant Protection Officers (Entomology) for the entire state and to Plant Protection Assistants (Entomology) for each district. For quick transport of men and materials, there should be a mobile unit attached to each individual officer. Each unit should be fully equipped with sufficient number of dusters and sprayers, and adequate stock of pesticides, etc..

In our country there is need for research in the branch of Entomology. Our studies in bionomics have been confined to few pests, and a great deal remains to be done. Studies in insect tropism or behaviour are of utmost importance. Insect ecology must play an important part in placing in our hands facts on the basis of which we could predict insect abundance and outbreaks. Biological control of crop pests is yet in its infancy in India. Insect pathology is a young science, and full of promise. As a result of general awakening to the applied value of Entomology and improvement in teaching of Entomology, it is expected that more money and more men will be available for research in this direction.

It is, therefore, necessary for the intensive integration of agricultural research, education and extension that the Post Graduate Courses are immediately started in the Agricultural Research Institute, Coimbatore, for the growth of Entomology in our country.

Integration of Agricultural Research, Education and Extension

(Some aspects of Agricultural Education)

by A. H. SUBRAMANIA SARMA,
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In any programme of national development, there is need for an integrated effort through research, education and extension, to attain successful results and gain the designed objectives. This is particularly so in Agriculture, which is a human activity of a large mass of the population of the country. In the sphere of agricultural development, agricultural education plays a prominent role in that ultimately it is the means of transmitting ideas of technological progress to the large number of farmers, wherein it is necessary to train and prepare the proper personnel for the achievement of the aims and objectives.

Agriculture is represented both as an art and a science: as an art it is a composite of manipulative skills in ploughing, preparation of the field or controlling plant growth activities. As a science, it has an organised body of knowledge as to causes and effects, laws, principles for directing agricultural skills. This division of agriculture as an art and a science has practical importance in deciding the relative emphasis to be placed in these aspects in agricultural education. Agriculture is also a means of earning a living or it may be merely a way of life. In the former concept, the ryot is interested in bettering his standard of living, he looks at it as a profession as any other. In the latter outlook, the ryot has been built into an environment, he lives in the midst of vocation by his own choice or otherwise. Here the incentive for betterment may not be present, the outlook is circumscribed within certain elementary satisfactions. Indeed, it may go to that extent of being a family affair than a vocation. This fact has again has considerable significance on agricultural education.

Categories of Agricultural Education: Agricultural education may have to serve several purposes. The objective is important as the standards and methods of education have to be planned or modified to suit the requirements of the individual. Agriculture may be taught as:

- (i) a general agriculture school subject. Here the subject belongs to the realm of general education, learnings desirable for all persons.
- (ii) prevocation agriculture in schools. This may not have a vocational aim. It may be given to students before they take a vocational course. The prevocational study may form a background for a later study of the vocation.
- (iii) Vocational agriculture is the preparation of the student or trainee for a vocation or occupation in agriculture. The objective here is to train present or prospective farmers in farming methods or technique.
- (iv) College Agriculture intended to prepare a student for a vocation or for the agricultural profession. In the latter category may be included the graduates who go out for a professional employment.

Agricultural Educationists in Madras have always interested themselves in evolving varying types of training to suit the requirements of all concerned in the above categories. From the time the foundations of agricultural education were laid as early as 1876, until to date, Madras has sponsored agricultural education with a view to train the youth to become well trained agriculturists to run their own farms successfully and efficiently. Indeed the early sponsors of the Agricultural College at Saidapet have said that the idea of the institution was to give the needed training in modern methods of farming to the landed class to improve the agriculture of their farms and the country. To this day, this wholesome ideal has remained only as a wish but never fully consummated.

Madras State is not an exception in this matter; every advanced country has covered the ground with no more success than what have achieved here. Friends from the United States and elsewhere say that after their education, many trainees take up service of some form or other and the number actually returning to the land is but a small percentage of the total. It is not the place here to go into the why and wherefore of this fact, these have been debated in the past.

But certain issues arise from this position in designing the courses of studies to be run by the institution. For instance, type of agricultural education imparted in any institution must be related to the objectives to be attained by the trainees as a result of such education as was reiterated earlier. When an institution designs a course, it has certain definite goals as to the level of basic knowledge or skill expected of the trainees. Though this basic dictum is true in planning a course for a vocation, the objective may be different

and entirely modified when the course of study is planned for degree students in a College of Agriculture; as indeed the scope of such college education has no boundaries as may have been defined in the syllabus and circumscribed to what is contained in the prescribed text books. This must be, when it is remembered that graduate going out with a degree qualifies to be an all-rounder. He must prove to be a successful private farmer if he chooses to cultivate his own lands. He should fit in as extension worker to explain to the millions of farmers in our country the knowledge on better farming methods. After a little training he may enter the teaching profession as a College teacher to teach prospective students on improved farming methods or he may take a place as Research worker to solve a tricky agronomic problem. There is nothing preventing him from becoming a successful salesman for selling many things required by the farmer, be it a tractor, a manure mixture or insecticide. He may fit in if he so chooses to become the manager of an extensive tea, coffee or rubber plantation. It is thus seen that a College graduate must fit in to suit all these of life's adventures in the field of farming.

Changing times: This has relevance to the modern changed outlook on University training and on standardising techniques and evaluation of education, which have brought out many new ideas and concepts on a variety of problems connected with the philosophy and policy of agricultural education. These thoughts and ideas have been directed to the revision of the existing curriculum of studies and the design of uniform syllabus and teaching standards, the relative emphasis on the various contributory sciences, extension training and examination standards. The analysis of occupations of the agricultural graduates, the specific objectives of agricultural education and their relative importance, the requirements of agricultural industries in the state, an inquiry into the causes of failure in agricultural vocation—all these would help to reorientate the standards of studies of students and training levels imparted in the sphere of agricultural education.

A cursory examination of the occupations of former graduates from this institution would at once show that a great part of the passed personnel seek employment in Government departments and largely in the extension service. Even with developments in the other fields opening up new avenues of employment, still, Government would continue to be the largest employer for some time to come. It is a matter for serious thought whether a uniform standard should be adopted or each institution allowed to go forward and progress in their traditional way according to its own genius.

Over a long period of time in this institute, teaching courses have been planned and executed which have been found to satisfy the needs and aspirations of those who have fitted themselves in a variety of agricultural vocations enumerated earlier. During this long period, the course of study has not remained stagnant, many improvements and modifications have been effected from time to time and new subjects added. The basic approach, however has remained unchanged and stood the test of time.

Specialisation: This has relevance to specialisation in some branch of the science and attention is being bestowed among thoughtful educationists on the usefulness to provide facilities for such specialisation. Such facilities exist in main institutions and the course of study is designed accordingly. It is however pertinent to recall the earlier reference to the future employment opportunities. It is a matter for serious thought whether specialisation would not handicap them in their future employment.

Extension training: According to modern ideas, an Agricultural College should have provision not only for instruction and practical training but also an extension wing. In the present set up of the department, the extension wing is isolated from the instructional and research wings, though co-ordination is maintained between all the wings at administrative level. In view of the fact that a large number of graduates are employed as extension workers in the department itself, it is obvious that such training is essential to make them successful extension workers. There is thus an imperative need to organise an extension training wing in the scheme of education in the Agricultural College.

Vocational education: Vocational education, except as a means of seeking employment, has not made much headway among the farming class. It is doubtful whether it would become popular at all. Agricultural education at all levels have been viewed purely as a means of securing a job. Whether it would attract the real farmer who needs the training for his vocation, time alone would show.

Retrospect and prospect: Over the past ninety years, agricultural education has undergone many changes. Many far reaching programmes are envisaged in the present and future Five year Plans. The future set up of agricultural education must be to make these plans a success. Changes, both practical and ideological are sure to come about. Be that as it may, the Agricultural College at Coimbatore would continue to play a useful part in all these endeavours, as befitting the pioneer institution in the country in Agricultural Education.

Integration of Agricultural Research, Education and Propaganda

by C. BALASUBRAMANIAM,
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Introduction: This is a very important subject, for the consideration of which the present time is very opportune. The Agricultural College and Research Institute is celebrating its Golden Jubilee and the Agricultural Meteorology wing of the India Meteorological Department of the Government of India is celebrating in August, 1957 its Silver Jubilee. The All India Farmers' Forum had three conventions. The Indian Council of Agricultural Research conducted recently a seminar on Agricultural Education. So details are available in plenty for taking a final and useful decision on this very important subject of integrating agricultural research, education and propaganda, the adoption of which will certainly maintain steadily the high level of food production in India. The world population increases at the rate of 1,20,000 every day. So it is very essential that something tangible is achieved in this direction. In this paper some suggestions have been given with special reference to the role of the Meteorologists in Agriculture.

Agricultural Research: The main aim of Agricultural Research should be to maintain steadily the high level of crop production. The various means of achieving this laudable object are briefly listed below:

- (i) Evolution of improved strains of seeds.
- (ii) Improvement of agricultural implements.
- (iii) Planning of economic and useful method of manuring and cultivation of crops.
- (iv) Assessment of the barest minimum of water requirements of the major cultivated crops.
- (v) Utilisation of cheap sources of power like wind and sun.
- (vi) Formulation of suggestions for effecting reduction of loss to crops due to pests and diseases and also due to weather abnormalities.
- (vii) Production of rain to meet the dire needs of the crops.

In regard to the first three means the Crop Specialists and the Agricultural Engineers will be pronouncing their expert views in their papers on the subject. Coming to the assessment of water

requirements of crops, systematic work is yet to commence on an All-India basis. In America, for instance, much headway has been made in this direction. Experimentally the agricultural scientists in America have proved that for the irrigated corn crops, it is enough if they are irrigated during the three weeks period from tasseling to the milk stage. Similar useful findings have been drawn by workers in other countries in regard to wheat and tobacco. If useful data are collected on the critical growth phase of the major cultivated crops and the minimum number of irrigations that should be given to them during those critical growth phases, it will immensely add to the facility of the farmers to increase the area under irrigated crops with their existing slender irrigational sources.

Even today many farmers living in remotest villages are not having electric power for agricultural purposes. For them the only solution is to harness the energy from the inexhaustible sources, namely, sun and wind. As regards the tapping of solar energy for agriculture, the advancement made in countries like France and Russia, is worth noticing. Harnessing wind power for agriculture is a simpler process than the harnessing of solar energy. Very many countries like Denmark, France, Germany, Italy, Australia and Russia have succeeded in making wind power useful not only for agriculture but also for small scale industries. Very reliable and cheap windmills have been evolved in these countries. It is pleasing to note that the Planning Commission of India has provided an amount of Rupees seven crores for wind research with the intention of opening two research institutes, one in the North and one in the South. The team of the committee on Plan Projects for the study of Community Development and National Extension Blocks discussed the feasibility of harnessing wind energy for agriculture during their recent visit to Coimbatore.

Loss to crops by pests and diseases and also due to weather abnormalities like floods, droughts, cyclones, gales hurricanes etc., is to be prevented to the extent possible. Well organised research on an All-India basis is quite essential to have substantial success in this direction. The marvellous achievements made in Japan, America and Great Britain respectively in regard to paddy, wheat and potato are worth mentioning and the warning system that they have evolved are really worth copying. In Great Britain, for instance, the Meteorological Office issues the Potato Blight warning, as this disease spreads rapidly in warm moist weather. The Agricultural

Meteorology Section at Coimbatore has brought out the possibility of predicting the incidence of early blight of potato at Nanjanad from a knowledge of the prevailing temperature and rainfall conditions. It is, therefore, high time that intensive and well planned research is thought of in this connection.

So far as weather abnormalities are concerned, substantial work has been done in almost every country to have a successful system of affording protection to crops. Much progress in this direction is possible in India also in close collaboration with the Meteorological Department. A pilot scheme has been just sanctioned for the Madras State as per the recommendations of the Central Agricultural Information Committee and it is fervently hoped that the Agricultural Meteorology Section will, in the course of two or three years, be able to minimise the damage to crops in the State by the sudden and violent changes in weather. The 20 year - plan of Russia to reduce the loss to crops by hurricanes and gales by establishing effective shelter belts and wind breaks is already being considered with reference to India by the Forest Department.

Coming to the last, but the most important portion of agricultural research is the production of rain to save the withering crops, particularly in rain-fed areas. Action is being taken in this connection both at the Centre as well as in Madras State. Days may not be far off when something substantial is achieved in this line of agricultural research to the great relief of the farmers at large.

Agricultural Propaganda : Every State has got a well organised propaganda wing in its Agricultural Department. Organisation of State Seed Farms is a new approach to render timely supply of improved strains of seeds to the farmers. In modern days facilities like radios, news papers in regional languages, cinema houses, recreation clubs and what not are available in plenty to function as effective disseminating media. What is wanted is a good organisation. The Government alone cannot do much in this direction. The active co-operation of the public is essential. The suggestion in this connection is the formation of Agricultural Co-operative Societies to protect the interests of the every tiller of the soil from the village level to the State level with different graded facilities and responsibilities. The noble example set by China is enough to imbibe sufficient faith in the utility of organising such co-operative bodies for the production and marketing of agricultural commodities.

Agricultural Education : When once the main policies of agricultural research and agricultural propaganda activities of the Agricultural Departments in the various States are decided and directed to proceed on an all India basis, with slight deviations to suit the local conditions, then the question of having suitably qualified personnel comes in for a serious consideration. It is no doubt a fact that a number of agricultural graduates are being produced in India by the different Colleges of Agriculture. But a calm and dispassionate analysis of the mode of training adopted in different Colleges of Agriculture will reveal that there is yet a considerable amount of spade work to be done to bring them all to an uniform level of efficiency. This is, in fact, the object with which the Indian Council of Agricultural Research has recently conducted a seminar on agricultural education at Trivandrum. At this seminar, in which the Principals and Senior Professors of the various Colleges of Agriculture in India took part, a number of useful suggestions have emanated after prolonged and detailed discussions. The most important point stressed at this seminar is that the students should gain a first hand knowledge of the reaction of the existing agricultural research and extension activities of the Department of Agriculture on the farmers and as to how they welcome and receive them.

The suggestion, which is offered in this connection with reference to Madras State, is that the agricultural education may be advantageously formulated as follows. With the institution of pre-professional course a student has to put in four years of course in Agriculture before he qualifies himself for a degree in Agriculture. These four years may be divided into two periods of two years each, with an University Examination at the end of each year. In the first period of two years the trainees should be taught the basic principles of agriculture and all allied subjects, Based on the 'Rating scale' card, as in U. S. A. and approved by the Seminar at Trivandrum, the natural aptitude of the student should be decided as to whether he is suited more for research or for propaganda work. In the second period of two years he is to be given intensive training either in research or propaganda as the case may be. The training in the fourth and final year should be highly practical in nature, if not entirely practical, so that he may fit in efficiently in service after graduation. The chances for promotion in service in both these wings, namely, research and propaganda, should be practically of the same nature.

Means of Integration : Having dealt with in a brief manner the frame work of ideal research and propaganda organisation and also the manner of producing eminently qualified personnel for the department, the question of integration comes in. Organisation of Regional Councils with officials of both research and propaganda branches of the department and a few non officials, who are practical farmers, is a suggestion made in this connection. Each Regional Council should not comprise more than three or four districts. There should be a similar council for the State as a whole, in which there should be at least two non-official representatives from each Regional Council. Functioning of any council either solely for research or for extension should not be encouraged. There should be an integration of research and propaganda at every stage of the activity of the department. When the Research Officers actively collaborate with the officers of the propaganda side, who, in turn, are aware of the immediate and real needs of the farmers, then shaping of research to meet the farmers' demands will be easy. Equally easy it will be to evolve suitable graduates in agriculture.

Conclusion : When the above suggestions are implemented it should be possible, as stated in the introductory portion, to bring every inch of the available land under cultivation and also to maintain the high level of crop production. Further the loss to crops due to weather abnormalities and pests and diseases may also be reduced considerably.

Integration of Research, Education and Extension

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The views expressed in this note are made on my own responsibility. They do not represent the views of any of my official superiors nor do those officers stand committed in any manner through this note.

The use of the word "Integration" in the subject matter of the present symposium presupposes that whatever liaison or co-ordination that may now exist between Research and Education is not considered adequate and that one should now go the whole hog and secure a full integration and not mere co-ordination alone. The use of the word co-ordination implies the existence of two separate wings which should meet together and pool and exchange their ideas whereas integration implies a merger of the two. This policy of integration seems to be inconsistent with any existing rule or regulation which prescribes separate qualifications for recruitment of persons in charge of teaching, right from the bottom to the top. These rules create a separate hierarchy of educational personnel in the Department. Whatever be the reason that impelled the authorities in creating such a separate hierarchy, it has to be admitted that this strikes at the root of the principle of integration. Integration to be successful should have one pre-requisite namely, the pooling of all available man power in each branch or subject both in research the teaching wing, and enable the drafting of personnel for either of these wings from that common pool. It should also be possible to change the men from research to teaching subject of course to the limitations imposed by individual aptitudes. As long as you keep a separate set of qualifications, for the men of the teaching wing, no exchange is really possible and it often happens that the men on the research wing continue there only and so also the teaching personnel. If it is argued that the qualifications prescribed for teaching personnel are supplementary to research qualifications, may I ask whether it is not a fact that the existence of these very supplementary qualifications bar out the free exchange of men from research to teaching and *vice versa*? I am of the view that frequent exchange of men between research and teaching (i. e. a two way traffic) is

necessary for integration of research and teaching. This would ensure that the teaching personnel acquire and pass on to the student a knowledge of all recent developments in the field of research with which they are concerned.

Coming to integration of research and extension, I may refer the demand frequently expressed in certain quarters that practical agriculturists should be associated with the research work going on at Agricultural Research Stations. This demand has been considered as not feasible. It has been contended that the Farmers' week and other deliberations where Farmers are given an opportunity to visit research centres offer adequate opportunities for the practical Farmer to acquaint himself with recent developments in research. I agree that a practical Farmer however learned he may be, may find it difficult to understand and appreciate the actual method of research. He may not for instance understand the need why a particular kind of lay out in a field experiment is adopted or the reasons why a particular method of breeding is utilised. But in assessing progress from the practical and utilitarian point of view, I suppose any practical Farmer would easily understand whether any practical progress useful to his needs has been made. He can also appreciate what difficulties the worker had to confront with during the course of his work. I am of the view that in assessing results every year, one or more practical Farmers should be given an opportunity to understand the progress. Committees of a few Farmers can well be associated with various research centres and they may hold membership from 3 to 5 years during which period they will meet atleast once a year. During such meetings the research workers will explain to them in a manner in which they can understand the problems that were tackled since the previous meetings and the progress that has been achieved. Farmers' Weeks are larger functions where apparently close study of the problems and assessment of the practical progress achieved are not feasible. It is therefore necessary to associate small committees of Farmers consisting of not more than 5 or 6 whenever progress of work is reviewed. These Farmers will serve as carriers of information on progress of research to their villages.

Then there is the extension worker whether working in the Agricultural Department or in the Community Projects and National Extension Service Organisations. Sometimes it is said that there should be a free exchange of men from the extension wing to the research wing and *vice versa*. This suggestion overlooks the fundamental point that a really good research man is not some one who is

created as such by an order of a competent authority based on a set of rules prescribing particular qualifications. His qualities and competence as a research man are something which are already latent in him and which given an opportunity blossom out into excellent work which very often commands international respect. I concede that administration has to have rules and regulations for whatever it has to do in order to eliminate personal preferences and prejudices. But that is not the same thing as saying that by its mere order, administration can bring into being first class research men. By the same logic administration cannot also create to order first class extension men. These activities require basic aptitudes which are inherent. The very administration which goes by rules and regulations very often puts a round peg in a square hole only because there are no aptitude tests atleast for recruitment to the subordinate executive ranks before a person is drafted into the research wing or to the extension wing. It is only after one or two years that the officers who supervise the work of new men discover that these recruits are in a wrong place. These men who are in wrong places can be switched on to their proper places and utilised to the full. For instance a person who has a flare for bringing up good posters or exhibitions and who is now in the research wing is ultimately the person who after a few years of experience in the research wing can well be drafted to the extension wing. The very fact that such a person has been in the research wing for some years enables him to have an overall idea of the research work done at our research centres and he can easily put across results of such work to the Farmers. The reverse can also take place. The transfer of such men to their proper places based on a study of aptitudes can create a two way traffic and enrich both fields. In such matters the question will always be asked as to what will happen to the future prospects of these individuals. The reply is that personal interests cannot be the ruling principle in such large matters which affect the public at large.

Integration of research and extension in the same sense as integration of research and education i. e., a merger of the two wings, is not in my view within practical possibilities because of the different aptitudes that men of each wing require. But integration can be partially effected by a free flow of knowledge from the research wing to the extension wing. There are several media for passing on such knowledge and I do not propose to discuss them in this note because I am limiting myself to the administrative angle. The speed with which our extension literature reaches the extension worker or

the Farmer is a very important consideration. As things at present stand we are not moving fast enough. Administratively centralisation of all printing and such items of work may seem feasible. In a centralised unit, each individual or a group of individuals deal with only one aspect of administration. They acquire specialised knowledge in their line and are therefore less liable to commit mistakes in the application of rules and regulations. In handling printing work for instance it is always easier to purchase stationery or printing materials by Departments or units who have specialised in these lines. It is also administratively easier to get all printing jobs done in a central press. But in such an arrangement, they have to wait in queue with others with the result for instance that an instructional leaf-let on planting a crop or selection of seed gets ready late and reaches the field staff long after the planting season is over. Ultimately the very purpose of the leaf-let is thus defeated. If speed has to be ensured some sort of decentralisation of such items of work as printing might seem desirable. It might be argued that the compilation of such literature should be taken up sufficiently in advance so as to facilitate the literature to be printed in time and to reach the Farmer in time. I am afraid this is difficult. The research man should first find out what exactly he has to give to the extension man before the extension man decides how he can sell this idea to the Farmer in a manner and with a speed which will enable the Farmer to get the idea before the proper season.

While it is true our research people are writing up a number of reports or papers, I have been wondering whether we have an organisation, however small it may be, which actually contacts the research men or probes into their reports to get at material for extension work. There seems no use in any one arguing that it is the research man that should hand over his results quickly to the extension man nor for the research man to argue that it is for the extension man to himself cull out what he wants. I am of the view that we should have a small unit of 5 or 6 men who should constantly probe into the various reports of research men and meet them frequently in an attempt to get at material for extension work which should be turned out to the Farmer with speed and in time.

Research, Education and Propaganda in Relation to the Improvement of Chewing Variety of Tobacco in Madras State

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It is a recognised principle that to agricultural workers in all walks of life whether in the field or in the laboratory, the most essential function is to help the cultivators to meet their needs. Research, education and propaganda in the field of agriculture have hitherto progressed in a co-ordinated manner in dealing with the problems of the cultivators. However, the chewing variety of tobacco is one which has not received due attention in Madras State until very recently. The object of the paper is to present and discuss the different problems which need such a co-ordinated effort of all concerned to impart practical knowledge to tobacco cultivators in the scientific method of cultivation.

In Madras State the total area under tobacco extends to about 43 thousand acres of which varieties other than *Virginia* and *Nicotiana rustica* occupy nearly 35 thousand acres. Of the many types of chewing varieties grown, that which is known under the trade name of Meenampalayam tobacco commands a better market value on account of its intrinsic taste and a roma which is attributed to the nature of the soil and the brackishness of the well water invariably used for irrigation. As more attention is being concentrated on the aspects of all crops to improve the over all production for increasing the national output, it will be but fitting that the scientific growing of tobacco should also be taken up not only for increasing production and improving the quality but also to rectify and overcome the defects in other respects. Although an extensive field has been covered in the cytogenetical studies of the different species and varieties of tobacco, very little work has been done on the problems related to the cultivation of the chewing variety of tobacco. Of the four common varieties, Vazhaikappal is most popular one cultivated to a large extent and the next best is Vattakappal. Erumaikappal and Surikappal are cultivated to a limited extent. Information on

the classification of these varieties and their inherent response to different agronomical practices is yet inadequate. The nursery practices have not been standardised though seedlings are raised on well manured plots usually after a crop of Ragi. Mortality of seedlings is fairly high in the nursery beds, due to diseases especially in years of heavy rainfall. As a result, not only the growth and vigour of the seedlings are affected but also the transplanting is delayed. The optimum age of seedlings necessary for transplanting and better methods of seed bed management to get healthy and vigorous seedlings are problems worth investigation. Planting commences in September and continues up to the end of December, the planting being adjusted according to the previous crop which is either Ragi and early harvested crop or Groundnut and Tenai which occupy the fields for a longer period. But mid seasons plantings are said to be the best for ensuring good yield and quality and comparative freedom from pests and diseases. Dewy weather, which usually sets in during the growing period of the mid season planted crops, is said to be helpful for including better growth, flavour and taste. Though the above is in general the experience of the cultivators, there are no regular observation recorded in the different varieties under the varying periods of planting and soil conditions. The same is the position with regard to the cultural practices followed. Intercultivation upto a certain period of growth is very essential for the proper development of leaves. Topping is very essential for the proper development of leaves. Topping is usually done at a height of about 2' leaving about 7 to 10 leaves normally. The relationship of topping at different heights and at different stages of growth of the crop to the ultimate development of leaves and incidence of pests and diseases are yet to be studied. The different methods of planting i. e., on ridges and in beds may influence the main field management and incidence of pests and diseases. There is practically no authentic information regarding the varietal response to different spacing and topping height in relation to the nature of the soils. Results of experiments done at the Hookah and Chewing Tobacco Research Station, Pusa (Bihar State) indicate that topping at 10 leaves favours better yield and quality. Closer spacing of 2' between plants spaced 30" apart has given higher yield and good grade leaf. Similarly from the results of trials conducted at the Cigar and Cheroot Tobacco Research Station, Vendasur (Madras State) it was found that higher topping and closer spacings gave significantly higher yields than lower topping and wider spacings. Topping at 16 leaves and spacing at 24" were not significantly better

in yield than 14 leaves topping and 27" spacing. In the cultivation of Meenampalayam Tobacco greatest importance is paid to manuring. Heavy doses of cattle manure upto 50 cart loads are applied per acre, either to the preceding crop or directly to tobacco before planting, if the previous crop happens to be groundnut, Tenai etc.,. Sheep-penning is also a practice followed by some which is reported to induce better quality and taste in the cured product. Some of the more advanced cultivators apply (over a basal dose of 10 tons of cattle manure) about 2 cwt. of Ammonium sulphate and 150 lb. of Groundnut cake. Potassic fertilizers are rarely used, as brackish water from the wells invariably used irrigation is said to supply the required quantity of such salts to the crop. The effect of application of green manures and bulky organic manures at different levels individually and in combination and fractional application of concentrated manures for the standing crop to the final yield and quality should also be studied. There is an opinion current among the cultivators that inorganic fertilisers tend to affect the keeping quality of the cured produce although they increase the yields. There is no experimental evidence to substantiate this belief. This is an important item to be investigated as it is concerned with the market value of the crop. It is the age long experience of the cultivators that irrigation with brackish water from the wells increases the yield and quality of the cured product. On the contrary, sweet water from any source either wells, canals or tanks has been noted to impart paler colour, lower density of the leaves and inferior flavour and keeping quality though it has been found possible to reduce the effects of sweet water to a good extent by sheep-penning the lands before planting. The problem of irrigation in the tobacco tract in relation to soil and season require an organised study. Sun curing is commonly adopted for this chewing tobacco. Though the agronomic practices determine the yield and quality of the crop to a good extent, the final texture, colour and aroma depend upon the proper stage of harvest of the crops in relation to the prevailing weather conditions and care taken in the final curing under shade in the godowns. The curing consists in opening and rearranging heaps or curing stacks at regulated intervals depending on the weather conditions and the progress in curing of the leaves in the stacks from time to time. But the various processes to be followed for ensuring high quality in tobacco have not been worked out in detail or standardised for the different varieties. Detailed work on this aspect will be taken up after the return of the officer of the Madras Agricultural Service who has been deputed to

Ceylon for necessary training in cultivation and curing practices of the Jaffna variety. The main pests on the crop noted are the plant lice, leaf-eating caterpillar and the stem borer. The "frog-eye" spot disease is the one commonly seen and in certain years it has been noted to affect the crop badly resulting in poor growth and inferior quality. Effective remedial measures or prophylactic applications have to be found out which should in no way affect the quality and taste of this chewing type. Here again, there is a real need to carry out adequate investigations on various aspects in relation to the occurrence of pests and diseases, so that we may be able to programme and test out different remedial measures before recommending suitable methods for general adoption.

From the above brief survey, it is quite obvious that a vast field of research lies here, wherefrom practical results may be expected in a number of aspects closely related to increased crop production. A study of the effects of the prevailing weather conditions on the yield and quality of the crop should prove also another useful item of work. Besides, the applicability of the age long practices in vogue have to be examined for the furtherance of the tobacco industry. The excise revenue is also likely to increase considerably as a result.

With the opening of the Lower Bhavani Project in Coimbatore District another problem that has cropped up is regarding the suitability of canal water for growing tobacco. The alleged inferior quality of tobacco grown under sweet water compared to the brackish water from the wells has to be investigated. The urgency to take up the above study is apparent from the fact that with the supply from the canal, the tobacco crop can be irrigated at a much lesser cost than that usually required for irrigation from the wells. Further, of late, opinion is gaining ground with some cultivators that due to the seepage of water from the canal into the wells in the ayacut the brackishness of the well water has got reduced, resulting in poorer quality of tobacco. This is a problem which is bound to vitally affect the area grown with tobacco in this tract and also the excise revenue in the long run. The defects noted in the canal water will have to be got over by supplementing the canal water with suitable salts to produce a crop comparable in quality and colour to that grown with water from the wells. With the timely assistance rendered by the Indian Central Tobacco Committee, problems related to the possibility of producing a quality crop with canal water supplemented with potassic salt similar to that usually obtained

previously with well water, manuring of tobacco and time of planting are being studied at the Agricultural Research Station, Bhavanisagar. Late in 1956 the problem was taken up and the results obtained are in favour of obtaining superior yields with better quality by the addition of suitable salts to canal water and by judicious manuring. A significant increased production of 46.9% of cured leaves has been recorded in plots manured with 400 lbs. of ammonium sulphate over the plots that received with 50 cart loads of cattle manure only. The trial will be repeated in the subsequent years to obtain confirmatory results.

Integration of Agricultural Research, Education and Propaganda

by K. KUPPAMUTHU, B.Sc. (Ag).

The subject for the conference symposium is "Integration of Agricultural Research, Education and Propaganda". Each one of the subject to be integrated is a vast one by itself under "Agriculture" and the integration of all into one will only solve the problems connected with Agriculture. Research in literal sense can be carried on but the results may not be of any practical use and such results of academical value cannot be integrated with Agricultural education and propaganda. Attempts in this line will result in failure only. Only such researches the results of which are of practical use can be integrated with the education, especially, Agricultural Education, which are to be transmitted to the cultivators through extension workers for achieving immediate results and to solve the present day food - problem.

In this paper the latter two parts of the wide subject "Integration of Agricultural Research, Education, and Propaganda" are taken up for discussion particularly with reference to the Education of Village Level Workers who are the multipurpose workers and who act as liason officers between the village people and subject matter specialists engaged in the various development departments for the extension or propaganda work. Under the new set up for extension work for improving the condition of the rural public, the Village Level Worker's play the important role in the propaganda or extension side. Hence the integration of their education and propaganda is of no less importance than the education of people of a higher calibre. Hence this aspect is taken up as the main theme of this article.

As a sort of introduction, I have to make a brief survey of this kind of education on a country wide basis. When the First Five Year Plan was drawn it was considered necessary to have a separate department under the Directorate of Extension to bring about a change in the outlook of millions of families in the countryside and to assist them in their efforts to build a new life and accordingly the Community Projects and National Extension Services came into existence. Thus a foundation for a welfare state was laid through

these services with the object of covering the entire country under N. E. S. by 1961. A pattern of social and economic life is the aim of a Welfare State and adequate food supply is the essential basis for the development of a sound healthy balanced economy. The establishment of improved Agriculture in the country has opened the way for a sound diversified economy. To man the National Extension Services experienced people with the aptitude for such work were drawn from different departments. The next problem faced was the inadequacy of men to work in these departments and to achieve the above objects. Further it was considered that various departments like Education, Public-Services, Industries, Health Development Departments etc., play a greater role in the Social and Economic fabric of the countryside and that a common man, who can guide the villagers in the activities of all the departments at the Village level, is of utmost importance. With this object in view institutions were started in 1952 on a countrywide basis to train the required number of men in these subjects and their extension methods for Village development and to work as Gramasevaks in the villages. At present in the Madras State there are ten such centres.

The trainees at these centres are given the basic educational knowledge in the various technical subjects like Agriculture, Animal Husbandry, Co-operation, Public-Health, Village Industries etc., which form the back bone of the rural life. Agriculture forms the main subject taught. These subjects are taught to them by men qualified in the various subjects with reference to the latest Researches and findings in the concerned subjects. The integration of the results of Researches with that of Education takes place at this level. Practical problems to be faced when they go out for propaganda into the field are borne in mind at the time of teaching, these subjects. Thus the method of teaching and the subjects taught at these centres are job-related with a rural back ground. How this is attained and the advantages derived by such a method are dealt with in the following paragraphs.

After gaining the requisite basic knowledge of a few subjects the trainees are taken to villages, round about the centre for halts of even a week to study the subjects learnt by them at the centre as applied to actual practice in the villages. They are given a chance to approach the farmers and to draw up their future action of the programme with reference to a particular subject in a realistic way and in group consultation with the villagers. Organised village

groups and in rare cases individuals form the media for the extension work. Agriculture and Animal Husbandry have a prominent part in such activities. The needs of the villagers, their attitudes and minds are well understood before suggesting any programme of improvement. The people are made to understand the changes brought about in our country and in the world by the scientific discoveries and their utilisation and how it is important to prepare themselves to the changed conditions in their own interest. These are done through cultural activities, Audio Visual Education etc., Thus as technicians by providing sound technical knowledge or informations at the first approach and at the proper time the trainees stimulate the thoughts and actions of the farmers. One may know what exactly a farmer has to do, but the problem is that he should first believe it and secondly he should have the enthusiasm for it. For this, lot of listening to them and finding out their real problems and solving such problems only will help. These problems are studied and learnt by the trainees by their stay in the villages and having constant touch with the villagers. The trainees observe closely the various improvements done by the regular Village Level Worker, follow the different stages of introduction and learn themselves as to how the villagers are convinced about a particular improvement. Through this they perfect what they have learnt in the class room and develop a certain amount of self confidence for doing such jobs in the villages themselves. They also note the difficulties experienced in introducing such improvements. The problems experienced by them in the introduction of any improvement are discussed by them with the regular Village Level Worker in the village and with the instructors in the concerned subject in their camps in the villages and in the class room.

Such visits to villages are made at intervals throughout the period of training so that all problems connected with the preparation of the field, sowing of seed, manuring, protection from pests, maintenance of purity, storage of seeds etc., coming up at all seasons will be faced by the trainees and they will learn the methods of solving and approaching the people with such problems.

During the period of such training in Village Extension work the trainees in addition to receipt of guidance and assistance from their instructors get the guidance of the regular Village Level Workers and the subject matter specialists working in the National Extension Service Blocks. By such a training they are guided on

proper lines before committing any serious mistakes and they gain the confidence in introducing or propagating any particular improvement when they go out as regular Village Level Workers at the completion of their training. This also provides an opportunity for the instructors to learn as to the ways of overcoming new situations that they might have come across and to modify and improve the technique of training accordingly.

With the limited experience in the field of education, both in a Rural Extension Training Centre and in the Agricultural College the author is made to feel that the integration of Agricultural Research, Education and Propaganda at the Agricultural College, Coimbatore in a similar way will produce better qualified Agricultural Graduates to work in the extension field with a lot of confidence and to face the various problems in the rural areas. This will also solve the time old complaint that the results of researches are not carried to the doors of the farmers. The problems faced during the training period and at the time of extension work will bring home to the minds of the Research workers the real problems facing the Agriculturists and the correct lines in which their researches are to be done so as to be of some practical utility to the cultivator for whom the Department exists.

Integration of Agricultural Research, Education and Extension

by V. N. MADHAVA RAO,
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In modern times, science advances most and best when organised. Organisation of research is itself a scientific method of major importance. There is now an increased appreciation in India, as in other countries, that progress in agriculture can be achieved only when there is recognition of the fact that efforts may collapse if all the three legs of the tripod—research, education and extension—are not all functioning. The Joint Indo-American team, in their report on agricultural research and education in India observe that everywhere in India, in its wide contact, the team has found approval of these sentiments and of the necessity for this co-ordination.

An attempt has been made in this paper to reflect the views of the Joint Indo-American team and such authorities as Dean Mumford, who had been associated with the Land Grant College Movement of the United States of America, one of the greatest national organisation of agricultural research and development, the report of the Indian Delegation to the Chinese Republic etc. The salient features of their observations are set out in brief.

Research: The farmer in India is most wedded to tradition. Although in recent years a perceptible change in his attitude is noticed, the impact of agricultural research on his farming methods cannot be said to be as powerful as it is in the other progressive countries. Lack of education and economic backwardness, rather than prejudices against improved technique, may be the factors responsible for this state of affairs. With the launching of the Community Project, National Extension Service and other schemes, the skepticism with which scientific research on agricultural problems was looked upon has gradually changed to one of confidence. This awakening among the farmers demands a wise and understanding attitude on the part of the investigators also. Inadequate or unfounded information cannot be allowed to pass through the expanded channels for agricultural extension. The Indo-American team has made the following recommendations for organising agricultural research in India.

Many of the problems relating to agriculture are of nationwide significance and of even international concern. Some of the problems do not admit of solution by the State. The United States of America took up a nation-wide attempt to correlate and co-ordinate the work of several States and the work of U. S. Department of Agriculture. As a result even as early as 1940, there were more than 1350 co-operative projects between the department of Agriculture and the States. Joint Committees with members from the United States Department of Agriculture and the Experimental Stations were organised. This committee encouraged co-operation, recommended procedure, in common with other agencies and a substantial contribution to co-ordination of research in the United States. There has been a substantial elimination of duplication by the several States and the Department of Agriculture. The Indian delegation to the Chinese Republic has also referred to a 'National Committee for co-ordination of agricultural research' established in that country. In regard to the Centre—State relationship the Indo-American team has recommended employment of Project Co-ordinators, who would review the work of the different States on similar problems with a view to co-ordinating the work.

Commenting upon technical personnel the team says "it has been advised that it has not been possible to co-ordinate the efforts of scientific research institutions because of 'personality conflicts' between heads of institutions reliance solely on seniority aggravate problems of co-ordination and co-operation because such senior individuals are strong willed, inflexible and unwilling to modify their views on questions which can best be compromised".

The transfer of Specialists trained in certain discipline to high level positions in another scientific field for which they are not specially qualified but to which they are entitled on the basis of seniority has also been mentioned with specific examples. The poor salary scales offered to scientific workers as compared with those in the administrative services has, according to the team, resulted in the loss of many potentially productive, well trained young scientists. The poor strength of staff employed in research stations has also been commented upon. Among other drawbacks are the absence of sufficient number of professional or scientific societies and lack of opportunities for scientists to participate in the conferences both of national and international character.

Research and education: The success of the Land Grant College Movement in the United States of America is claimed to be due to an intelligent co-ordination of the educational triad viz.,

research, education and extension. The Agricultural Colleges are based on the needs of the rural people. They are to create knowledge in the broad field of agriculture. The very rapid increase in the enrolment of colleges of agriculture in recent years and the widespread public approval of their educational programme is evidence of their essential values in our educational systems. The colleges are closely associated with the research stations. Without research stations, the educational programme would soon perish from a dearth of ideas. The technical training in the college is effective because it is solidly based on work at the agricultural research stations. These stations though primarily intended for solving problems of agriculture are now recognised as essential for good college training. Agricultural teaching is not merely the accumulated knowledge of all the best methods of agriculture of all ages, but also the knowledge of all sciences related to agriculture.

That a college of agriculture has three main features viz., teaching, research and extension was realised very early in the United States of America. Good teaching could not be separated from research. Results of research obtained purely for farmers should be fully utilised for teaching students who were to become farmers or guide them. The college teacher is a more efficient teacher if he is at the same time conducting investigations. The teacher who takes no interest in research or is overburdened with teaching that he can do no research or is overburdened with teaching that he can do no research, can hardly be an inspiration or a model for his students. The close association between the research stations and the college has had a remarkable influence on the general progress of agriculture that one would agree with Dr. Allen's observations viz., "during the life of the Agricultural Colleges, there has been more progress in matters relating to farming than in all the centuries that went before".

The agricultural colleges in India have been conceived and developed with the primary purpose of preparing young men to enter Government service. Little opportunity was provided for specialisation at under-graduate level. The intent was to develop multi-purpose men who could fit reasonably well into any one of the several types of jobs. The curriculum was therefore uniformly inelastic. This system which has proved satisfactory to the present time, may require some rethinking in the near future. It is claimed that the beginning of specialisation is the beginning of success in the colleges of agriculture, greatly accelerated by the establishment of the agriculture, research stations.

Research, education and extension: The work of the research worker did not end with establishing a truth but in developing a truth but in developing a technique for the use of the knowledge so discovered. Success in extension service cannot be achieved without co-ordination between the agricultural college and the agricultural research stations. In addition to research staff agricultural research institutions should also have extension specialists in different subjects who should be members of the resident departments and by reason of this connection will be fully conversant with the latest developments and discoveries of the station.

The role played by the Agricultural Demonstrator and Extension Officer is of greatest importance. He is the representative in the local farm community of all that the department stands for. He is the representative in the local farm community of all that the department stands for. He is really a teacher in a great adult education movement. His primary function is putting knowledge to work. The future of the extension service is dependent on a strong dynamic college and efficiency organised and directed research centres.

For effective results in extension great emphasis is laid on the publication of results of research. It is something to discover a new truth. It is another to present the truth in such a manner that discoveries will have the widest possible use. The authors of scientific publications are generally criticised on the grounds that they report their results in the languages of science and that they are generally too conservative in suggesting applications. There should be an effort to report results with such clarity and simplicity that the intelligent reader should be able to gain a fairly definite idea of at least what the investigator has really discovered. It is often said that research workers devote more attention to a discussion of how the results were obtained than to stating as clearly as possible just what has been discovered.

To foster development of an efficient extension service, organisation of rural youth clubs on the model of the 4-H clubs, organisation of conferences between scientific workers and cultivators, are suggested. It has also been recommended that various types of action and development programmes such as quarantine and other restrictions and related activities should not be functions of those in-charge of research or education. Such activities involving regulatory measures affect desirable relationship that should be maintained between cultivators and extension officers.

Finally, it would be a great mistake to measure the achievements of the Agricultural colleges and Research Centres solely by economic results or monetary returns. One of the most significant results is the enlargement of the intellectual horizons of the people. "The farmer's success is dependent quite as much upon a keen intelligence as upon the traditional rural virtues recognised for generations as essential for *successful* rural life".

REFERENCES

1. (1955) Report of the Joint Indo-American Team on Agricultural research and education in India. Indian Council of Agricultural Research.
2. (1955) Report of the Indian Delegation to China.
3. Cullinan, F. P. (1954) A look ahead in Horticultural research. Proc. Amer. Soc. Hort. Sci. 64, pp. 526-534.
4. Mumford, F. B. (1940) The Land Grant College Movement. Bull. 419, Uni. of Missouri.

Integration of Research, Education and Extension

by M. D. PRABHU

On this historic occasion of the GOLDEN JUBILEE celebrations of this COLLEGE and INSTITUTE it is fitting that the subject chosen for the conference is a vital one namely Integration of Research, Education and Extension. Looking back with justifiable pride from this important milestone in her long history on her magnificent contribution to the development of Agriculture and her splendid achievements in the application of modern science to the age old methods of plant husbandry shall this Institute rest on her well earned laurels? Or brace herself to the needs of the stirring times in which we find ourselves today under the inspiring leadership of our beloved Prime-Minister? There can be but one answer. She shall march forward to even greater achievements in the future. For this purpose the foremost need appears to be to fuse the three streams of Research, Education and Extension into one well knit mighty weapon that will do away for ever the chronic insufficiency in food and general backwardness of our Villages and usher in a brighter era of prosperity and plenty.

The three branches Sir, are in fact comparable to the three sides of a pyramid and are but different views of one organic whole obtained from different angles as I hope to convince this August assembly before long. Only our thinking has grown tangled so that our task today is rather to reorientate our attitude than actually bring the three branches under a single roof or even under a single administrative head. An advance in one branch automatically and may I add naturally brings corresponding advances in the remaining branches providing that they have always been only one and not three separate entities. When Education is upgraded Research is improved and Extension becomes not only simple and easy but swift and lasting.

Research: During the past 100 years Scientific Research has made more headway than in all the preceeding centuries put together with the result that we are today standing on the threshold of a New Age. Undreamt of riches and abundance are looming on the horizon and will soon be in our grasp if we only make wise use of the tools which Science has placed in our hands. Just as we rise with the help

of the ground on which we have stumbled the urgent need of the day is More and Much more of Scientific Research to tide over the critical times that lie ahead. This fact has been recognised in America and a new term the megabuck has crept into the Research programmes signifying smallest unit of expenditure on Science as a million dollars and multiples of the same.

Science Sir, is a jealous mistress. She wants all of you. She wants all of you all the time and if you love the ordinary pursuits and pleasures of life Science has no objection but she quietly moves away. In the higher brackets of Research, the discipline and rigours of Science are in noway inferior to the Commando training imparted at West Point or Sandhurst or the rigid schedule of preparation undergone by the Champions at Wimbledon. Such being their preoccupation the absent minded Professor who boils his watch and carries an egg in his pocket has become a standard joke among lay men. It is not only just but also a policy of Wisdom for the public and the Government to look after their scientist with tender and fostering care rather than leave this relatively helpless people to the mercies of the rules and regulations framed for members of other less exacting services. The long drawn controversy between the rival claims of pure and applied Science have happily been settled and it is now generally recognised that the Government should foster both in underdeveloped countries.

Education: A good Research Scientist will attract Students like honey attracting Bees. Like the seeds in the Parable of the Sower that fell on the roadside and were eaten away by birds a small percentage of student each year will not profit by their studies. But this loss need not cause much worry. But the great organic heart of the vast majority of the students is quite sound and there is no doubt that they will produce abundant and rich harvest after leaving the portals of the College like the seeds in the same Parable which fell on fertile ground. There is no short cut or easy method for the study of Science. If in any system of Scientific Education the student does not put in hard work and painful toil then the product will be cheap shoddy mass produced without the quality of independant and free thought so essential to a Scientist.

The difference between a good teacher and a student is one of degree and not kind. A good teacher does not stop learning even when he gets his degree and his job. On the other hand his thirst for learning and knowledge will progressively increase and he will teach the students by precept as well as the routine methods.

It is fortunate that the Heads of Research Sections with all their unrivalled Library and Laboratory facilities are themselves incharge of teaching in this Institution. The students not only learn their subjects according to the syllabus prescribed by the University but also imbibe the intangible but nonetheless invaluable spirit of Scientific Enquiry pervading the atmosphere of this Institute.

Extension : When Education and Research advance, Extension will not lag behind. The conservatism of the Indian Ryot is fast breaking down and judged by the rapid spread of improved strains, implements, insecticides not to mention the motor bus and the talkie film. It is clear that the ryot wants simple, practical and sound methods of immediate improvement in his own environment rather than imitate blindly methods followed in other countries and other circumstances. The Extension, Sir, is different from the old methods of demonstration and propaganda in that Extension presupposes a two-way traffic. One a stream of practical knowledge hints and improvements from the Institute to his holding and another stream of special technical problems peculiar to his land and holding back to the Specialists of the Institute for investigation, hypothesis, experimentation, alteration, adjustment and finally Solution.

In Conclusion, we hope that the deliberations on this historic occasion under your distinguished presidentship will afford a new orientation to our efforts and lead to complete psychological merger of the three Spheres of work which have only one Aim and none else namely Self Sufficiency or Complete Freedom on the Food Front, for the whole country. We also hope that this ancient land where Learning and Knowledge thrived 5,000 years ago when other countries and Continents were steeped in the darkness of ignorance, this Land ageless in her wisdom but young in her freedom will produce Scientists who will unfurl her flags like Tenzing on the highest peaks of Scientific discoveries and win for her GLOBAL RENOWN AND RECOGNITION.

Integration of Agricultural Research, Education and Propaganda

by M. V. JAYARAMAN,
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Introduction : The very title of the symposium on the one hand the imperative need for the integration of Agricultural Research, education and propaganda, and implies on the other hand, that at present there is lack of co-ordination among the three aspects of agricultural improvement, to the extent desirable. It needs no mention that for the development of any branch of science, research of both fundamental and applied nature is vital. Research also cannot progress without raking into consideration, the work already done, and the knowledge gained by generations due to agelong experience and observations, however emperical they might be. This is so especially in the case of agriculture, which is not only both an art and science but also a pastime, on which rests the national economy of any country, and ours in particular. Agriculture is a vast subject comprising a variety of sciences, each one having grown to formidable proportions, requiring special study for considerable periods of time. It is well known that a sound knowledge of Botany, Chemistry, Soil-Physics, Entomology, Mycology, Animal-Husbandry, Agricultural Engineering, Agricultural Meteorology, Economics, etc., not to speak of other sub-branches like Soil-Science, Cyto-genetics, Dairying, Poultry-keeping, Bee-keeping etc., is essential to tackle the problems of agriculture in their true perspective.

Need for Research : Agriculture presents a variety of problems, each one being kaleidoscopic in character; the more we probe into each problem, the more complicated it appears. It may be argued, however, that agriculture has been going on for thousands of years in this country, apparently without the need for any botheration from the scientists. This argument itself is placed on no solid proof. Agricultural research seems to have been progressing silently in the ages past in an emperical way. Several agricultural practices, which have been handed down for generations and have now been well established in the different localities are only the results of experimentation for ages, probably by hit and miss method. Many of the varieties and types of crops, which were cultivated by the agriculturist

before the advent of modern agricultural research, should have been the results of keen observations of the older generations in picking out natural selections and multiplying them for the benefit of humanity. But, unfortunately, frequent wars, pestilence, foreign domination, and the impact of the industrialised west, have broken the golden thread of continuity of knowledge on matters regarding agriculture. Further, the change in the outlook of the nations, the rapidly growing population in geometric progression, the reduction of the yield of crops in the inverse proportion, change of food habits etc., have augmented the necessity for agricultural research and to place it on a scientific footing, to reorient the agricultural practices, to be in tune with the modern sentiments, with the aim of increasing the production per unit area to meet the ever growing demand of man and machinery.

Need for propaganda: By the experience gained in agricultural research, the agriculturist is introduced to new varieties of crops and new crop rotations, to suit his soils and climate, in order to provide him employment althrough the year and to derive the maximum benefit from his meagre holdings. But the resources of the soil and the resources of the agriculturist are the greatest limiting factors in the rapid progress of introduction of new techniques. Both those factors work in a vicious circle. Here comes the difficulty of the research worker in putting his laboratory results into actual practice. The transalation of the results of a laboratory on a field scale, and that too in the cultivators' holdings is no easy task. The cultivator need not attach so much importance to a particular aspect of study, as a research worker to his pet problem. Unless the large scale adoption of the promising laboratory results are accomplished the volume of research done in the laboratory will be of no avail to the agriculturist, who is by no means an easy problem to tackle with. He has got his set notions and sentiments with regard to agricultural practices and varieties, and will not tolerate any advice from an outsider, regarding deviation in his practices. It is a very difficult task indeed to tell the cultivator that the practices he is adopting are wrong. The cultivator will be reluctant to discard his practices, which have withstood the test of time, and adopt new ones which are yet to be tested and convinced to his entire satisfaction. This kind of deep seated attachment to age-old practices is not peculiar to our own country only. This was found to be a formidable task for Extension workers, even in the ultra-modern country like the United States of America as late as 1910. Considering the above facts the need for suitable propaganda need not be over emphasised.

Need for Agricultural Education : The role of agricultural education is only to bridge the gulf between the research and propaganda sections in agriculture. In the attempts made in this country for the development of agriculture, demonstration seems to have preceded education and research in the opening of a farm at Saidapet in 1865. But it was soon realised that if agricultural improvement was to be substantial, it must be preceded by the creation of a class of men who had received the education and training in methods of farming on modern lines.

Early attempts at integration : There can be no two opinions on the fact that research, education and propaganda are the three main supports on which agricultural progress rests. The need for integration was felt even at the very inception of scientific agriculture in Madras and it may not be out of place to indicate here the early attempts, made at integration. In the opening of this Agricultural College and Research Institute in 1907 a beginning was made for the integration of agricultural research, education and extension. The need for research and demonstration alongside of agricultural education has been stressed by Sir Arthur Lawley and A. E. Castle Stuart, in their opening addresses. Based on the experience gained during the beginning it was felt desirable to place agricultural education on a better footing, so that the students can utilise their knowledge in a fitting manner for advancement of agriculture. That the pioneers in this field had to work hard against odds is evident from the fact that the idea of affiliation of the College to the Madras University, even though was mooted out as early as 1900, could be accomplished only twenty-two years later, due to the unaccommodative and unhelpful attitude taken by the University and the Government. When agricultural education was first introduced it seems that even the educated *elite* at the helm of affairs treated it more or less with contempt. The hopes of the promoters of agricultural science was belied, inspite of their ceaseless efforts and enthusiasm in an unsympathetic atmosphere, in as much as the graduates of agriculture did not return to their lands, as was expected, but sought jobs in government service or elsewhere. It was not the fault of the agricultural graduates if they did not go back to their lands. The truth was that agriculture was not profitable and attractive for a new venture. Agriculture, inspite of its being the mainstay of the population, was but a way of life but not profession. With this background the task of extension workers in having to educate and convince the ryot regarding the agricultural improvements can easily be imagined. The economic condition of the ryot was mainly responsible for the

lack of appreciation of the good work turned out by the agriculture extension staff. But, research made rapid strides in several branches and won the admiration of scientists from all over the world. The research worker was absorbed entirely in his work, thrilled by the hope of new discoveries and he had not much to worry about, as he was comparatively better paid than any other technical graduate. On this score, work done by the propaganda division need not be under-estimated. Improvement, especially in the multiplication of improved strains of crops, has been progressing un-noticed, but went without recognition, partly because the improved strains came to be known to the ryots by popular names-and in some places as 'Company' varieties-and partly due to the increased return did not show considerable increase in money value as the then prevailing prices were low.

Integration - Recent trends: As it was realised beyond doubt that the achievements of agricultural improvement on a large scale was not practicable unless something was done to ameliorate the economic condition of the ryot, credit facilities like *thakkavi* loans were made available. But this amount was utilised by the ryot only to partly liquidate his previous debts and not for agricultural improvement. The ryot was not to be entirely blamed for this because the price of food grains and other agricultural commodities was too low to be anything appreciable. In order to obtain better returns for the ryots' produce this department organised Marketing Committees which have turned out creditable work with regard to commercial crops. Only when the prices of food grains and other agricultural commodities began to rise in 1943, thanks to the stoppage of the import of Burma rice due to the Second World War, the general public began to realise the food situation. The 'Press', which was silent hitherto on matters regarding agriculture, began to make hue and cry about the food situation and curiously enough forgot conveniently that the problem of food was closely related to agriculture. The procurement policy also marred the progress of agricultural extension. Neither the producer nor the consumer got the benefit out of it. The producer lost interest in furthering his production. These difficulties proved a blessing in disguise and opened the eyes of the Government. As a result food production got priority in the First Five Year Plan. Every attempt made to improve the living condition of the ryot is an attempt at the integration of research, education and propaganda in agriculture, as the individual and national economy rests only on agriculture and its improvement. It is imperative, therefore, that agriculture should have its right place in the national economy.

Integration - Future scope : By the general awakening and the rapid strides that have since been made in the extension side of agriculture, it cannot be claimed that the integration of the three aspects has been fully achieved. The several National Extension and Community Development Blocks have only helped in intensifying the agricultural propaganda and providing the ryot with all the requisites necessities. The sudden expansion in the propaganda side required a large number of qualified personnel and so the education side had to enlarge to meet the demand for large number of hands. But this has resulted in the deterioration of quality. The need for selection of the right type of young men and educate them well to efficiency in the field of agriculture requires no special emphasis. Agricultural education must comprise of all the subjects in which the common ryot is interested or is expected to take interest in the interest of the nation. This will in itself present several problems from the selection of suitable candidates to undergo the course, bearing in mind always the welfare of the entire nation, to the selection of teachers to impart the course. The agricultural student must be introduced to several branches of agricultural research and the extension features. Now-a-days the student takes up agriculture course after trying in vain to enter either medical or engineering college. The selection of particular course is not according to the natural aptitude of the candidate but by the incentive offered by the future prospects of pay. It is a plain fact that agriculture has been placed at the lowest rungs of the ladder in this respect, and naturally enough it is not possible to impart the energy, interest and enthusiasm in the agricultural graduate to the extent required. It is essential that only the best candidates are selected for the agricultural course. The improvement in agriculture requires to be always continuous. The results of the labours of the agriculturist end with the harvest of the crop. The crop is not always there as a building to gaze and admire. The memory is short in the public sector and only the hard and continuous effort of the extension worker can place agriculture on a better footing.

The agriculture extension worker has not been given the right place in the various developmental activities. He has been placed below the rank of those who are not appreciative of the needs of agriculture. It has been reported in the several evaluation reports and has also been felt by several outstanding persons that the development in the Blocks manned by the agricultural graduates are far superior to those operated by others. But, yet, Government is still hesitating to implement the recommendations regarding posting of agricultural graduates as Block Development Officers.

On the research aspect also things are not as bright as they should be. The availability of finance is one of the limiting factors to progress. Further, sufficient encouragement to research workers in the upkeep of their enthusiasm in the form of higher training or provision of equal opportunities to all to qualify themselves for higher degree - as degree are at present the only measuring rods for the competence or otherwise of a person - will go a long way in the furtherance of research. The agriculture course is only the preparation of a candidate for a general understanding of the subject and the progress in research or extension depends on the merit of the person and specialisation.

The extension worker at present has to face new problems during his work. The rise in the price of food grains has brought in its wake the trouble, in the pacifying of which the agriculture extension worker has no hand. Previously the propagandists had to approach only the cultivating land owner. Neither the absentee land owner nor the tenant had interest in the land. The agricultural labour had to bother about neither. Now, for the agricultural extension to be successful, the local conditions are to be taken into consideration. The labour also requires to be educated. For example, in the introduction of thin seed rate the cultivator actually got into trouble as no labour was available to pull out his seedlings. The seedlings were sturdy, with better root-development than in the thick sown nursery and so would not yield easily to the usual mode of pulling. The seedlings broke at the node badly and the labourers got disgusted with it and migrated to another holding, where they in demand. Similarly for all agricultural operations, as we have to be dependent upon the labour, the education of not only the cultivator but also the worker is essential. This can be accomplished quickly and successfully only if all the cultivators in a village co-operate. The agricultural extension worker must now probe into the field of organising co-operative cultivation. Co-operation should also be simple and devoid of all procedural complications. This field of improvement also should be brought under the purview of agricultural extension. This will help the extension worker to be in close contact with the cultivators in every sphere of activity from cultivation to processing and marketing.

For the integration to be effective there should be exchange of knowledge between the research worker and the cultivator, so that, based on the experience gained by the cultivators, the researcher can reorient his studies and cater better to the needs of the cultivator.

This is being done at present in the conduct of Departmental Officers' Conferences and celebration of Farmers' Days. For the exchange of knowledge to be more effective the services of extension workers and agriculturists in the lower ranks must be properly utilised, to be in tune with the modern democratic outlook. The cultivators themselves have risen up to the occasion by organising Farmers' Forum in the different parts of the country and they rightly demand improvement from the agricultural research workers. Even then, the picture is not so rosy as it has been painted. The public are still unaware of the achievements of the Agricultural Department, even though they may be enjoying the fruits of the labours of this Department. This is partly due to prejudice and partly ignorance of matters pertaining to agriculture. Even the 'Press' has not given the right place to agriculture, paradoxically in a country, where most of its population is engaged in agriculture. Therefore, the extension staff has a tough task to carry out in driving out the prejudice and ignorance from the public. To enable the agricultural workers to attain this the government may, with advantage, reshuffle its administrative machinery and place agriculturists at the helm of affairs. Then only progress can be rapid to solve the food problem in this country once for all. In order that integration of research, education and propaganda can be achieved effectively, agriculture should be given its due importance. The younger generation should be introduced to the technique of agriculture even from the commencement of education, namely in elementary schools.

Finally, for the development of agriculture, the finer aspects of life are not to be forgotten. The womenfolk, in whose hands only the produce of agriculture gets the final verdict, should be taken into confidence. The processing and preservation of food-stuffs should form an integral part of the Agricultural Department.

Conclusion : In short, the success in integration of all aspects of agricultural improvement cannot be claimed to have been achieved unless the administration in the entire country from top to bottom scintillates knowledge regarding agriculture.

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Integration of Agricultural Research Education and Propaganda

by K. SHIVARAMA SHETTY, B. Sc., L. C. S. B.

India is primarily a country of farmers, and the increasing of her agricultural production forms a keystone in the arch of India's plan for progress and prosperity. The increase in production can be secured only by harnessing modern science to aid and develop agricultural technique. But science before it could go to the help of the farmer has to set its own house in order in other words the effective functioning of its various branches such as research, education and propaganda is of vital importance to agriculture which plays such an important role in the economy of the country. Let us now try to examine this question in greater detail.

Nobody disputes the fact that Research, Education and Propaganda are kindred subjects closely linked to one another and cannot be isolated without detriment to the growth of each one of them. But how far the sphere of one should be allowed to get merged with that of the other is a matter on which opinions are likely to differ. The problem therefore is to devise a method of management which will ensure that best possible results are produced in each of these three spheres and are used to advantage in the other two. Here it becomes necessary to review the function of each one of these branches and the requisites for the satisfactory discharge of such functions.

To put it briefly research aims at new knowledge, whereas education and propaganda sections are concerned mostly with the dissemination of knowledge which is already available. Here again the knowledge that is imparted under education is much more complex and exhaustive than under propaganda and hence differs from it both in kind and degree. The object of propaganda is to present to the public facts which are of practical application in daily life; whereas under education it becomes necessary to impart relevant knowledge irrespective of the possibility of their immediate practical application. With all these differences, however, all the three aspects operate in an endless cycle with problems from the public coming to the research section for solution the research section grappling with the same and passing on the result for dissemination under education to students and under propaganda to the public, and fresh problems coming for solution and so on.

If however, it is attempted to combine the role of a research worker a lecturer and propagandist in one person the result can be any thing but gratifying. Such a person will not be able to achieve anything worthwhile in any of these fields, as the singleness of purpose which is the *sine qua non* for producing good results will be woefully wanting. The knowledge of such a person is likely to be superficial as he is not free to pursue one subject and get at the root of the problems, connected with it. Such superficial knowledge besides bringing no contributions to science cannot afford any satisfaction to the person concerned either.

I feel that of all the three items under review research especially is a jealous mistress, and demands undivided attention from her votaries, before yielding up any of her secrets. We will be only hampering the research work if we burden the research worker with teaching or propaganda which are full time jobs by themselves. It is also relevant to note here that the qualities expected of a research worker are not the same as those necessary to make a good teacher or propagandist. Rarely does one find a combination of all these qualities in one person. So it is essential to separate these functions, appoint suitable persons exclusively to handle each one of them separately so that they are not only able to do justice to the subjects but also develop their talents in the process.

This is not to deny or under estimate the necessity for co-ordinating the work in these three units. This co-ordination can be secured by the constitution of a liaison body consisting of representatives drawn from the three wings which could meet periodically exchange views and get the doubts if any resolved. The Head of the Institute or his deputy could head such a body. So it is suggested that in the first place steps should be taken to ensure selection of proper personnel to man the three sections. For example high academic qualifications and aptitude for research are required of a research worker, whereas teaching and propaganda warrant possession of different qualities. It is said that a good teacher is one who could make familiar things appear new and new things familiar. This in other words means that he must possess forceful and some times even novel methods of expression. Besides, this he should be sociable and have the ability to anticipate the students difficulties and the courtesy to help them. Of course the qualities set for the above are needed in addition to the basic academic qualifications. But persons not possessing the above qualities whatever be their scholastic attainments are likely to prove

misfits as teachers. But the role of the propagandist calls for display of still different qualities. His position is analogous to that of a salesman the only difference is that in the market place the salesman sells goods here the propagandist sells 'ideas'. In both cases however they must inspire confidence in the customers. The propagandist should besides possessing thorough knowledge of his 'ware' should not be lacking in self confidence.

The difficulty inherent in selecting suitable persons for the various jobs can be mitigated if it is properly timed. An overwhelming majority of the persons employed in these three branches are picked from the students passing out of college. They study in the college for a pretty long period spread over three years and during this period it will be easy to test them and assess their worth and aptitudes. The various qualities required of a research worker a teacher and propagandist have been discussed above. The students should be selected and grouped in the three classes above. The students should be selected and grouped in the three classes with reference to their suitability for each class of service. Number of vacancies available in each branch should also be taken into consideration in determining the strength of each group. Consistent with the above the students own wish can be accommodated as far as possible. The selection work which is to be done at the commencement of the final year can be entrusted to a high powered body consisting of the principal sectional heads and a representative of Government from outside the college. It is suggested that during the final six months or one year of the course specialised training is imported to the persons selected in their respective branches. This will have the effect of creating a bias in their mind in favour of the subjects they are to tackle later.

As at present, the students selected for B. Sc. Ag. course are to undergo a preprofessional course for one year at various centres. I am of the opinion that this could with advantage be merged with the college course which in consequence will get extended to four years. This will more than make good for shortening of the general course due to imparting of specialised training during the last six months or one year.

The implementation of these suggestions presupposes concerted action on the part of college authorities University and Government and it is hoped that these proposals will receive the attention they deserve at their hands.

PRESIDENT'S CONCLUDING REMARKS

Ladies and Gentlemen,

We have been hearing many interesting and thought-provoking papers on the subject matter of the Symposium, viz. "Integration of Agricultural Research, Education and Extension" from all aspects from eminent scientists and educationists assembled here. The subject has been analysed from all angles such as from the point of view of a research worker, agricultural chemist, plant pathologist, paddy specialist, tobacco grower, educationist, meteorologist etc. I congratulate everyone of them on the masterly way in which the subject has been treated from the particular aspect in which they have specialised.

I now give a brief synopsis of the different papers contributed to the Symposium.

- (1) There is multiplicity of agencies at work in Agricultural Research and in this there is bound to be wastage and much overlapping. A scheme should be evolved to harness the efforts of all scientific workers into an integrated system. The pattern of agricultural education should be changed constantly to the changing needs and circumstances.
- (2) The whole scheme should be reviewed from three aspects, viz. Fundamental, Experimental and Developmental and a liaison or the research coordination officer should be appointed for effective coordination of these three aspects.
- (3) Trained plant protection personnel should be increased.
- (4) A post graduate course should be started which will go a long way in attaining desired results in integration.
- (5) Regional councils with officials and non-officials should be organised for research and propaganda.
- (6) Small units of five or six men should be organised for extension work among the farmers.
- (7) Extension work should be done with two aims - one the immediate aim and the other the ultimate aim for desired results of an immediate or permanent nature.
- (8) A brief summary of Research, education and extension in American Colleges was given. Students who study in the Agriculture Colleges are sons of farmers.

I shall now devote some space to future work in our country on this important subject, certain aspects of which we have discussed to-day. The age that we live in is an age of Science and Technology

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(Abstracts of accepted papers)

and if we have to maintain our position among the great nations of the world, we have to keep abreast with them if not of them in our Scientific advance. What we have achieved so far is but a minute fraction of what we have yet to know. A large number of experiments have been carried out in different provinces on manurial, varietal and agronomic aspects of different crops and sufficient information has been gathered in these respects; but, despite this accumulation of knowledge only a few recommendations of the Agricultural Department have so far been adopted by the general body of cultivators. Speaking generally, the crops grow well in Government Farms but little improvement is visible even in the fields of cultivators adjoining these farms. The question of translating the results of research into general practice should engage our immediate attention. Whatever we achieve in the laboratory would only be worthwhile if it enables us to comprehend and interpret the phenomena in the field which again is but a step in our efforts to solve the many-sided problem of our beloved and hard-working peasants in their incessant toil to produce agricultural products for the country.

Gentlemen, in conclusion, I am deeply thankful for the signal honour that the Agricultural Department has done by asking me to preside over this Symposium. I felt a little diffident in taking up the leadership of the deliberation on this important subject at the Golden Jubilee gathering of top ranking scientists in the premier agricultural organisation of the country. I take it as an honour done to a student of Botany. Further I could always count upon your co-operation and help in the discharge of my duties here. These considerations have made me agree to your kind wishes.

I wish this Agricultural College and Research Institute - a great Centre of learning that has always been in the vanguard of both teaching and research in Agricultural Sciences during the past half - a century - a very bright future. The role of agricultural sciences in the present context of the development of our country needs no emphasis and in this, I wish this Institution and its workers all success in their future endeavours. I am sure the Government of Madras and the Agricultural Department will take up the valuable suggestions contained in the papers read at this Symposium in formulating a plan for the integration of Agricultural Education, Research and Extension in the country.

Thank you once again.

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Foliar Versus Soil Fertiliser Application in Crops

by

T. R. Narayanan, and Kumari Vinodini Vasudevan

The studies were started in 1954 on paddy to see how far the yield could be improved by supplying nutrients through sprays as compared to soil dressings. The results of the first ten experiments have been discussed in a previous paper (in the Fifth Scientific Workers' Conference in 1955). The present series of nine experiments were carried out at two centres, Coimbatore and Aduthurai and wherever possible the treatments were duplicated in pot cultures, as well as in the field. The various nutrient salts were supplied as sulphates, in two ways on soil dressings supplied one week before transplanting the paddy seedlings and the other as foliar sprays, one month after planting. These were superposed on a basal dose of 5,000 lb. green manure per acre. The nutrients tried included both macro and micro elements and also urea and superphosphate. In the spray treatments, the spray volumes were kept at 100 gallons per acre except in three trials, where 200 gallons per acre were used.

Visual differences were sometimes noticeable by way of a deeper green in the foliage especially with soil dressings. Temporary leaf scorch symptoms became visible when several salts were sprayed all together. No differences were noticeable in flowering or ripening earliness, nor were the results influenced by varietal or seasonal differences. In grain yields differences were more pronounced in pots than in field trials. Certain treatments did however show positive effects large enough to warrant further experimentation with them for confirmation, e. g. trace element salts applied to soil, and magnesium sulphate applied as soil dressing. In sprays too, urea and magnesium sulphate sprays showed some increase in yields, of the order of 6 and 3 per cent but superphosphate increased grain yield by as much as 14.4 per cent. Foliar sprays either of urea, or of micro nutrients if given more than once for paddy seemed to depress the yields more often than to increase them.

Straw yield responses follow the same trends but in a slightly larger measure than grain. Superphosphate as foliar spray has shown the best responses in straw weight also. The other promising treatments seem to be magnesium sulphate and/or urea applied to the soil.

The utility of magnesium sulphate is an interesting and new finding in these experiments, which is corroborated by the results of some Japanese workers. Foliar application of phosphates represents the most efficient method of fertiliser placement yet devised, because up to 95 per cent is utilised by the plant and the quantities (and thereby the cost) used are also very much less than the quantity necessary to produce the same increase by soil applications. It is therefore suggested that this line of work is well worth pursuing on a more comprehensive scale.

Studies on a Few Mutations in Rice Varieties Induced by Chemicals

by
Kumari M. V. Sukanya Bai, K. Rajagopalan and A. Abdul Samad

Germinating seeds of Co. 13 and GEB. 24 were subjected to the action of finely powdered acenaphthenes tied in a muslin cloth suspended in a test-tube for a few days. In another treatment the seeds were treated with the paste of acenaphthenes dissolved in lard. Higher doses of ceresan at 4 gms and 5 gms per pound of Co. 13 seed were used as against the normal prophylactic dose of 1 gm per pound of seed. The blooming spikelets of variety Co. 13 were exposed to benzene-vapour to different periods ranging from 30 seconds to two minutes. A few mutants were spotted out and were tested for their yield performance and attributes such as height, tillering and grain characters.

Fourteen promising cultures obtained from GEB. 24 treated with acenaphthene, were compared for yield in 1954-55 and 1955-56 seasons and all of them recorded higher yields than the parent strain with an increase ranging upto 51.5% during both the seasons. Most of the cultures were of same duration as GEB. 24, while a few of them were a week longer than the parent. The cultures were taller and had more number of productive tillers than the parent. In addition, these mutants showed higher ratios of length to breadth indicating thereby the grains are finer than GEB. 24. A mutant of Co. 13 treated with acenaphthene which has been advanced to trial in the districts has given 3.1% and 5.9% increased yield over Co. 13 and Co. 22 respectively in Salem Dist. It was longer than Co. 13 by 10 days.

Out of six cultures obtained by treatment of Co. 13 with ceresan compared for yield, the performance of four were found to be encouraging the increase in yield being up to 58.6% during 1953-54 over Co. 13. The mutants were 2-5 days longer than Co. 13.

The higher yield in the mutants is found contributed by the yield-attributes such as more productive tillers per plant, more number of grains per ear and greater weight of 1000 grains. The grains of mutants from GEB. 24 treated with acenaphthene, in addition, are found to be finer than GEB. 24, which is a desirable attribute. The yielding capacity of some of them showed certain degree of deterioration. It has been programmed to determine the cause of deterioration.

Seedborne Fungi and Sorghum Seed Viability

by
D. V. Govindaswamy, K. Ramakrishnan,
T. K. Kandaswamy and A. Venkata Rao

This paper summarises results of a study of seed-borne fungi of sorghum in this state and their role in reducing the viability of seed. Fourteen samples of eleven strains of sorghum (Co. 1, Co. 11, Co. 12, Co. 19, TPT. 1, K. 1, K. 2, K. 3, Seneholam, Manjal Cholan and Vellai Cholan) received from regional Millets Stations, Coimbatore, Tirupathur, Kovilpatti, Palur and Ariyalur were examined. The fungi associated with the seed were the saprophytic moulds *Aspergillus niger*, *Rhizopus nigricans*, *Curvularia lunata*, two well-known pathogens of sorghum, *Macrophomina phaseoli*, *Fusarium moniliforme* and two other fungi *Helminthosporium* sp and *Pellicularia filamentosa*. The last is a well

known damping off fungus. *Aspergillus niger*, *Rhizopus nigricans* and *Fusarium moniliforme* were more frequently associated with the seeds than the others. Deterioration of seed viability was studied by using Co. 12 sorghum seed. Surface sterilised seed lots were treated with heavy spore suspension individually with each of the fungi *Aspergillus niger*, *Rhizopus nigricans*, *Curvularia lunata*, *Fusarium moniliforme* and *Helminthosporium* sp and an untreated control was left for comparison. The seeds were stored in dessicators maintained at 55, 65, 75, 85 and 95% humidity levels for five months from November 1956 to April 1957. Samples were drawn at the end of each month and the viability of the seeds were tested in germination trays and in soil in pots simultaneously. There was no appreciable fall in the viability of seeds up to five months in 75% and lower humidity levels in the fungi treated lots and the untreated control. A steep fall in germination was, however, noticed at 95% humidity level from the 4th month onwards while at 95% humidity level the viability was markedly reduced at the end of the second month itself. In the fungi treated series kept at 85% and 95% humidity levels the viability was almost completely lost at the end of the 4th month while in the untreated control there was still about 25% viability at the end of this period. The results of this study seem to indicate that the primary cause of seed deterioration in storage is high moisture. Seedborne fungi may hasten this process at high levels of humidity.

It was observed that the germination in soil was less by about 20 to 30% as compared to that in germination trays in all the humidity levels. This probably indicates that at lower levels even though moulds and moisture do not cause death of the embryo, they cause reduction in vigour and the weakened plumule is probably unable to push itself out of the soil.

Studies on Training and Pruning of Anab-E-Shahi Grape

by
U. Narasinga Rao and S. Muthuswami

Anab-E-Shahi is a recently introduced variety of grapes. Studies were undertaken at the College Orchard, Coimbatore from 1953 on the growth and fruiting habits of this variety so as to evolve a suitable training and pruning method. Single stake, bilateral and pandal systems in training and cutting back canes to two, three four and five buds were the treatments employed for the study.

In a comparative study of the three training systems, pandal system was found to promote the largest number of canes per vine, viz., 35.3 as against 5.1 and 16.6 in single stake and cordon systems. From the point of view of production capacity in terms of unit area occupied by vines, it was found that the single stake system offered the best means for increasing the cropping potential. On an acre basis in this system, the new shoots produced in an acre of vineyard was estimated as 70 times more than in pandal trained vines.

In the study on the effect of the different pruning treatments, two-bud canes proved less fruitful than four-bud canes. The number of new shoots produced per cane was also less in the former. The largest percentage of four-bud canes produced more than two shoots with a mean of 2.4 shoots per cane as against 1.6 only in two bud pruning. About 39 percent of four bud canes were fruitful against 21 percent only in two-bud canes.

The Anab-E-Shahi is very a vigorous variety, a vine covering an area of 370 square feet of pandal within a year. Although the pandal system offers full scope for growth expression, it involves a huge outlay in initial establishment of a vineyard. From the point of view of production capacity on an acre basis, the single-stake system is far superior to the former, with the added virtue of allowing a greater number of vines per acre, and of the considerable ease in handling the vines. It has been estimated that from an acre, vines trained to this system would yield 4491 bunches against 608 in pandal system. It would be seen that for a vigorous but moderate cropping variety such as Anab-E-Shahi, the single stake system would prove to be ultimately more profitable to adopt. The variety has been found to be fruitful on lower buds but long spurs are found desirable not only to increase yields but also to promote vegetative growth to form fruiting wood for subsequent years. Cutting hard back to very short spurs does not induce greater vegetative growth. In fact, in two-bud canes the production of new laterals is less than in four-bud canes. Thus the practice adopted with this variety in its native home of Hyderabad, viz., of cutting back to the foundation buds in summer to promote greater production of fruiting wood for the next season, does not appear justified under Coimbatore conditions whereas pruning in this manner has resulted in low production of laterals. On all considerations, four-bud pruning appears to be the best for this variety not only for optimum crop production but also for a greater production of laterals to ensure optimum fruiting wood for the subsequent seasons.

Iron Chelates in the Nutrition of Paddy

by

A. Mariakulandai and T. Seshagiri-Rao

This paper gives an account of a green house experiment on the response of paddy to an iron supply chelate — Versenol (R) iron chelate containing 9 percent iron as Fe.

Paddy varieties GEB. 24 and Co. 25 were grown in glazed pots with ten treatments. The treatments included three levels of chelate, viz., 1 gm., 2 and 3 gm. per pot, with and without N and P fertilisers. Measurements of height, tillers etc., were recorded periodically. Yields of grain and straw were also recorded for both the varieties and the plant materials were analysed for major nutrients and also iron.

The growth was satisfactory at 1 gm. level with N and P but at the higher levels of chelate, the growth was poor with and without N and fertilisers, and at the highest levels was even poorer than the control. The progressively lower yields at the higher doses of chelate is in consonance with the stunted growth. Co. 25 has recorded higher yields in all the treatments. It is also seen that with increasing dose of chelate the uptake of N is increased as shown by the analyses of grain and straw. As regards the effect of iron on the uptake of P, an inverse relationship was noticed in GEB. 24 in treatments receiving chelates only. On the other treatments and in the case of Co. 25 no adverse effect is noticed. The inverse relationship between the intake of iron and K is more conspicuous and striking in both the varieties with the exception of treatments N plus P plus Chelate in Co. 25. The results are discussed fully in the paper to bring out the probable role of chelates in the nutrition of the rice plant.

Hybridisation and its Scope for Improvements in Bananas

by

J. S. Sundararaj, K. M. Padmanabhan Nambisan and M. C. Appaiyan

In bananas the possibility to bring in the desirable qualities which are diversified in many varieties, is confronted with many obstacles, as edible bananas are vegetatively parthenocarpic and effectively seed-sterile. The breeders only hope is to exploit the partial female sterility met with in the horticultural varieties. Before setting out on any comprehensive breeding programme, it was felt necessary to assess the range of female fertility and the compatibility of the different cultivated varieties to *Musa acuminata*, *Musa banksii*, *Musa balbisiana* including its clones and *Musa chiloearpa*. The desirable economic characters of the wild species are enumerated. Among the cultivated varieties the following varieties which are important either economically or from a breeding point of view were selected for the study: Poovan, Rasthali, Monthan, Pey Kunnan, Venneettin Mannan, Thote, Raja Vazhai.

The variety Poovan showed a definite specificity towards *Musa acuminata*, its wild progenitor, as male parent. In the variety Rasthali, though it gave a few seeds with *Musa balbisiana*, germination was a total failure. It showed definite incompatibility with *Musa coccinea* and *Musa chiloearpa*. Monthan for some unknown reasons is incompatible with its wild progenitor, *Musa balbisiana* but could be successfully crossed with *Musa coccinea*. On the other hand, the varieties Pey Kunnan, Venneettin Mannan, Thote, and Raja Vazhai, which have a *balbisiana* origin, were highly female fertile with appreciable seed-setting and germination. Further they were found to be compatible with such unrelated species as *Musa coccinea* and *Musa chiloearpa*. The results obtained indicate that inter-specific hybridization is not beyond possibility in the genus *Musa*.

Effect of 2, 4-D on Soil Micro Organisms

by

K. S. Nair, K. M. Krishna Menon and A. Mariakulandai

The object of the present study was to find out the effect of the application of the sodium salt of 2, 4-D on the soil microbial population. Trials were conducted in plots in cultivated dryland, cultivated garden-land and uncultivated blacksoil with two treatments viz., (1) control (no spray) and (2) spray of 2, 4-D at 5 lb. per acre. Soil samples collected at varying periods up to 120 days since spraying were analysed for total bacterial population, carbondioxide evolution, and the major physiological groups of soil bacteria.

The analysis of the data reveal that the total bacterial population is not significantly affected due to spraying during the first 15 days. A marked rise in numbers is found from 15 to 30 days, increase being significantly higher than the control. This rise, in response to the application of 2, 4-D, is attributed to the development of a bacterial flora, capable of utilising the compound for its growth. The effect of 2, 4-D persists up to 45 days and thereafter no important effect is noticed, which may be due to the almost complete breakdown of the 2, 4-D in the soils, by that period. The amount of carbondioxide evolved from the soils followed a similar trend as in the case of the total bacterial counts.

Favourable effect on the growth of *Azotobacter* was also indicated, on the average for the entire period, a significant increase of 219 *Azotobacter* cells per gram of soil was obtained by spraying 2, 4-D. 2, 4-D suppressed the growth of denitrifying and nitrate reducing bacteria. Cellulose decomposing bacteria remained unaffected throughout the entire period, by the application of 2, 4-D.

Crop Response and Correlation of Growth Characters with Yield in the Japanese Method of Rice Cultivation

by
M. K. Venkatasubramaniam and T. A. Govinda Iyer

Increased yields have been obtained by adopting the Japanese method of paddy cultivation as advocated by Korakendra although such increases are often found less profitable than the local method. An experiment to compare the Japanese method of rice cultivation with the farm method was conducted at the Rice Research Station, Tirurkuppam for three years from 1954 in the Sornavari, Samba and Navarai seasons using two strains for each season. An attempt has been made to determine the extent of crop response to the Japanese method and to correlate the growth factors with the yield.

The cultivation routine and cultural operations adopted for the two methods are as given below:

JAPANESE METHOD:

Nursery: Seed rate: $1\frac{1}{2}$ lb. per cent of nursery. Manuring: 40 cart loads of Farm yard manure plus 2000 lb. ash plus 2000 lb. compost per acre one week before sowing a mixture of ammonium sulphate and superphosphate in equal proportions at the rate of 2 lb. for every pound of seed at the time of sowing as well as 20 days after sowing. **Transplant field.** Manuring: 20 cart loads of Farm yard manure plus 30 lb. P_2O_5 as superphosphate per acre before planting. Another dose of 30 lb. N and 30 lb. P_2O_5 after planting in two split doses. Spacing: $10'' \times 6''$ in Sornavari and Navarai and $10'' \times 10''$ in Samba with 4 seedlings per hole.

FARM METHOD:

Nursery: Seed rate: 3 lb. per cent of nursery. Manure: 10,000 lb. green leaf per acre. **Transplant field.** Manure: 5000 lb. green leaf plus $30 P_2O_5$ as ammonium sulphate after planting in one dose. Spacing: $4'' \times 4''$ bulk planting for Sornavari and Navarai and $6'' \times 6''$ bulk planting for Samba. 2 seedlings per hole.

The statistical analysis of grain yield data obtained for the three years indicated the following:

(a) Significant increases in yields were obtained in all the three seasons by adopting the Japanese method. (b) The varieties TKM. 5 and Co. 18 used in the Navarai season alone indicated a difference, Co. 18 yielding about 120 lb. per acre more than TKM. 5. (c) The methods of cultivation did not reveal any interaction effects with either the varieties or the seasons.

Values of correlation co-efficients were worked out and examined with the following conclusions:

(a) All the three yield components showed strong positive association with yield. Tillers and length of earhead influenced yield in Sornavari and Samba, while only the number of grains influenced yield in the Navarai season. Strong positive association was also obtained in all pairs of the yield components except in pairs grain numbers and tillers and grain numbers and length of tillers in the Navarai season. (b) It has been concluded from the above that increases in tillers and length of earhead increase grain yield only when such increases are closely followed by similar increases in the grain numbers.

A Note on the Breeding Trials for the Improvement of Rainfed American Cotton in Madras State

by
L. Neelakantan, V. Santhanam and R. S. Annappan

About fifty years ago when American Cotton was first introduced in the State it was generally considered suitable for cultivation only under irrigated conditions. But the high potentialities for yield observed in the variety which gained currency under the popular name of Cambodia, deriving this name from the place of import in Indo-China, gave a fillip to its spontaneous extension in the central districts of the State. In course of time Cambodia cotton gradually found its way into the red and mixed soils receiving early rains in North East Monsoon as a rainfed crop also. Today nearly fifty percent of the Cambodia area is under unirrigated conditions. A separate breeding scheme for improving the yield and quality of this variety has been functioning at Periakulam (Madurai Dist.) since 1950. A brief review of the performance of a few promising cultures in the advanced stages of breeding during the period 1954-57 has been presented in this note. All the cultures surpassed the stipulated objectives of the scheme in lint yield and fibre length while promising indications have been obtained in the matter of spinning value also. Strain 9030 G. recently obtained from the Winter Cambodia Scheme is found to be better than 9030-8-5 which had been promising in the earlier trials under the unirrigated Cambodia Scheme at Periakulam. As the former strain has been found promising in the irrigated Winter Cambodia zone, the possibility of unifying the entire Cambodia tract irrigated and unirrigated under one strain is proposed to be investigated.

Some New Hybrids in Grain Sorghums

by
Dr. N. Krishnaswamy, V. S. Raman and P. Chandrasekaran

Though *S. halepense* (Johnson grass) was originally considered to be the ancestor of the cultivated sorghums, Snowden considered it very improbable since this species possesses rhizomes and is 40-chromosomed. Since this is perennial, rhizomatous and tolerably drought resistant it has been hybridised by several workers in America with the grain sorghums ($2n=20$) as well as with Sudan grass for producing perennial grain as well as suitable fodder types. To overcome the disadvantages of numerical differences in chromosome number between the parents, Johnson grass ($2n=40$) and Sudan grass ($2n=20$), the chromosomes of the latter have been doubled and hybrids obtained. Since then,

occurrence and distribution of 20-chromosomed forms of *S. halepense* also, has been recorded in the hills of South India and these along with the 40 chromosomed forms have been used, in this Institute, with the twin objectives of: (i) knowing exactly the inter-relationship of the Johnson grass (20 & 40 forms) and the cultivated sorghums, and (ii) obtaining perennial and drought resistant forms of sorghum for grain as well as fodder. The tetraploid *Sudanense* obtained from America has also been used for hybridisation to secure ideal fodder types.

For improvement of 40-chromosomed *S. halepense* derivatives, certain male-sterile sorghums ($2n=20$), (asynaptic), capable of producing viable diploid female gametes ($n=20$) have been used as mother parent for hybridisation. On two successive back-crossing, the characters of the cultivated sorghums are exaggerated and it has been found possible to evolve a perennial, tillering, and drought resistant sorghum type very similar to the grain and panicle characters of the grain sorghums. On the diploid level, the hybridisation of the 20-chromosomed Johnson grass with the cultivated sorghum has been found easy. Further back-crosses of this primary hybrid with selected short duration grain, and fodder sorghums have been done. Here also the selection of perennial drought resistant juicy sorghums with less of HCN content both for grain and fodder has been found possible.

Comparatively low frequency of quadrivalent formation in derivatives of Johnson grass x cultivated sorghum back-cross progenies lead us to assume that *S. halepense* ($2N=40$) being an auto-allopolyploid. This coupled with the high seed fertility in the offsprings suggest that *S. halepense* is genomically closely related to the cultivated grain sorghums and the difficulty in hybridisation is only that of numerical difference and also possibly, by the barrier created by the shift in time of anthesis. It is therefore clear that the 20 chromosomed *S. halepense* also is probably an ancestor to the grain and grass sorghums. From the data presented in the paper it will be seen that the ideal of a fodder type combining the characteristics of *S. halepense* and *S. sudanense* with the grain sorghums has been achieved here in diverse directions.

Some Experiments on the Control of Cotton Jassids

Empoasca devastans D.

by
T. Santhanarathan

Among the two dozen species of insects, attacking irrigated cotton *Empoasca devastans* Distant is economically most important. A brief account of the life history and habits of the pest, symptoms of damage and on the findings more systematic and detailed investigations were taken up from 1952 in Madras State and tangible progress has been achieved.

At Coimbatore from 1952, a number of synthetic chemicals such as DDT, Folidol, HETP, Pestox 3 H, Systox, Toxaphene both as spray and dust and Endrin 19.5% emulsifiable concentrate were tested in observational plots and under replicated and randomised block conditions. The chemicals were applied at different soluble concentrations once and twice on separate sets of plots. Counts of insect population were recorded from a known number of leaves at periodical intervals with reference to each plot and treatment. Data on the yield were also recorded for the plots receiving different treatments. The data obtained were analysed

statistically. Of the various chemicals tried, Systox 0.05%, Folidol 0.025% and Endrin 1 oz. in 12½ gallons of water sprayed twice proved to be the best. Treatments are to be given when the incidence of the pest is noted to a moderate extent in the fields. The chemicals not only reduced infestation but also indicated increased yields.

The cost for two rounds of treatments, inclusive of labour charges, with Systox 0.05%, Folidol 0.025% and Endrin 1 oz. in 12½ gallons of water works out to Rs. 50, Rs. 30/- and Rs. 11-6-0 respectively. On the whole considering increased yields and low infestation of Jassids, Systox spray twice is the best, followed by Folidol and Endrin sprays twice. Though the cost for Endrin treatment is comparatively less than the other two chemicals, increased yields obtained with the latter will compensate for the higher cost of treatment involved with the two chemicals viz., Folidol and Systox.

A Preliminary Study on the Manuring of Castor with Artificial Fertilizers

by
M. Bhavanishanker Rao, P. Krishnaswamy, K. Thandavarayan,
M. Ramachandran and K. Navakodi

The castor crop, which is becoming more and more industrially important, is now raised in this State without any proper manuring. There is meagre information on the response of this crop to application of fertilisers, either in this country or abroad. Sporadic experiments conducted in America, Ceylon and in some states of India did not give any consistent results.

An experiment was conducted at the Agricultural Research Station, Thindivanam to study the effect of application of fertilizers N, P, K singly and in combination among themselves. The dosages were, ammonium sulphate to supply 30 lb. N, super phosphate to supply 20 lb. P₂O₅, and potassium sulphate to supply 30 lb. K₂O per acre. The fertilizers are applied over a basal dressing of 2½ tons of cattle manure per acre. The strain TMV. 2, was raised in the plots and the experiments were conducted for 3 years. Quantitative data on the height of main stem, number of capsules per spike, number of spikes per plant, etc. were collected for all the three years of trial. There was an indication that the plants in all the fertilizer applied plots were tall and robust. The length of the spike was also appreciably greater in the fertilizer applied plots, the longest being in the treatment N. The total number of spikes per plant was more in the manured especially in those applied with nitrogen.

The yield data obtained in the three years were statistically analysed and the differences were significant. Considering the average performance for the three years, it is seen that the treatments NK, NP and NPK have given significant increases in yield over the control. The average percentages of increase in case of these treatments are 59.3, 56.4 and 46.5 respectively. Qualitative studies carried out on the produce from the different manurial treatments did not reveal any marked effect on quality due to the application of fertilizers. The residual effect of fertilizers was also studied. It was proved that there was a great decline in yield due to continuous cropping but the influence of fertilizer especially NP, NPK, NK and N was evident. It was found that an additional income of Rs. 7/-, and Rs. 5/- was obtained in case of the treatments NP and NK, as compared to the control.

Presence of Root Promoting Hormone in Seeds of a Non-dormant Bench Variety of Groundnut (TMV. 2)

by
S. S. Nagarajan and S. Gopalakrishnan

The authors found that the extract of TMV. 2 seeds had a hormonal effect in inducing root development in a spreading variety of groundnut (TMV. 3). The seeds of TMV. 3 were soaked in TMV. 2 extract and germinated in sand. After germination the young seedlings showed profuse root formation from the adaxial as well as abaxial sides of the cotyledonary stalks suggesting that the extract had the property of root promoting hormones. Trials were conducted to find out the time of hormone production, the method of extraction, and the hormone content with respect to age of seed. The extract of ungerminated seeds, germinating seeds and embryos gave 10, 60 and 10 and 6, 32 and 5 as percentages of TMV. 3 seedlings showing adventitious root formation in the cold and hot water extracts respectively. But the extracts of crushed seeds, cotyledons or testa either in the cold (28°C) or hot water (100°C) did not induce root formation. The percentages in the case of 6 months, 1 year and 2 years old seeds were 60, 35 and 32 respectively.

Studies have indicated that: (1) there is a pronounced root inducing effect when aqueous extract of germinating seeds is used as against ungerminated seeds. (2) the hormone is present more in the embryos and not perceptible in other zones of the seed. (3) the older the seed the less the hormonal content or effect. (4) Cold water extraction at 28°C is preferable to hot water at 100°C which tends to destroy the efficacy of the root inducing substance.

Influence of Rainfall and Climate on Rice Crop in Cavery Delta

by
C. Balasubramaniam and M. V. Jayaraman

Data collected for a period of 26 years for rainfall pattern and 18 years for temperature changes have been considered in this paper. The main findings are given below:—

(i) In the case of *Kuruvai* crop if the seedlings are aged at the time of planting, grain yield is invariably low. (ii) The duration of the *Thaladi* crop is less than that of the *Samba* crop, though the same strain played by the meteorological environments during crop growth. (iii) Though both *Samba* and *Thaladi* are long duration crops, the influence of the pattern of rainfall during their respective growth phases is of different nature. (iv) Generally heavy rains at the time of boot stage and flowering period of the *Samba* crop, lower the grain yield of the crop. (v) Only the *Kuruvai* crop has an inherent tendency to fluctuate in yield with a cycle of three years whereas the other two crops have no such inherent quality. (vi) Generally the *Kuruvai* crop sown *Samba* and *Thaladi* crops get serious incidence of pests and disease. If the rains during the North-east monsoon period are meagre, the *Samba* and *Thaladi* crops get severe infestation of Steam Borer and Soorai. When they are heavy and continuous, the grain yield of the *Samba* crop particularly is low.

Weather Review — For November, 1957

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January 1957
North	Madras (Meenambakkam)	10.7	- 3.2	38.0
	Tirurkuppam*	9.9	+ 4.9	38.9
	Vellare*	6.6	- 1.1	35.7
	Gudiyatham*	5.7	+ 3.2	34.7
East Coast	Palur*	7.1	- 0.3	32.8
	Tindivanam*	6.7	+ 2.0	35.2
	Cuddalore	11.8	- 2.7	41.2
	Nagapattinam	15.6	- 1.9	49.1
	Aduthurai*	8.8	+ 1.7	39.7
	Pattukottai*	9.8	+ 3.4	31.2
Central	Salem	3.0	- 0.8	23.7
	Coimbatore (An. M. O.)*	16.1	+ 11.4	34.8
	Coimbatore	14.6	+ 10.6	28.1
	Tiruchirapalli	5.1	- 1.9	25.7
South	Madurai	5.4	- 0.3	29.1
	Pamban	20.0	+ 8.3	28.1
	Koillattur*	8.5	+ 3.1	25.2
	Palayamkottai*	8.5	+ 1.1	26.3
	Ambasamudram*	8.7	+ 0.4	22.9
	Nagarcoil*	9.7	+ 3.1	46.3
Hills	Kodaikanal	10.2	Nil	82.1
	Coonoor*	21.1	+ 10.6	82.1
	Ootacamund*	9.2	+ 5.8	63.3
	Nanjangad*	7.0	+ 3.4	65.3

Note:— 1. * Meteorological Stations of the Madras Agricultural Department.

The North East monsoon continued to be active in Madras State throughout the month of November, 1957. A fresh easterly wave that entered in Southeast Bay of Bengal on 1—11—'57, was laying off the east coast of Ceylon on 2—11—'57, when a low pressure wave was moving west-wards across the Comorin, and rains or thundershowers were local in Madras State during the first three days of the month. Under the influence of a depression over the southwest Bay of Bengal which moved northwestwards and passed island as a low pressure area south of Madras, the monsoon had been active in the districts of Chengleput and adjoining Andhra Pradesh on 4—11—'57, when rains or thundershowers were widespread in north Madras, while local in South Tamilnad. Due to the filling up of the low pressure area over the northeast districts of Madras State, the prevalence of markedly unsettled weather in southeast Arabian Sea, and the movement of the depression northwards entering the east Central Arabian Sea on successive days, fairly widespread rains or thundershowers occurred for four days from 5—11—'57. As the depression got deepened on 9—11—'57 and intensified into a cyclonic storm, probably severe with a core of hurricane winds on 10—11—'57, rains or thundershowers were localised in south Tamilnad for two days from 9—11—'57. The depression moved to east Central Arabian Sea, got weakened into a storm of moderate intensity and later into a shallow depression and was laying as a shallow

elongated trough over east central and adjoining south Arabian Sea. Its influence was felt in Madras State as fairly widespread rains or thundershowers for four days from 11—11—'57.

An easterly wave that was moving across Comorin and Maldives area brought in showers at a few places in Madras State on 15—11—'57. As it became unimportant on the succeeding day, only isolated showers were received in south Madras while weather was dry elsewhere for two days from 16—11—'57. A feeble easterly wave while moving across the Comorin area gave isolated showers at Pamban on 18—11—'57, but as it moved away on the next day, mainly dry weather prevailed throughout the State on 19—11—'57. Another fresh easterly wave that was laying over the southwest Bay of Bengal to the east of Ceylon on 19—11—'57 moved into Comorin and merged into the seasonal trough on 21—11—'57. Rains or thundershowers occurred at a few places in coastal and south Madras on 20—11—'57, and were localised throughout Tamilnad on 21—11—'57. Scattered rains were received on 22—11—'57 and the weather was mainly dry on 23—11—'57. Rains or thunderstorms were local for four days from 24—11—'57. Showers occurred at a number of places in Coastal Madras on 25—11—'57, whereas weather was mainly dry elsewhere in the region. Localised and scattered showers were received in south Madras on 29—11—'57 and 30—11—'57 respectively, while the weather was mainly dry elsewhere in the region.

Rainfall: The noteworthy rainfalls and the zonal rainfall for the month are furnished below:

Noteworthy Rainfalls for the month

S. No.	Date	Name of place	Rainfall in inches
1.	4—11—1957	Tirurkuppam	5.16
2.	5—11—1957	Coimbatore (A. M. O.)	3.56
3.	do	Madras	3.87
4.	do	Ootacamund	3.12
5.	6—11—1957	Pamban	3.44
6.	7—11—1957	Kolipatti	4.54
7.	8—11—1957	Coonoor	4.70

Zonal Rainfall for the month (in inches)

Name of Zone	Rainfall for the month	Departure from normal	Remarks.
North	8.2	+1.0	Just above normal
East Coast	10.0	+0.2	Just normal
Central	9.7	+4.8	Above normal
South	10.1	+2.6	do
Hills	11.9	+5.0	do

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore.
9—12—1957.

C. B. M., & M. S. D.

THE MADRAS AGRICULTURAL JOURNAL

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The pages of the Madras Agricultural Journal shall be open ordinarily only to the members of the Madras Agricultural Union.

All articles for publication should be addressed to the Editor, Madras Agricultural Journal, Lawley Road P. O., Coimbatore.

In view of the high cost of printing, contributions should be as concise as possible and should conform to the best usage in the leading Journals published in India and abroad.

Manuscripts should be typed with double spacing on one side of the paper only and with wide margin. They should not ordinarily exceed 5,000 words or 12 pages of printed matter including tables and illustrations in the Journal. Manuscripts should be carefully revised; numerical data and calculation checked. Main headings in the text should be typed in capitals with paragraph indentations and followed by a period and two hyphens. Sub-heads should be lower case and underlined to indicate italics. Latin nomenclature and local terms etc., should be in italics. Original papers must conclude with a summary of not more than 300 words, drawing attention to the main facts and conclusions.

Tables: The number of tables should be restricted to those absolutely necessary, as numerous tables detract from the readability of the article. Each table should be numbered consecutively from 1 up and must have a heading stating its contents clearly and concisely. The tables are to be typed on separate sheets with their positions marked in the text.

Illustrations: Wherever possible illustrations should be made with pen and Indian ink for reproduction as line blocks. The name of the author, title of the article and figure number should be written on the back of each figure in blacklead pencil. Each figure should have a legend typed on a separate sheet.

Photographs: Photographs and wash drawings are more expensive as half-tone blocks are necessary. The cost of blocks is chargeable to the author of the article. Photographs submitted as illustrations should be unmounted, glossy prints of good quality, with strong contrasts, trimmed so as to include only the essential features to be illustrated. They should preferably be of the same size as desired in the printed paper. Photographs should always be packed flat, never rolled or folded.

Line drawings: Line drawings, and charts should be prepared in twice the scale desired in the printed form. All letterings, figure numbers and explanatory notes in graphs should be light face and large enough to be 1/16" high in the finished illustrations.

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References: References and reviews of literature should relate only to closely pertinent papers. The list of references should come at the end of the article, after the summary and should be arranged in alphabetical order of authors' names followed by the year of publication in brackets, and then the title of the paper, name of periodical, volume number in bold face type and then the page number, e. g. Darlington C. D., (1944) Heredity, development and infection Nature, 154: 164-9. Abbreviations for names of journals are to be in the approved form as given in the World List of Periodicals.

The responsibility for statements, whether of fact or opinion, rests entirely with the author of the article and not with the Editorial Board of the Madras Agricultural Journal.

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