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Why The Green Revolution Was Short Run Phenomena In The Development Process Of Pakistan: A Lesson For Future

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ABSTRACT

Agriculture is the most important sector of Pakistan's economy. It provides food and fibre, source of scarce foreign exchange earning and a market for industrial goods. In 1960s various policy measures were taken for Agriculture development. The research tries to examine various issues related to this sector. Focus of the research, however, is to analyze the role of Green Revolution in the development process of Pakistan and its short and long term impact on the economy. The paper analyzes weaknesses due to which the Green Revolution remained a short-term phenomena. The contributing factors of Green Revolution and other supporting institutions are also discussed. The findings of this study show that the Green Revolution increased agriculture production and employment level. It also had impact on distribution of income and the social and political environment in the country. However, there were certain policy gaps due to which the impact of Green Revolution remained a short-term phenomena.

INTRODUCTION

Every developed economy of the world has an extraordinary real shock for its accelerated development at any stage of its growth. The span of the real shock based on its long term and mid term development strategy is affected by Inter sectoral correlation, development multi-

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plier and intrasector multiplier. This development strategy provided and elevated benchmark and most of the developed economies use it as a launching pad for their extra ordinary development. The economies keeping up the previous pace of development continue to accelerate their growth rate in different sectors of their economy. The states may decide developing their economy in the area of their factor abundance and make it epicenter of their national development. Sectors pertaining to factor abundance may be used as their strengthening areas and special efforts are made to exploit this locational advantage as naturally exists. Similarly like many economies of the world Pakistan has factor abundance in human resource which may be mainly developed for agricultural development due to its inbuilt dependence mechanism and comparative advantage over other factors. The government of Pakistan in 1960s introduced different development plans, as a result the agricultural production increased rapidly in areas where new high yielding varieties of wheat and rice were introduced. The growth rate of agriculture in West Pakistan increased 1.8 percent per annum in the first plan and 3.8 percent per annum in the second plan. In third plan the growth rate this was more than 6.0 percent per annum. This made West Pakistan self-sufficient in food grains and also enabled it to export rice and to cater for the wheat requirements of East Pakistan. This remarkable progress in agricultural productivity has been called the Green Revolution.

This paper explains the impact of Green Revolution on the agriculture, and rural development of Pakistan. To analyze its impact in detail the paper is divided into a number of sections. Section-I explains the theoretical framework of Green Revolution. Section-II deals with four stages of Green Revolution and Section-III highlights the impact of Green Revolution. This section is further divided into four sub-sections, which explain the impact of Green Revolution on agricultural production, the distribution of income, Employment and social and political environment. Section-IV identifies the contributing factors of Green Revolution, such as the government support, and other supporting institutions. Moreover, a model of development is presented in this section.

1. Meaning of Green Revolution

The Green Revolution means introduction of new technology in agriculture sector, in order to increase its production through different measures. Many of the world's countries made diversified efforts through following measures:

- i. Introduction of new high yield varieties of wheat, rice, and maize.
- ii. Improvement in per acre yield through quality fertilizers to compensate for land deficiencies in many less developed countries.
- iii. Pesticides and insecticides have expanded the acreage a single farmer can tend by reducing the time required to disinfect the crop.
- iv. Irrigation has made double cropping feasible in many countries where formerly one harvest a year was standard.
- v. New methods of rotating crops were developed which increased land productivity.
- vi. New shorter plants have been discovered that are more responsive to fertilizer. Similarly, some sturdier types are more disease-resistant.
- vii. Botanists have been able to breed the photosensitive genes out of plants . Making planting possible at any time of the year.

The revolution gained momentum from scientific and technological break through in improved quality and utilization of inputs like high yielding varieties of seed (HYV), fertilizers, pesticides and water. There was a greater spread of agricultural mechanization mainly in terms of tube wells, tractors and other machinery.

1. Stages of Green Revolution

For the purpose of analysis the green revolution can be divided into four different stages:-

(i) Scientific Breakthrough

The scientific Breakthrough is the discovery of high yield varieties of seeds. This is usually associated with Mexican wheat varieties (Mexi-Pak) developed in the international corn and wheat improvement center and the high yielding rice varieties in the International Rice Research Institute (IRRI) in Philippines.

(ii) Technological Breakthrough

To achieve optimal level of output from above HYVs, pertinent technological developments were made in the field of mechanization and water resource utilization.

(iii) Production Breakthrough

To have optimal agriculture produce, there was a dire need of excess supply of inputs such as fertilizers, chemicals, machinery and HYVs of seeds. With production breakthrough a large-scale supply of all the inputs was made available. In addition the government made facilitating policies pertaining to easy and cheap availability of inputs and prices stability of outputs etc.

(iv) Agricultural Breakthrough

The efforts made in earlier phases helped a lot to give enormous output. It covered all the main crops and also the various enterprises of animal production. This agriculture produce directly and indirectly benefited the small as well as large-scale farmers.

2. Impact of Green Revolution

Green Revolution had impact on production, consumption and overall societal development, leading to a tangible increase in production of agri-produce, and its easy and cheaper supply to the consumer. An overall development of society has been observed due to upward shifting of indifference curve. We shall, however, pay attention on the following aspects in particular:

Impact on Agricultural Production

In early 1960's, new varieties of wheat were taken up by Mexican growers and planted on 90 percent of the country's wheat land, which doubled the average yield per acre as compared with traditional varieties of wheat. Pakistan raised its total output of wheat in these years from 4.5 million to 8.4 million tons, with 83 percent increase. In this regard following indicators may be taken into account.

a. Agricultural Income:

Year	Income (In current prices) Rs. billion
1959-60	7.7
1969-70	15.5

Sources: Pakistan Economic Survey, Ministry of Finance (Various Issues).

This information shows that after green revolution the income of agriculture sector has doubled.

b. Index of Agriculture Productivity

Year	Index (Productivity)
1948-49	89
1957-58	93
1968-69	146

Sources: Pakistan Economic Survey, Ministry of Finance (Various Issues).

Which shows green revolution lead to a high increase in the index of productivity.

c. Growth Rate of Agriculture Sector

Growth Plan	Rate of Growth
First	1.8%
Second	3.8%
Third	6.0%

Sources: Five Years Plan Reports, Govt. of Pakistan

Which indicates that due to green revolution the average annual growth rate has doubled.

d. Wheat Production

Year	Million Tons
1959-60	3.7
1968-69	6.8

Sources: Pakistan Economic Survey, Ministry of Finance, (Various Issues)

Due to green revolution the production of wheat has doubled.

e. Rice Production

Year	Million Tons
1959-60	0.9
1968-69	2.1

Sources: Pakistan Economic Survey, Ministry of Finance (Various Issues).

Which indicates that after the green revolution the production in rice increased more than two times.

f. Per Acre Yield

Year	Million Tons
1963-64	11.1
1968-69	17.0

Sources: Pakistan Economic Survey, Ministry of Finance (Various Issues).

So green revolution substantially increased per acre production of rice and wheat.

Factors Responsible for this Phenomenal Growth

There are many factors responsible for this phenomenal growth; some are of general nature, whereas the others are Pakistan specific. Each one is explained below: -

General Factors

There were certain common factors existing in those countries, which adopted Green revolution.

- a. High yield varieties were introduced, which gave more production.
- b. Progress in fertilizer manufacturing was observed which enabled farmers not only to maintain the fertility of land, but also enrich the soil.
- c. Better quality pesticides and insecticides increased acreage of land to be disinfected by the farmers for better crops.
- d. Better management of human resource was made through optimal utilization of already available farm labor and induction of newly trained laborers.
- e. An effective utilization of non-human resources was made.
- f. The quantity and quality of land inputs as determined by the total cultivated area and the cropping intensity was improved.
- g. Water availability was ensured, keeping in view its quantity required at a pertinent time during growth of crops.

Pakistan Specific Factors

Although the above general factors substantially contributed to the rapid increase in agricultural production of Pakistan, yet, there were some specific factors that played important role in agricultural growth in Pakistan, which are given below:

- a. Government policies to provide subsidies and credit to the producers encouraged them to develop and adopt new technology for accelerated agriculture growth

- b. Incentive prices were offered to the farmers through the price support programme, which guaranteed them to sell produce in the market. This reduced the element of risk and uncertainty and created a conducive atmosphere to enhance agricultural production.
- c. The government's policies made way for the enhancement of private investment in agriculture sector especially in manufacturing and installation of tube wells and machinery and allied equipments. The annual increase in 1963-64 and 1964-65 was around 35 percent.
- d. Transmission of the improved technology to the farmers through Extension Service Programmes.

The phenomenal growth in West Pakistan's agriculture can be decomposed into two periods:

- i. In the period between 1960 to 1965 the accelerated growth was due to availability and utilization of additional irrigation water which was in fact the cutting edge of the development over other factors.
- ii. For the period from 1966 to 1969 in addition to supplementary irrigation water, excess supply of HYV seeds, chemicals and fertilizers mainly contributed in the increase in growth.

Impact on Distribution of Income

There is a mixed response on the distribution effects of green revolution in the light of available evidences. Mainly, there are two schools of thoughts; one claims that green revolution, gave more benefits to large farmer as compared to small farmers, which increased inequality between income classes and among different regions. The other school of thought believes that Green Revolution in Pakistan seems growth inducing and employment generating; it also reduced inequality between income classes and regions. Point of views of both school of thought are elaborated in the following sections:

1. Green Revolution Increased Income Disparity

According to Rashid Amjad (1984) the Green Revolution increased income disparity among different income groups, landholders and farmers. He supported his analysis with considerable evidences from different landholders and regions.

According to him the gains of green revolution have been limited to the big landlords, and the already better off farmers who had access to advance technology required for cultivating the miracle seeds i.e. adequate water, fertilizer etc. Most of the small farmers could not shift over to new technologies and available HYVs due to the following reasons.

- a. The government's supports price could not uplift them to breakeven point of profit earning.
- b. New technology entailed high initial cost, which was not in their financial reach to undertake investment.
- c. Important inputs especially water and seeds were monopolized by large farmers.
- d. Tube wells were only affordable by large landlords.

A small survey comprising questions regarding use of fertilizers revealed following facts:

- . Why small farmer with land holdings less than 12.5 acres, did not use fertilizers? In response 79% listed the reason as lack of funds and 35% as lack of water.
- . Similarly 93% of the farmers who were using fertilizer less than their desired level listed the main reason of deficient use due to lack of funds and 25% as due to lack of water.

Credit

In certain cases credit was not available to small farmers, who due to lack of financial resources could not purchase important inputs and HYVs required for accelerated growth. Major chunk of the credit was available to big farmers e.g. during 1970-71 86.4% of credit went to the farmers holding 12 acres or more than 12 acres land.

Regional Disparity

Green revolution has unevenly distributed its benefits to different regions of Pakistan due to concentration of the type of land holders i.e. small landlords or big landlords above 12 acres. The areas having a large number of big landlords remained major beneficiary while the part of the country inhabiting more of small land holders could not get benefits out of the government credit distribution policies. This led to disparity among different provinces; supporting data is given below:

Region	Share of Wheat Production	
	1964-65	1969-70
N.W.F.P	7.2%	3.3%
Balochistan	1.8%	0.8%
Sindh	12.6%	15.6%
Punjab	78.4%	77.3%

Sources: Agriculture Year Book (Various Issues)

Mechanization

The introduction of mechanized farming led to the replacement of tenant farmers and small farmers with corresponding increases in the landless labor force.

2. Green Revolution Reduced the Income Disparity

According to Ghaffar Chaudhry (1982) the green revolution had positive impact on income distribution and reduced the income disparities. According to him marketable surplus also increased during green revolution. He provided some considerable evidences in this regards:

a. Net Income per acre

Income of small farmer increased much rapidly than the income of large farmers, which is clear from the following table.

Years	Net Income Rs./acre	
	Small farmer	Large Farm
1965-66	262.4	132.3
1970-71	581.4	207.0
Increase	221.6%	156.4%

Sources: Pakistan Economic Survey, Ministry of Finance (Various Issues).

The small farmers got more income and they raised their living standard, nutritional level and increased using HYVs and new form technology.

b. Productivity Index

The productivity index of small farmer ended up with higher productivity level than large farmer after the green revolution. Which is evident from the following table.

Years	Productivity Index	
	Small farmer	Large Farm
1965-66	100	100
1970-71	222	156
Increase	122%	56%

Sources: Agriculture Year Book (Various Issues)

This increased productivity enhanced small farmers bargaining power with the traders and they were able to get better prices of their products.

c. Percentile Land Shares

Not only the distribution of income improved but also there was a fair distribution of land holding. We can see this as:

%age of Farm	Cumulative Land Share	
	1960	1972
Lowest 10%	0.46%	0.88%
Lowest 50%	9.72%	16.09%
Lowest 90%	53.76%	59.14%

Sources: Agriculture Year Book (Various Issues)

d. Income Distribution Improved Between Different Tenorial Classes

Three types of peoples work on the land:

- . Landlord
- . Tenants
- . Owners cultivator

The following table show the impact of green revolution on these classes:

Years	Net Average Farm income (In Rupees)		
	Big landlord	Peasant Proprietor	Tenants
1965-66	4459	1527	1208
1970-71	8300	3532	2916
Increase	86%	102%	141%

Source: Agriculture Year Book (Various Issues)

From this it is clear that the tenants benefited more from green revolution than the other two classes meaning positive impact of green revolution towards poor:

e. Daily Wage of Rural Workers

Daily wages of rural workers increased remarkable during the period of green revolution, which is evident from the following table.

(Constant Prices of 1959-60)

Years	Real Daily Wage (Rs.)	Growth (Annual Growth Rate)
1951-52	1.75	-
1959-60	2.02	1.81
1964-65	2.34	2.99
1969-70	3.44	8.01
1974-75	4.68	6.35

Source: Pakistan Economic Survey, Ministry of Finance (Various Issues).

We can see that real wage, which is a measures of standard of living increased during green revolution.

f. Annual Growth rats (%) of agriculture commodities

Years	Balochistan	NWFP	Sindh	Punjab	Pakistan
1959-60 to 1964-65	19.9		7.8	7.7	5.0
1964-65 to 1969-70	7.2		2.2	7.3	7.1
1969-70 to 1974-75	2.7		3.7	4.7	2.2
1974-75 to 1979-80	5.2		2.6	5.5	3.5

Source: Agriculture Year Book (Various Issues)

The growth rate of agricultural commodities was not concentrated only in Sindh and Punjab provinces; rather NWFP and Balochistan were also in the similar track. For example, the growth rate of agricultural commodity in Balochistan during 1964-1970 was 7.2% as against 7.1% in Punjab and 7.3% in Sindh. So we can say that

green revolution did not increase regional disparities and effect of green revolution was almost same on all the four provinces.

g. Rural Income distribution

Years	Commulative Income Shares (%)		
	Lowest 10%	Lowest 50 %	Lowest 90%
1959	3		26
1968-69	4		30
1971-72	4		30

Source: Agriculture Year Book (Various Issues)

These figures show that rural income distribution in general was also improved during green revolution.

Impact on Employment

The introduction of the new high yielding wheat and rice technology has resulted in an increase in the demand for labor. The net effect of the increase in demand for labor lead to a significant rise in real wages.

The increase in labor use has been due to greater labor utilization per unit of cropped area, and in some cases to high cropping intensity. Even mechanized farms typically were utilizing increased labor inputs per hectare although simulation results conducted by some researchers indicate that labor inputs per hectare might be expected to decline substantially under fully mechanized techniques combined with adoptions of the HYV technology.

At this stage it seems more accurate to view the growth of tractors mechanization, in areas such as the Punjab, as an economic response to the rising demand for labor associated with the intensification of crop production rather than as an autonomous source of technological change leading to labor displacement.

Annual Growth Rate of Job Opportunities

Period	Annual growth rate due to increase			Total growth rate
	Crop land	Labor input	Cropping Pattern	

1964-68	1.88	0.69	0.72
1968-72	0.77	0.73	0.20
1972-76	1.32	0.73	0.75
1964-76	1.32	0.72	0.56

Source: Agriculture Year Book (Various Issues)

The labor force employment situation in the crop-production sector consistently improved during 1960s and 1970s. The improvement of employment in the crop-production sector was mainly induced by Green Revolution due to following reasons:

- a. Increased multiple cropping
- b. Augmented farm productivities
- c. Shift of cropping pattern in favour of more valuable labor-intensive cash crops.
- d. Directly added, labor inputs per acre except in the case of tractors.
- e. New jobs creation both within, and outside agriculture.

According to Gill who has done a USAID study, the labor requirement increased in agriculture by 20-40% due to more harvesting and weeding, introduction of HYV, more tube well installation and greater fertilizer use.

There were also some indirect effects of Green Revolution, such as:

- a. Rapid development of tube well related small-scale industries.
- b. Repair shops for tube well, tractor and other machinery.
- c. Electric transmission lines.
- d. Distribution centers for fertilizer and diesel oil.
- e. Transportation services.

Evidence:

It has been seen that tube well manufacturing industry provided 8000 jobs in industrial towns of Pakistan, while farm equipment manufacturing provided about 106,000 jobs in Pakistan at the end of the 1960s. Although, the number of small farmers, tenants and permanent agricultural workers has declined between 1960 and 1972, yet this decline could not be attributed to deficiency in demand for labor under green revolution. Instead it seems to be the result of shift from permanent hired labor to greater use of casual and family labor, and the movement of a number of tenants and small farmers from agriculture to non-agricultural jobs. Thus green revolution has been responsible for creating more jobs with important implications on rural wage rates.

Impact on Social and Political Environment

The economic effects of the green revolution were easily observable, with growing output, increasing income and more employment opportunities. However, the Green Revolution also had social and political impact.

There was a change of attitude towards education, which was necessary for appropriate utilization of mechanical and chemical technology. It also led to net enhancement of capabilities of agriculturists. They became increasingly aware of the importance of education in their new challenging environment for better farming through mastering over new technologies. However, the emphasis upon the social sector was not so significant in the 1960s.

It is argued that the structure of technology and the direction of credit flows themselves reflect the influence of large landowners and capitalist farmers on public policy. The green revolution was the first big shock that abruptly changed the growth path of agriculture in Pakistan. There is little doubt that it radically transformed the economic, political and social directions of the country and established deeper, well-entrenched, capitalist centered production. There was a process of the development of capitalist farming, which generated political controversies in Pakistan rural society.

4 Policy and Green Revolution

Green Revolution occurred with the use of high quality inputs such as high yielding varieties (HYV) fertilizer, pesticides, insecticides and new mechanical technology in different areas. Special credit goes to the discoveries and inventions of these inputs. However, the government ensured the availability of these inputs and served as a supporting institution for this break-through as explained below:

- . Availability of water was ensured by constructing new canals and dams.
- . Incentive prices were also offered to the farmers for their production. This was done through the support price programme, which assured the farmers a market for their products at a guaranteed floor price. This reduced the element of risk and uncertainty and created a conducive atmosphere for stepping up agricultural production.

- . Favorable terms of trade for agriculture in the form of liberal input subsidies and active price supports for major agricultural commodities were key factors in the promotion of Green Revolution.
- . Subsidies on key agricultural inputs like chemical fertilizers, diesel oil, electricity, insecticides and tube well equipment were given.
- . Extensive service programme was launched to transfer the improved technology to the farmers.
- . Private investment was mainly directed in tube wells, machinery and equipment.
- . A favorable trade policy was adopted for agriculture development.

Weaknesses of the Public Policy

We can say that public policy played an important role to bring agricultural break through in the country. However, there were some weaknesses from the government side, due to which its effect remained short run and we could not develop our agriculture on long run basis. Some policy gaps in the Green Revolution period where as under:

- . No proper arrangement was made to change the conservative thinking pattern of the farmers.
- . Even distribution of credit to all the formers especially the weak and small was not ensured.
- . Marketing facilities could not be provided to farmers to get better reward of their hard work and labor.
- . Storage capacity was not increased against corresponding multiplied agricultural produce.
- . Stability in agriculture prices not be maintained.
- . Opportunities to reinvest the surplus in agriculture sector shrinkd because government did not try to create the favourable circumstances to reinvest surplus.
- . Proper agro-based industry was not developed, which would absorb the agricultural output, and create its further demand.

Keeping in view weaknesses and strengths of the government policies for achievement of high growth level of agriculture produce and importance of the agriculture sector which not only feeds a large population of the country but also provide a primary base for secondary marketing activities, a viable production model is required. In order to achieve these objectives a comprehensive, indigenous, and efficient model of Agricultural is being proposed.

Model of Agriculture Development

A model based on two-pronged strategy comprising achievement of full employment level and optimal production level may be adopted for long run agriculture development in Pakistan. It is an efficient economical and effective model which is devised according to the local circumstances and nature of different available factors of production. It is a viable and indigenous model for achievement of government objectives of long run development with accelerated pace.

1. Achievement of Full Employment Level

This strategy on one hand is based on the achievement of full employment level of resources such as human resources and other factors of production. The unemployment of different factors of production, which are available in raw form, may be minimized to zero level. The wastage of natural resources, which may also be curtailed, and alternatively appropriate exploitation for enhancement of the overall production is done. All the factors and circumstances, which helped in substantial growth of agriculture sector in the short run, may be incorporated in Pakistan's agriculture for long run development strategy on perpetual basis. Following steps may be taken to increase agricultural production with the optimal choice of use of inputs in appropriate manner.

a. Barren Land may be exploited to Full Employment Level

A large part of waste land such as government unoccupied by active farmers, land unutilized by big land lords, land utilized by resources less land owners, big area of common land not properly utilized and large disputed land and waste land of the river beds and forest land etc. needs to be exploited to full potential.

b. Water Resources may be used by curtailing their wastage

A huge quantity of water wastes in to the sea, which could otherwise have been utilized through construction of dams, bar-

rages, lakes etc and extension of water channels in different areas for expansion of irrigation network in order to have manifold agricultural produce.

c. Full employment of human resource

A large quantity of unemployed human resources may appropriately be utilized with creating more room for their employment in the agricultural sector. Even the multiple effect of above two variables of the strategy may multiply jobs opportunities for different skilled and unskilled labors.

1. Achievement of Optimal Production Level

The optimal production level of the agriculture sector may be achieved by removing different exogenous and endogenous technical inefficiencies from the system. Different factors playing catalytic role and booster role may be used for accelerating growth in the agricultural development. In this regard, following steps may be taken to achieve optimal production level.

- (1) Use of HYVs of different crops.
- (2) Availability of advanced technology on cheaper cost.
- (3) Reduction in the prices of inputs.
- (4) Attention on research and development
- (5) Strengthening the agriculture extension services through demonstration at the spot
- (6) Strengthening the media and information process [use of IT]
- (7) Improving the marketing facilitating
- (8) Provision of infrastructure such as roads, electricity etc.
- (9) Provision of storage and credit facilities especially to small farmers.
- (10) Provision of government subsidies to agriculture inputs.
- (11) Improvement/provision of food processing units in rural areas.
- (12) Increase in export of surplus food.
- (13) Improvement in early disposal of food grain and other agriculture produce.

- (2) Provision of training facilities in agriculture fields especially for uneducated farmers.

5. Concluding Remarks

After considering all aspect of the Green Revolution, it may be said that in 1960s and 70s the agricultural production increased rapidly. The introduction of HYVs of wheat

and rice in the late sixties was one of the major technological improvements experienced by agriculture in Pakistan. This agricultural break-through passes through a number of stages and it affected almost every aspect of the agriculture and rural development.

Despite difference of opinion on its impact and nature of beneficiaries there is a consensus

that it had a positive impact on the country's economy. Due to this Revolution, there was an

increase in GDP, increase in productivity and more employment opportunities for the masses.

It is an established fact that the green revolution a positive role in the agriculture and rural development of Pakistan. It also played a significant role in our social and political structure that affected the economy later on. However, there were few weaknesses

in the revolutionary process which hampered development of our agriculture on the long

run basis and made it a short run phenomenon. There is a need to overcome these weaknesses; to develop our agriculture on long run basis. The adoption of development model that is efficient, economical and effective, may lead to long run development of the agriculture sector.

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