

SUSTAINING AND ADVANCING THE GREEN REVOLUTION

by

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Introduction

Mr. Governor, gentlemen and colleagues first I would like to say it is a real pleasure to take part in the opening ceremonies of this Wheat Seminar.* There is nothing more important than communication between fellow scientists to bring together the new knowledge which should be brought to bear on production problems. In the past three or four years the West Wing of Pakistan has achieved spectacular increases in the production of wheat and rice. This is largely due to the coordinated effort between the scientists working in the different regions, now provinces, of the country. Without the coordination that was part of that program, I doubt very much if the breakthroughs in production could have been achieved. The administrative situation today is different, nevertheless I hope that coordination can be continued. The wheat scientists complement one another from the standpoint of the research effort.

Their work, for example, has dealt with, among other things, the problem of stability in yield. This well-known problem is indicative of the need for research coordination. In particular, a variety may be developed in one location and found to be high yielding, but when it is put out on farmers' fields, sometimes as close as 50 or

* Transcript of a speech presented at the opening ceremony of the Pakistan Wheat Improvement Seminar held at the Punjab Agricultural Research Institute, Lyallpur, Pakistan, March 18, 1971.

100 miles from where the variety was developed, one may find that what was considered to be high yielding variety has limited usefulness because it was adapted only to local climatic conditions. One can find similar examples with plant diseases. So I would urge you all to find the necessary administrative mechanisms to establish coordination in agricultural research in the West Wing and, for that matter, throughout Pakistan.

I am pleased to learn that there has been rapid rise in wheat production in the East Wing also during the past few years. This important increase in food production is the result of using wheat varieties with broad adaptation, early maturity, and adequate disease resistance, combined with fertilizer and increased irrigation water provided by low-lift pumps.

Some Problems

From the national standpoint there is one particular problem in wheat research that needs immediate attention. This is the establishment of a summer nursery for wheat in the high valleys. The use of a summer wheat nursery where the wheat breeder can accelerate the development and selection of new varieties by growing two successive crops of wheat per year is now an accepted and highly desirable practice. The use of a summer nursery for wheat research not only cuts, by one half, the time required between making a cross and the release of a new variety, but will also result in the year round utilization of the wheat research workers. The summer wheat nursery will have to be at sufficient altitude to provide the lower temperatures required for the satisfactory development of the wheat plant and it should also be in an area where the usual wheat diseases will thrive so that the susceptible

varieties can be eliminated early in the breeding program. Several possible locations for a summer wheat nursery in the western wing of Pakistan have been evaluated but the most desirable appears to be the Kaghan Valley.

Another problem has been and continues to be the lack of coordination between the various sections (disciplines) at the major research institutions. While I firmly believe Pakistan now has one of the world's most dynamic and progressive wheat breeding programs, it has not made adequate use of the knowledge and skills of the plant pathologist, agronomist, entomologist, and plant physiologist and cereal technologists. To overcome this problem within the provincial setting, each research institute should designate a specific group of individuals to work together as a team specializing on all of the problems of the wheat plant and its culture. If proper cooperation is achieved, the other scientists can remain administratively responsible to their respective sections, but should plan the details of their research with the other members of the wheat team. Often they could, and should, carry out joint research projects on the same plots. Qualified, aggressive young men should be selected for this effort, not those who must spend a major portion of their time in the administration of a section, or who must by the nature of their jobs, maintain an interest in a wide variety of crops. They should be allowed to continue cooperation with the team over a period of years so that they develop a full understanding of all of the factors which collectively determine the potential yield of the crop on which they are working. In some cases, additional practical training like that conducted at CIMHT may be beneficial. The first step towards this goal should be the

establishment of a close working relationship by wheat team with one or more scientists in the sections of agronomy and plant pathology. Entomology, plant physiology and cereal technology can be added as these become critically limiting factors.

Increased investments of required inputs are necessary to increase crop yields. Labor and more fertilizer can be used profitably with the high yielding varieties. Thus, it becomes necessary to have greater security of harvest. Unless the farmer's wheat has better disease resistance, he might lose this investment. So, as one moves forward into increased production with higher yields, the protection from losses becomes more important.

Consideration for other crops

You have moved rapidly with rice and wheat production but you have not made the same progress in other crops. There comes a time now when all the provinces need to decide how much wheat is needed for the entire country. The same is required for rice. How much rice is needed? How much can be exported? What should the quality of that rice be? This needs to be examined each year, jointly, by the scientists and those concerned with planning. Someday, unless this is done, Pakistan will overproduce rice and wheat, especially when normal irrigation supplies and adequate rainfall prevail. Pakistan currently has a shortage of pulses and oilseeds. Neither of these crops can currently compete with the more profitable wheat. The reason that pulses and oilseeds cannot economically compete with wheat is because the research in these crops has not been aggressive. The only way to really overcome the low production is to get the research functioning

and the research results applied on farmer's fields. Up to a point one can increase the production of oilseeds and pulses by increasing product prices, but this is not always wise, desirable, or possible. So it is necessary to build into the research programs the required strength to increase the yields of these crops and not rely too heavily upon economic manipulation in order to bring about the increased production of these crops which are so essential and in short supply.

Now that the production of major food grains, wheat and rice is approaching self-sufficiency, there is an urgent need to concentrate on the research necessary to increase the yields of maize, jowar and bajra. Aside from being important food grains, these cereals will be the basis for animal and oil industries.

Research on cotton is stagnant, particularly the plant protection aspects. Although Pakistan cotton yields and production have increased, average yields nonetheless remain among the lowest in the world for irrigated cotton. Exploiting the potential of the cotton crop is necessary for supporting the ever increasing local textile industry as well as earning foreign exchange. The insect problem is of such nature that it must be attacked not only through timely use of proper pesticides but it is also essential to develop a supporting program of sanitation practices to break the biological cycle and reduce insect population to manageable levels at the beginning of the crop season. The existing regulations must be re-evaluated in light of present cropping patterns and, with necessary revisions, implemented if the present situation is to be rectified.

I must agree one hundred percent with His Excellency, the Governor, when he said that research has no value if it does not reach the farm. I would rather go further than that. I suggest that we should not do research unless we expect to apply it. I cannot justify in my mind the expense for chasing academic butterflies. Some experiments may not have immediate application, and this we must accept, but research should have as its ultimate aim the satisfying of human needs.

Need to correct the fertilizer imbalance

One of the most urgent problems which must be solved to further increase wheat yields is to correct the phosphate fertilizer imbalance. In the early years of the Accelerated Wheat Program, and I expect that the same is true with rice, major emphasis was given to the use of nitrogen fertilizers. The soil nitrogen level in West Pakistan was, with only minor exceptions, extremely low. Nitrogen fertilizer application consequently produced impressive yield increases and made nitrogenous fertilization extremely profitable. The soil scientists knew even then, as they do now, that the ratio of nitrogen to phosphorus application in the West Wing of Pakistan should be about two to one. However, records indicate that the nitrogen fertilizer sales are presently seven times that of the phosphate fertilizers. The native available phosphate levels of the soils have declined as increased yields are harvested. Consequently, farmers are currently getting less response to nitrogen fertilization than they did three years ago. Hence, the type of stories that circulated two years ago when some said that "Mexipak wheat has degenerated" or "The Mexican

wheats have lost their yield potential", etc. are inaccurate descriptions of the real problem. In retrospect, when the first crop of the high yielding wheat was grown there had been some accumulation of phosphates so that application of nitrogen alone produced high yields. In reality, the high yielding varieties had used up the available phosphate in the soil that had been accumulating with the slow weathering of minerals and rocks. Hence, with succeeding crops, the response to nitrogen decreased and the farmer wrongly assumed that it was genetic degeneration of the wheat variety. What really has happened is that a fertilizer imbalance has developed and the farmer needs to start using increased phosphate in his fertilizer program. This is largely an extension problem, but the researchers need to verify in their micro-plot trials and semi-commercial trials the benefits of balanced fertilization.

Data on the current status of fertilizer use on wheat is inadequate. Few can even say today what percentage of farmers use fertilizer on their wheat. I would like to point out also that it is a moral obligation of the Government to bring the benefits of the "Green Revolution" to all farmers. The first step is to collect reliable data on current production, acreage, yields, fertilizer use, etc. Many questions need answer. Is it 30 percent or possibly less that use fertilizer? How many farmers apply the recommended amounts and kinds of fertilizer? I have heard 10 percent; or is it as low as 5 percent? We do not know. We must learn the nature and causes of the current situation so that we can help all farmers participate in the new technology of the "Green Revolution". Is credit the bottleneck? The small farmer, and particularly the barani farmer, must

profit from the new technology if Pakistan is to have and maintain economic and political stability. There is great scope for increasing the participation in the so-called "Green Revolution". Even with the most optimistic estimates of rate of farmers' acceptance, there is much to be done by Extension and Research. The planners and those government officials who formulate and put into operation agricultural policy, also have much to do.

There must be an expanding program for training qualified research and extension staff. Unusual talent must be recognized and rewarded. I would hope that administrative changes will be made so that opportunities will exist whereby the scientist and the extension worker can advance in his particular speciality on the basis of merit, and there will be a minimum of shifting away from his specific field to accept promotion.

Before concluding, I would like to mention one aspect of irrigated agriculture that is so often neglected. Frequently, the question is asked, "Why don't you plant breeders develop varieties that are salt tolerant?" My answer is, up to a point, a small bit of progress can be made, but on the other hand you are asking the plant breeder to solve a hydraulic engineering problem. Let us always remember that here in the West Wing of Pakistan you have the largest single irrigation system in the world, with only a very few miles of drainage. To have efficient water use and to have maximum response from fertilizers resulting in maximum yields, the salts must not be allowed to accumulate in the upper-layer of the soil. This drainage problem will require inter-provincial coordination and huge investments.

But this problem must be solved. I am not attempting to establish priorities as to how and when to start the drainage program. But until the drainage problem is overcome, one cannot expect maximum performance of high yielding varieties nor the maximum response to fertilization. As water becomes limiting and soils progressively more saline they lose their structure, yields decline, cultivatable acres shrink, and production will fall. Irrigation without drainage is inviting disaster and famine. All the advances of the so-called "Green Revolution" can be lost in the West Wing of Pakistan if we fail to develop an adequate drainage system.

Concluding comments

I accepted the Nobel Peace Prize in the name of agriculture everywhere. I accepted it in the name of the thousands of researchers and extension staff. I also accepted it in the name of the thousands of government officials who supported the various programs. Finally, I accepted the Nobel Peace Prize on behalf of the millions of farmers, many of whom are here in Pakistan, who have the courage to take the new seed and the new technology and put them to work on the farms. I cannot accept the credit of the "Green Revolution" by myself. It could not have been accomplished with my ten weak fingers and mediocre brain without the contributions of all the afore-mentioned participants. But, you see, our job is not done - despite progress achieved, we cannot rest on our laurels.

We must look ahead so that food production increases faster than population. Each day, there are 2 lakh more people added to the world's population. The population of the West Wing of Pakistan

increases by 3,800 each day. This means that we will have to provide not only food for this increase but also classrooms and education, jobs, housing, transportation, medical facilities and all factors that are a part of an improved standard of living. Worldwide political stability hinges on satisfying the demands of increasing population. We have plenty to do, we must not be complacent, we must work harder to build a better world.

I thank you all very much.