

# Organization and Application of Agricultural Research and Education

Ind. Agr. Res. Inst. <sup>by</sup> M. S. Swaminathan <sup>New Delhi</sup>

Introduction: These are days when agricultural research development has become a ~~fascia~~ fashionable topic for discussion. It is repeatedly emphasised that only the introduction of science into our agriculture can help to break the yield dilemma, i.e., the static nature of the per-acre ~~productivity~~ <sup>yield</sup> of ~~the~~ <sup>our</sup> major cereals, millets and pulses. However, a comparison of the quantum of financial support extended to agricultural research in relation to other scientific

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activities indicates where the priorities ~~real~~ really are (Fig. 1). The situation in a country like Australia where agriculture ~~is~~ has been developed into a ~~really regarded as the~~ primary industry is revealing (Fig. 2).

~~So~~ There is no distinction between "applied research" and "ivory-tower research", if administrative arrangements for exploiting the fruits of

research do not exist. I shall  
therefore confine myself in this  
article to ~~dealing with~~ <sup>some</sup> aspects  
~~of~~ <sup>of</sup> some possible approaches  
~~towards~~ for increasing  
the technical competence of  
the field extension staff and  
~~and for~~ <sup>new</sup> agricultural  
graduates and for bringing  
about at the administrative  
level a close integration  
of research, extension and  
training. Uncoordinated

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Activity is known to be the primary weakness of our developmental effort. Avoidable Hence, earnestness in achievement should be reflected in ~~rendering~~ in bringing about a confluence of activities now proceeding on parallel lines.

# Organization and Application of

INCREASING THE EFFECTIVENESS OF AGRICULTURAL  
EXTENSION

Agricultural Research

and Education

By

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Extension:

Agricultural extension has three major roles - supply

of the inputs indicated by research as necessary for a desired output, transfer of knowledge relating to the maximization of the effectiveness of the inputs applied, and a feed-back channel for information from the farmer to the scientist so as to ensure research on the factors limiting yields. If a good extension machinery exists, the time-gap between discovery and application will be reduced and at the same time research workers will be kept busy finding answers to problems of immediate relevance to the farming community. Research and extension have, therefore, a symbiotic relationship and if this symbiosis is fostered through adequate administrative, political and financial support, a continuous rise in the economic yield per unit area can be achieved without detriment to the long term productivity of the soil.

Recent research strategy aims <sup>at exploiting</sup> to ~~exploit~~ fully the favourable features of our agricultural situation, namely the existence of abundant sunlight and fairly extensive water resources. The possibility of having green plants converting solar into chemical energy during most parts of the year is an unique asset of sub-tropical and tropical agriculture. The development and release of high yielding varieties in the major cereals and millets have enabled a farmer with a holding of only 3 to 4 acres to derive a net income of over Rs. 3,000/- per year. Such high yield and income possibilities have provided the motivation necessary for the farmer to take to a whole set of new cropping patterns and practices, an

outcome

Contd.....2/-

outcome ~~of~~ which could not be achieved all these years in spite of plans and propaganda.

Dwarf varieties of wheat or rice or hybrids of maize, Jowar, baira are high yielding only if certain fundamental changes in age-old agronomic practices are made. Thus, the time of the first irrigation may make as much as 1 tonne per hectare difference in yield, given the same fertilizer dose and total number of irrigations. The depth of transplanting makes a similar difference in rice. Therefore, the extension agency assumes great significance for ensuring the maximum return to the farmer from his investment on inputs and to the country the maximum production from the existing fertilizer and water resources.

We have a very wide extension net-work in the country. As in every other field of human endeavour, any striking impact of the extension agency, such as the excellent work done in Tanjore and Ludhiana IADP Districts, can be traced to an outstanding individual extension leader. The field extension staff, by and large, have been unable to win the respect of farmers, because of their poor technical and practical knowledge. They have, therefore, relied heavily on their control over input supply to invite visits from farmers. The lack of a living contact with plants and an understanding of the factors limiting crop yields in the farmers' fields have rendered the extension staff practically useless from the point of view of transmitting to the scientist problems requiring investigation. Also, many of the present-day extension officers have worked at some time as research men and they hence tend to forget the fact that it is the duty of extension workers not to function as substitutes for research workers and vice versa.

Magnitude of the problem of information-transfer

While the number of farmers to be contacted is very large, the number of gifted and well-informed extension workers is few. Progress in scientific methods of destroying yield barriers and manipulating yield and quality is, on the other hand, very rapid. The price of most of the inputs is among the highest in the world and the availability is low. Therefore, the need for increasing as speedily as possible the technical competence of the field extension staff, so that knowledge concerning the qualitative aspects of input use can be rapidly spread is obvious. Because of the magnitude and urgency of the problem, thought should be given to the evolution of new information-transfer techniques which would help the country to reap rapidly the fruits of recent scientific research and thereby rise from the mire of economic recession and world charity. It is also necessary to evolve closer administrative linkage between research and extension.

The National Demonstration Programme started in 1965 at my suggestion is intended <sup>and the farmer directly into contact</sup> to bring the scientist ~~layout~~ <sup>scientists lay out</sup> demonstrations in farmers' fields to show how to realise the yield potential of the new varieties. During 1967, 2000 demonstrations, each with a minimum yield target of 10 tonnes of grain per hectare per year will be put up by research workers in collaboration with extension staff throughout the country under the sponsorship of I.C.A.R. These demonstrations have had a far-reaching impact on the minds of farmers. For example, one Delhi farmer who was giving up wheat cultivation in 1964-'65 worked for a world record for the yield of Spring Wheat in 1966-'67, as a result of a demonstration put up in his farm in 1965-'66.

Under this programme,  
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Only those who have themselves produced high yields can with confidence teach the farmers how to do likewise. In other words, extension workers must be conversant with modern production technology. Practical experience rather than a printed list of package of practices can help them to win the respect and following of farmers. Numerous types of training schools and programmes exist now, aiming to increase the technical competence of the extension worker. Judged by the end-~~ed~~ result, much is yet to be accomplished in creating an extension agency capable of discharging the triple functions described at the beginning.

~~A new~~ Use of large State Farms for training students

I believe that one additional approach to this problem is to entrust the running of large State farms to the senior extension staff in each area. Such a step will have several advantages. First, the extension staff can apply the latest scientific findings on a large scale and acquire proficiency in the use of such techniques as well as evolve such modifications as may be necessary in the methods suggested to facilitate their large scale adoption. Secondly, a large number of extension workers can be trained to produce high yields ~~themselves~~ and thereby equip themselves to educate the farmers. Thirdly, the farms can become demonstration and training centres for farmers. Finally, there will be ample scope for establishing close links with the scientists, who can make use of such farms to conduct pilot experiments and carry out adaptive research. At the level of making strategic decisions relating to the management of such farms, scientific institutions such as Agricultural Universities or I.A.R.I. should be closely associated.

While the new high yielding varieties show a wide adaptation, the cultural practices necessary to get the best out of them need modification from area to area and sometimes even from farm to farm.

If the large farms already existing such as the one at Suratgarh and those proposed to be established in the different States become the seats of the Extension Directorates (rather than Govt. Offices as now), the extension staff will become production oriented and the attitude of the farming community towards them will change.

It is possible now to get at least 10 tonnes per hectare per year by growing 2-3 crops, provided there is water. To build a buffer stock of 5 million tonnes per year only about 500,000 hectares of irrigated land will be needed. If farms totalling this area are established <sup>and</sup> placed under the charge of extension staff, not only would the purpose of creating a very efficient extension machinery be served, but also the need for creating a buffer stock not solely dependent upon levy and other procurement practices would be met. Yield oriented farms ~~run~~<sup>s</sup> run by extension workers, if organised properly, could become an effective instrument in the production of buffer stocks. In addition, they would help us to get the best out of the few good scientists and extension leaders we have, since they could pay concentrated attention to a few centres, rather than dissipate their efforts over a wide area. Finally, such extension-cum-training-cum-buffer stock production farms can be run very economically and efficiently by making one year service at such farms a requirement for getting degrees in agriculture. Nearly 5000 B.Sc. Ags' are being produced annually now and hence the farms ~~run~~<sup>s</sup> will have enormous technical man-power. Imitation of extension set-ups in countries with neither the magnitude nor variety of problems we face will lead us no where.

The students will have an excellent opportunity for acquiring proficiency in production technology

NOTE ON THE REORGANISATION OF THE  
AGRICULTURAL RESEARCH ADMINISTRATION.

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BACKGROUND:

Agricultural Research Administration:

As mentioned

at the outset,

The allocation for agricultural research amounted to less than 10% of the national science budget during the first three Plans. This imbalance in support has resulted in a weak research base and consequently many important problems relating to agricultural production have eluded solution. An attempt is now being made to remedy this situation and it is hoped that about hundred crores of rupees would be available for agricultural research and education during the Fourth Plan period. Certain steps have already been taken by the Government of India to reorganise the Indian Council of Agricultural Research and convert it into a body similar to the C.S.I.R. A scientist has been appointed as the administrative head of the I.C.A.R., thereby replacing the tradition of appointing civil servants to this post. The research institutes formerly under the control of the Department of Agriculture, I.C.A.R., and several Commodity Committees have all been brought under the unified control of I.C.A.R. Research on most of the important crop plants would henceforth be carried out through All-India projects involving collaboration among scientists working in I.C.A.R., institutes, State Government institutes and Agricultural Universities. It is therefore hoped that isolated and ineffective activity which was the characteristic of agricultural research until recently, would soon give way to a dynamic, time-oriented research programme.

As a result, the research base now in existence will not be able to provide rapid solutions to the many new problems which will inevitably arise from the switch-over from a static to a scientific agriculture

A major defect of the present administrative situation is that the extension and policy making responsibilities are vested in the Department of Agriculture, the I.C.A.R. being concerned only with the coordination of research work. Under this situation the scientific component of strategic decisions <sup>could</sup> is often <sup>be</sup> low. Extension advice and the package of practices recommended <sup>may</sup> tend to get too general to be of value and frequently divorced from research findings.

Integration of research, extension and training

ORGANISATION OF AGRICULTURAL ADMINISTRATION

Since agriculture is the basic industry of the country, and since only an increase in the scientific and technological component of our agriculture can help in raising the per-acre yields, it is essential that a Body

In my view, <sup>2.</sup> the present agricultural administration comprising scientists, technologists and administrators is formed on the lines of the Atomic Energy Commission for making strategic decisions in agriculture. A small group designated "Agricultural Production Commission" composed of four scientists, technologists and administrators should be in complete charge of both the making and implementation of policy decisions, and should replace the present super-structure of the Department of Agriculture. The Chairman of this Board would perform also the duties of the Secretary to the Government of India. The other Members of the Board could be assigned the following major responsibilities (see enclosed chart):-

- (a). Input production and supply
- (b) Research, training and extension
- (c) Development and State Liaison.

What is important is that all vital decisions should be taken only after joint discussions among members of the Commission. An organisation like the Railway Board could also be envisaged, in which each Member has the status of a Secretary to the Government. The Commission will be directly responsible to the Cabinet Minister in-charge of Agriculture.

This policy making Board would be helped by several Task Implementation Bodies, the precise number depending upon the grouping of the subjects. If such an organisation is set up in the Department of Agriculture a sense of unity of purpose and action can be introduced into an area which today permits various sections of this organisation to work at cross purposes. Since agriculture is a State subject, the Centre will be able to play a more effective role in influencing agricultural development, if such a science-based-commission is formed.

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Re-organisation of the Department of Agriculture

Suggested organisational pattern

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Cabinet Minister for Agriculture

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Agricultural Production Commission

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Chairman  
(Co-ordination Wing)

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Member for Research, Training  
and Extension.

(ICAR, Fisheries Wing, Forestry Wing  
and Extension Directorate)

↓

Member for Input Production and Supply

(Divisions of Fertilizer, Seeds,  
Minor Irrigation, Plant Protection,  
Machinery and State Farms and  
Directorate of Economics and  
Statistics.)

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Member for Development and States  
Liaison.

(Crops Division, Animal Husbandry  
Division, Export Promotion Unit,  
Lands Wing, States Liaison Unit  
Prizes Commission)

(Existing Sections which can be placed under the  
charge of different Members are given within brackets.)

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Introduction:

These are days when agricultural development has become a fashionable topic for discussion. It is repeatedly emphasised that only the introduction of science into our agriculture can help to break the yield dilemma, i.e., the static nature of the per acre yield of our major cereals, millets and pulses. However, a comparison of the quantum of financial support extended to agricultural research in relation to other scientific activities indicates where the priorities really are (Figure 1). The situation in a country like Australia where agriculture has been developed into a primary industry is revealing (Figure 2).

There is no distinction between "applied research" and "ivory-tower research", if administrative arrangements for exploiting the fruits of research do not exist. I shall, therefore, confine myself in this article to some possible approaches for increasing the technical competence of the field extension staff and raw agricultural graduates and for bringing about at the administrative level a close integration of research, extension and training. Unco-ordinated activity is known to be the primary weakness of our developmental effort. Hence, earnestness in achievement should be reflected in bringing about a confluence of activities now proceeding on parallel lines.

Extension:

Agricultural extension has three major roles - supply of the inputs indicated by research as necessary for a desired output, transfer of knowledge relating to the maximization of the effectiveness of the inputs applied, and a feed-back channel for information from the farmer to the scientist so as to ensure research on the factors

limiting yields. If a good extension machinery exists, the time-gap between discovery and application will be reduced and at the same time research workers will be kept busy finding answers to problems of immediate relevance to the farming community. Research and extension have, therefore, a symbiotic relationship and if this symbiosis is fostered through adequate administrative, political and financial support, a continuous rise in the economic yield per unit area can be achieved without detriment to the long term productivity of the soil.

research

Recent strategy aims at exploiting fully the favourable features of our agricultural situation, namely the existence of abundant sunlight and fairly extensive water resources. The possibility of having green plants converting solar into chemical energy during most parts of the year is an unique asset of sub-tropical and tropical agriculture. The development and release of high yielding varieties in the major cereals and millets have enabled a farmer with a holding of only 3 to 4 acres to derive a net income of over Rs.3,000/- per year. Such high yield and income possibilities have provided the motivation necessary for the farmer to take to a whole set of new cropping patterns and practices, an outcome which could not be achieved all these years in spite of plans and propaganda.

Dwarf varieties of wheat or rice or hybrids of maize, jowar, bajra are high yielding only if certain fundamental changes in age-old agronomic practices are made. Thus, the time of the first irrigation may make as much as 1 tonne per hectare difference in the yield of wheat, given the same fertilizer dose and total number of irrigations. The depth of transplanting makes a similar difference in rice. Therefore, the extension agency assumes great significance for ensuring the maximum return to the farmer from his investment on inputs and to the country the maximum production from the existing fertilizer and water resources.

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extension leader. The field extension staff, by and large, have been unable to win the respect of farmers, because of their poor technical and practical knowledge. They have, therefore, relied heavily on their control over input supply to invite visits from farmers. The lack of a living contact with plants and an understanding of the factors limiting crop yields in the farmers' fields have rendered the extension staff practically useless from the point of view of transmitting to the scientist problems requiring investigation. Also, many of the present day extension officers have worked at some time as research men and they hence tend to forget the fact that it is the duty of extension workers not to function as substitutes for research workers and vice versa.

Magnitude of the problem of information - transfer.

While the number of farmers to be contacted is very large, the number of gifted and well-informed extension workers is few. Progress in scientific methods of destroying yield barriers and manipulating yield and quality is, on the other hand, very rapid. The price of most of the inputs is among the highest in the world and the availability is low. Therefore, the need for increasing as speedily as possible the technical competence of the field extension staff, so that knowledge concerning the qualitative aspects of input use can be rapidly spread is obvious. Because of the magnitude and urgency of the problem, thought should be given to the evolution of new information-transfer technique which would help the country to reap rapidly the fruits of recent scientific research and thereby rise from the mire of economic recession and world charity. It is also necessary to evolve closer administrative linkage between research and extension.

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#### Agricultural Research Administration.

As mentioned at the outset, the allocation for agricultural research amounted to less than 10% of the national science budget during the first three Plans. As a result, the research base now in existence will not be able to provide rapid solutions to the many new problems which will inevitably arise from the switch-over from a static to a scientific agriculture. An attempt is now being made to remedy this

situation and it is hoped that about hundred crores of rupees would be available for agricultural research and education during the Fourth Plan period. Certain steps have already been taken by the Government of India to reorganise the Indian Council of Agricultural Research and convert it into a body similar to the C.S.I.R. A scientist has been appointed as the administrative head of the I.C.A.R., thereby replacing the tradition of appointing civil servants to this post. The research institutes formerly under the control of the Department of Agriculture, I.C.A.R., and several Commodity Committees have all been brought under the unified control of I.C.A.R. Research on most of the important crop plants would henceforth be carried out through All-India projects involving collaboration among scientists working in I.C.A.R., institutes, State Government institutes and Agricultural Universities. It is therefore hoped that isolated and ineffective activity which was the characteristic of agricultural research until recently, would soon give way to a dynamic, time-oriented research programme.

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Integration of research extension and training

In my view, the present agricultural administration will benefit from adopting some of the features of the Atomic Energy Commission. A small group designated "Agricultural Production Commission" composed of scientists, technologists and administrators should be in complete charge of both the making and implementation of policy decisions. The Chairman of this Board would perform also the duties of the Secretary to the Government of India. The other Members of the Board could be assigned the following major responsibilities (see enclosed chart) :-

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If such an organisation replaces the present set up of the Department of Agriculture a sense of unity of purpose and action can be introduced into an area which today permits various sections of this organisation to work at cross purposes. Since agriculture is a State subject, the Centre will be able to play a more effective role in influencing agricultural development, if such a science-based-commission is formed.

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