Pakistan's WHEAT -An Enigma

WHILE THE FOOD PRODUCTION SHORTAGES CONTINUE, EXPANDED FOOD PRODUCTION REMAINS UNEXPLOITED.

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An adequate staple food supply is a basic requirement in any country for social tranquility and economic stability. These conditions are necessary for the successful launching of economic development programmes. An assured food supply is an absolute necessity for continued political independence.

Pakistan is blessed with a combination of geographic and climatic factors which provide the potential for producing the food required to adequately feed its large and rapidly growing population. At the same time, it can become a large exporter of food if this potential is transformed into reality.

Pakistan has the vast flood plain of the Indus with deep soils, favourable topography, and weather conditions that are excellent for crop growth throughout the year. It has the bountiful water resources of this famous river, which have now largely been harnessed by dams and canals so that the water can be utilized effectively throughout the year to produce food, forage, and fibre crops in a multiple-cropping system. Moreover, the country is blessed with farmers who are receptive to new ideas and methods whenever appropriate new technology combined with favourable economic policy is made available to them. This was clearly indicated by the rapidity with which they adopted the new wheat and rice technology during the late 1960s.

Although considerable progress has been made during the past decade in increasing food production in some crops, especially wheat and rice, this progress has slowed in recent years. In other important crops there has been little or no change in yield per hectare and total production, clearly indicating the need for creative research to develop appropriate high yielding technology.

Events of the past several years on the research, extension, and agricultural policy fronts indicate that it is urgent for the government of Pakistan, in close collaboration with the provincial governments, to examine why agricultural research and production is again declining — or stagnating — and take corrective action. As discussed below, the case of wheat production indicates the magnitude and scope of the problems that must be solved to exploit the unutilized production potential.

CAPITALIZING ON PAKISTAN'S VAST UNDER-EXPLOITED WHEAT PRODUCTION POTENTIAL

Wheat is the most important food crop of Pakistan. On a tonnage basis it constitutes over 60 per cent of the total grain production. Consequently, wheat production is a good overall indicator of the progress of agricultural production. Since about 60% of the total population is involved in agriculture, changes in wheat yields and production relate directly to changes in rural standards of living and rural economic development.

During the middle 1960s, following several years of widespread experimentation on farms in Pakistan, new high yield wheat production technology was introduced into Pakistan. This package of improved technology involved the following:

i) the introduction and use of the high-yielding Mexican dwarf disease-resistant varieties;

ii) the use of chemical fertilizer;

iii) the adoption of improved cultural practices such as better levelling of land, better seebed preparation, improvements in planting methods and in irrigation practices;

iv) reorganization and revitalization of wheat research, on an interdisciplinary basis throughout Pakistan;

v) reorganization and revitalization of production and extension training.

Once the package of improved technology was developed, it was linked to government economic policies which stimulated farmers to adopt the new technology and consequently

increase production. This stimulatory economic policy included:

i) the establishment and announcement, prior to the planting season, of a realistic, fair floor price --- or procurement price --- for grain for the next harvest;

ii) the assured availability of seed of the high yielding varieties and of fertilizer at the village level prior to the planting season; and

iii) the availability of government credit to small farmers for purchase of seed and fertilizer.

The results of the wheat production programme in the period from 1967-1970 were spectacular. Thousands of farmers, both large and small, enthusiastically adopted the new technology when they saw the large difference in yield between the traditional and new methods.

The new technology was demonstrated by research scientists and extension workers on either the farmer's or his neighbour's land. During this period faster progress was made toward increasing yield and production of wheat in Pakistan than in any other country of the world. As a result, Pakistan wheat production increased spectacularly from 3.75 million metric tons in 1965 to 6.5, 7.1, and 8.94 million metric tons in 1968, 1969, and 1977, respectively. During the 1968-69 period Pakistan achieved self-sufficiency in wheat production. Why has Pakistan not remained self-sufficient ? First, consumption of wheat has increased greatly as the result of population growth and also as the result of a modest increase in per capita consumption. Moreover, in the past five or six years the effectiveness of the wheat research, seed multiplication, and extension programmes has declined, and government economic policy has not encouraged wheat production. As a result, increases in production have slowed. The dynamic All-Pakistan Cooperative Wheat Research and Production Team that operated effectively on both experiment stations and on farms across the entire West Wing has lost its cohesiveness, enthusiasm, flexibility of operation, and has been fragmented into four largely independent, weaker, provincial programmes. All of the four provincial wheat research programmes have been further weakened by more bureaucratic regulations that have reduced their efficiency and destroyed the initiative of the research team.

Government services and policy, as they relate to availability of fertilizer, seed of improved varieties, and stimulatory prices for grain at harvest, have not demonstrated the flexibility to meet changing conditions, as they did in the late 1960s. The result is the disenchantment of researchers, extension workers, and farmers.

PAKISTAN'S WHEAT PRODUCTION POTENTIAL

With the proper implementation of the production technology now available, Pakistan has the potential to become self-sufficient in wheat production by the 1982 harvest, or conceivably even by the 1981 harvest. With a network of drainage ditches, requiring large capital investments, Pakistan has the potential to become a sizable wheat exporter by 1990.

These goals can be achieved without adversely affecting the production of other rabi crops. Rather, Pakistan has the potential to become self-sufficient in all food crops --- cereals, oilseeds, pluses, tuber crops, sugar, fruits, and vegetables --- by 1990, if aggressive training, research, extension, and production programmes and drainage are developed to transform this potential into reality.

For too long Pakistan has neglected the application of available improved technology and the necessary capital investment that could make it self-sufficient in wheat production. One of the principal causes that has led to this dilemma has been the continued shortsighted reliance upon food aid and concessional purchases of wheat (under PL-480 and other similar easy payment types of contracts) from friendly countries. This policy has been pursued while largely neglecting the expansion of its own production. It appears to us—long time friends

of Pakistan--- that the time has come for Pakistan to discard the "crutch" of concessional food purchases and develop the unexploited capacity to become self-sufficient in wheat and all other basic food production, as rapidly as possible.

One grave weakness of the Pakistan wheat programme is the absence of effective seed-producing associations, companies, or corporations. There is little point in investing money in large wheat breeding programmes if there are no effective organizations to multiply and distribute the newly developed varieties. At present under a World Bank loan to Pakistan, two seed corporations, one in the Punjab and the other in Sind, are being organized to meet this need. Unfortunately, it will be two years before these organizations become fully functional. Meanwhile, the wheat crop will remain largely vulnerable to attacks by rust if the weather is favourable for the pathogen.

The second major obstacle to the rapid expansion of wheat production is the failure to provide seeds and fertilizer to the farmer at the proper time. Much of the available truck and rail transport is occupied in the disbursement of imported wheat from the seaport inland. Little transport remains for timely delivery of fertilizer and seed, and even that is further hindered by roads and railroads made impassable by seasonal floods.

Shortages of phosphatic fertilizer at time of sowing are particularly detrimental to plans for increasing wheat production, since this nutrient should be applied prior to or at time of planting for best results. The shortage of fertilizer at the onset of planting is not a new obstacle. It is a recurring serious handicap and indicates the need to place purchase orders earlier and advance delivery dates.

Positive stimulatory effects can be obtained by establishing realistic production targets which can be achieved. This is a challenge to farmers, extension workers, researchers, and government planners and administrators. The establishment of such production targets can only be useful if they have the whole-hearted administrative and budgetary support of all key levels of government.

THE SELF-SUFFICIENCY TARGET: 12 million metric tons by 1982.

The target of self sufficiency in wheat by 1982 will require a production of approximately 12 million metric tons. If this target is to be achieved it will require the re-establishment of dynamic on-farm research and extension programmes to study, in detail, the present status of all major factors that currently limit yield and production.

From 1965 to 1971 a dynamic on-farm wheat research and extension programme was established and operated throughout West Pakistan. It developed the high yield technology which successfully launched the so-called green revolution. Unfortunately, with the break-up of the West Wing into four provincial agricultural departments, coordination of the programme was disrupted. It is believed that a number of factors that now limit yield and production were of little significance in the 1966-1971 period.

Consequently, during the next several years the PARC and provincial agricultural research institutes and universities must launch dynamic, cooperative, on-farm, interdisciplinary research programmes. These programmes should develop new and additional information to guide the extension and production programmes in the years ahead. What needs to be done, at this stage is to develop a package of practices that is relevant to current conditions. The following outlines some of the areas where research is needed.

I. Agronomy and Soils under Irrigated Conditions.

Research work is required to:

a) develop better understanding of the N: P ratio;

b) continue examination of potassium requirements;

c) initiate Micronutrient studies;

d) determine the optimum dates and rates of seeding for each of the principal varieties of each region;

e) study the effects of drainage on wheat yields in alkaline, water-logged soils versus non-drained plots in the same field;

f) study and develop both cultural and chemical methods of weed control;

g) survey farmers' fields at harvest time and obtain data on differences in grain yield with different production tech - nology in each region;

h) develop improved cultural practices for a rice-wheat cropping sequence.

II. Barani Agronomic and Soils Research.

This area of research has had little atten - ion in the past. Research must be launched to:

a) develop improved methods for conservation and utilization of the moisture that falls during the monsoon season. The studies will include:

i) different tillage treatments;

ii) methods of sowing;

iii) rates of seeding;

iv) dates of seeding;

b) determine best fertilizer treatments for barani conditions;

c) identify the best long season varieties for barani conditions.

III. Plant Breeding and On-farm Varietal Trials.

a) Regional variety yield trial: This trial should be enlarged and carried out at a greater number of locations.

b)Non-replicated screening nursery: Promising new lines from all breeding programmes should be evaluated for disease resistance.

IV. Plant Pathology.

This programme must make optimum use of the following:

a) The National Disease Screening
A rigorous disease- screening programme must be developed. All promising lines from the breeding programmes and international nurseries should be included and tested at 10 or 12 locations for disease data. This data needs to be integrated with yield data.

b) The regional diseases and Insect Screening Nursery. The material in this nursery can be a valuable source of new combinations of genes for disease resistance.

c) Monitoring Diseases in Commercial Fields. Monitoring diseases in commercial fields is absolutely necessary to identify at an early stage the appearance of new races of rust. The pathologist must use this information to identify lines from the breeding programmes which are resistant to both new races as well as the older races. The information developed by the pathologist is of no value unless it is utilized effectively by the breeder to develop and opportunely release new resistant varieties. In the future there must be closer cooperation between the plant pathologists and wheat breeders.

d) The summer Nursery at Kaghan
This nursery can be a highly important mechanism for developing leaf and stem

rust epidemics which could be of great value to the breeders in identifying lines with high levels of disease resistance. Appropriate administrative and operational support for this station is imperative if the station is to function satisfactorily.

MAINTAINING WHEAT SELF-SUFFICIENCY THROUGH 1990

The data in Table 1 indicate the production that will be necessary to achieve self sufficiency in wheat in 1982 and 1990, assuming two different levels of consumption.

The data in Table 2, assuming a constant area of 6.4 million hectares sown to wheat, indicate the yield increases that will be necessary to achieve the different levels of production.

Table 3 indicates that the record yields of 1977 were 1630 and 800 kilograms per hectare for irrigated and barani areas, respectively. These yields must be increased to 2750 and 1300 kilos per hectare by the year 1990 to produce the 13.8 to 15.8 million metric tons that will be required to feed the projected 1900 population of 105 million.

The increase in yields required to achieve this goal is a difficult undertaking. This challenge dictates the need for developing strong programmes for on farm resarch. If self-sufficiency is to be maintained, these improvements in technology must be effectively transmitted to farmers through agressive extension programmes. It also points out the importance of yield and production stability. In striving to attain self-sufficiency severe losses from rust, as occurred in the 1977-78 crop, must be avoided.

These projections do not take into consideration the possibilities of increasing the area cultivated to wheat. However, since there continues to be a need for increasing the production

Table 1

Population Growth and Wheat Production Needs of Pakistan For two Rates of Consumption Over the Next Twelve Years

Year	Population* Millions	Production Needs (including seed) Millions of Metric Tons CONSUMPTION 125 kg/Capita/Year	145 Kg/Capita/Year
1978	74	9.85	11.33
1982**	83	11.00	12.60
1990	105	13.8	15.80

* Source: Population Reference Bureau Data for 1977
1. Estimated Pakistan Population 1977 was 74 million
2. Estimated Population Growth Rate 2.9%

** It is projected that self-sufficiency in 1982 will require a production of about 12 million metric tons

Table 2

Production Figures for Different Yield Levels of Irrigated and Barani Wheat Based on The 1977 Area of 6.4 Million Hectares *

Yield Levels Kg/Hectare		Production Million Metric Tons		
Irrigated	Barani	Irrigated	Barani	Total
1200	750	5.66	1.17	6.83
1500	850	7.08	1.33	8.31
2000	1000	9.44	1.57	11.01
2500	1150	11.80	1.80	13.60
2750	1300	12.94	2.04	14.98

* 1977 Pakistan Wheat Crop Data. Source: USDA Foreign Agriculture Circular FG-19-77 December, 1977.

Table 3

Production Figures from the 1977 Wheat Harvest in Pakistan

	Area Millions Hectares	Production Million Metric Tons	Yield Kg/Hectare
IRRIGATED (75% Area)	4.70	7.69	1630
BARANI (25% Area)	1.57	1.25	800
Total Crop	6.27	8.94	Average 1430

of winter grain legumes and forages, there is likely to be a growing shortage of land for rabi crops by 1990. Moreover, each year much land is lost to cultivation by water-logging and salinity.

THE LONG TERM TARGET AND NEEDS FOR DEVELOPING A LARGE SCALE DRAINAGE SYSTEM FOR THE INDUS

When flying over the Indus, one cannot help but be appalled by the vast land area that has been removed from production by the relentless advance of the twin-headed monster of salinity and water-logging. According to some reports, every year several thousands of additional hectares are being reduced in pro-

ductivity or removed from cultivation by this monster. Although several studies have been made of this problem over the past two decades, no decisive large-scale programme has been developed to solve it. The problem continues to grow in intensity and magnitude, and if ignored will destroy the agriculture of much of the Indus Valley.

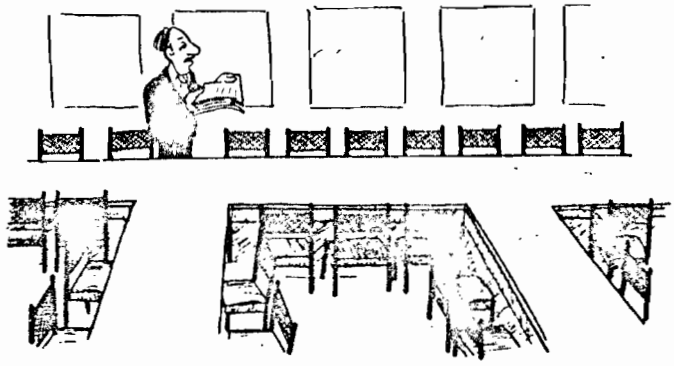
The only sizable programmes that have been installed to recover land that was lost to water-logging and salinity were the S.C.A.R.P. I and II. Neverthless, the amount of land reclaimed by these projects was less than 2 million acres, which is small compared to the total area needing drainage. Moreover, the tech - niques used in S.C.A.R.P. I and II are not feasible in vast areas where the subterranean water is highly saline.

Sooner or later the Government of Pakistan will have to come to grips with this enormous problem and invest in a vast network of horizontal drains.It cannot be solved by small projects initiated at local or provincial government level. The cost of installing such a network of drains will require enormous investment and will necessitate long-term financing by international funding agencies.

In the past the Government of Pakistan has been involved primarily in building dams to provide more irrigation water to farms in the Indus Basin. Apparently, little thought has been given to either protecting the watershed above the reservoirs from silting or to providing drainage in the irrigated land below the dams. It would seem that the time is now at hand to turn attention to drainage. Salinity and water-logging destroyed the fertile irrigated areas of Mesopotamia thousands of years ago. To continue to ignore the problem in Pakistan will bring a similar fate to the Indus.

CAN PAKISTAN DEVELOP ITS AGRICULTURAL PRODUCTION POTENTIAL IN THE NEXT FIFTEEN YEARS?

We are convinced that Pakistan can transform its agricultural production potential into reality within the fifteen years. To do so will require a firm commitment by all officials of both national and provincial governments. This will require large financial allocations and flexibility to use these funds. Finally, scientists, engineers, educators, and politicians must lay aside their personal egos and biases and commit themselves as a team to attack and conquer the tremendous challenge that lies ahead.



"I realize that this is your busy season, and I'm sorry I had to call this meeting for tonight."