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9

Lessons in Agricultural Development — Pakistan

In contrast to earlier writings on economic growth, which concentrated mainly on industrialization, recent works show an almost universal acceptance of the key role that agriculture must play in the development process.[1] Yet in spite of this emphasis, there are startlingly few agricultural success stories among the less developed countries. The agricultural bottleneck unfortunately remains one of the largest and most widespread development problems of the 1960's.

Compared with the general stagnation in the agricultural sector of most underdeveloped countries, the recent growth of rural Pakistan makes an extraordinary case study. In the first dozen years of her separate existence (1947–59) Pakistan was typical of much of the underdeveloped world. Many of her initial difficulties can be traced to the political and social upheavals accompanying partition. The rest, however, involved the familiar pattern of reliance on an age-old agricultural technology and of constraints on key agricultural inputs such as water and fertilizer. The result was that the agricultural sector, which comprised about 80 percent of the population and contributed about 55 percent of the GNP, grew at a rate less than the expansion of population.

During the Second Plan period of 1960/61 to 1964/65 the agricultural picture changed radically. (See Table 9.1.) The annual

1. See, for example, J. W. Mellor and B. F. Johnson, "The Role of Agriculture in Economic Development," *American Economic Review* (September 1961), pp. [illegible] W. H. Nicholls, "An Agricultural Surplus as a Factor in Economic

Table 9.1. Growth of agricultural value added in all Pakistan, 1947/48 to 1964/65 (1959/60 prices).

Items	Trend rates of growth per annum[a]	
	1949/50 to 1958/59	1959/60 to 1964/65
Total agriculture	1.1	3.2
Major crops	1.0	3.6
Minor crops	−1.1	3.6
Livestock	2.2	1.9
Forestry	2.3	3.2
Fishery	6.2	4.9

Source: Government of Pakistan Central Statistical Office, *Statistical Bulletin* (August 1965), pp. 952–33.

[a] Least-squares estimate of "b" in the equation $\log Y = a + b \cdot \text{time}$.

agricultural growth rate nearly tripled, rising from 1.2 percent to 3.2 percent, agricultural exports expanded rapidly, and there was a surge in rural private investment. A closer examination of Pakistan's rural transformation is therefore important, not only for an understanding of the past and prospective development of the world's fifth largest country, but also for the lessons it provides for other countries.

Following is a detailed analysis of the magnitude and sources of the recent rural growth. The analysis, which focuses on the Second Plan period, deals separately with each of the two provinces. The monsoon rice-jute agriculture of East Bengal is radically different from the irrigated wheat-cotton-rice culture of West Pakistan; in addition, the factors that accounted for most of the growth in the two regions appear to be quite dissimilar. In both regions, however, government policy played a key role, and particular attention is paid to the policy variables that made the rapid changes possible. The final portion of the chapter consolidates the lessons learned in Pakistan's two provinces during the First and Second Plan periods and indicates their implications for Pakistan's Third Plan as well as for the rest of the developing countries.

WEST PAKISTAN: MAGNITUDE AND SOURCES OF RECENT GROWTH

The general growth in West Pakistan agriculture has been an integral part of the two-period national agricultural performance.

During the years 1947/48 to 1958/59 there were considerable year-to-year fluctuations, but few of the major crops showed significant increases. "Stagnant" was the adjective most often used to describe the rural environment, and to predict a sudden upturn in production would have appeared rash.

But a sudden upturn did, in fact, take place in the 1959/60 to 1964/65 period. One indication of the surge is given by the trends in the national accounts data shown in Table 9.2. From these series

Table 9.2. Growth of value added in West Pakistan agriculture, 1959/60 to 1964/65 (1959/60 prices).

Items	Percent per year[a]
Total agriculture	3.8
Major crops	4.9
Minor crops	4.8
Livestock	1.9
Forestry	3.9
Fishery	9.7

Source: Computed from Government of Pakistan Central Statistical Office, *Interim Report of the National Income Commission* (September 1964), p. 106; 1964/65 data obtained directly from the Central Statistical Office.

[a] Least-squares estimate of "b" in the equation: $\log Y = a + b \cdot \text{time}$.

it is clear that the 4.9 percent annual expansion of "major crops" played the decisive role. Because of their growth and absolute level of importance, and also because the data are much more reliable, most of the West Pakistan analysis will focus on the major crops produced in the Indus Basin.[2]

A more disaggregated picture of the widespread improvements within the crop portion of GNP is given in Table 9.3. The computations show that virtually all commodities recorded a sizable

2. Data for the livestock sectors of both East and West Pakistan are particularly suspect. See mimeographed Pakistan Planning Commission papers by Walter P. Falcon and Carl H. Gotsch: "Growth of Livestock Products in East Pakistan during the Second Plan Period" (May 1965); "Recent Growth of the Livestock Sector of West Pakistan" (May 1965). The fact that livestock contribute as much to GNP as do combined large- and small-scale manufacturing underscores the importance of improving information about the animal-product sector. For discussion of data on the major crops, see Walter P. Falcon, "Reliability of Punjab Agricultural Data," *Statistical Papers* (Karachi: Institute of Development Economics, 1962), and "Farmer Response to Price in an Underdeveloped Area: A Case Study of West Pakistan," unpub. Ph.D. dissertation, Harvard University, 1962.

Table 9.3. Crop production in West Pakistan, 1959/60 to 1964/65.

Crop	Average production (thousands of tons)	Annual rate of growth[a] (percent)
Rice	1,127	7.8
Wheat	4,021	3.7
Bajra	375	6.9
Jowar	247	3.7
Maize	485	3.4
Barley	120	−6.2
Gram	614	—[b]
Other pulses	180	—[b]
Sugarcane	14,757	10.6
Rape, mustard	236	—[b]
Cotton seed	682	7.6
Potatoes	123	9.0
Onions	129	12.0
Other vegetables	739[c]	—[d]
Fruits	980[c]	—[d]
Cotton lint	1,934[e]	7.1
Tobacco	152[e]	6.7

Source: Computed from Government of Pakistan Planning Commission, *Handbook of Agricultural Statistics* (June 1964), pp. 70ff.; 1964/65 data supplied by West Pakistan Department of Agriculture.

[a] Least-squares estimate of "b" in the equation: $\log Y = a + b \cdot \text{time}$.
[b] No significant trend at the 5 percent level.
[c] For the years 1960/61 to 1963/64.
[d] Insufficient data for trend calculation.
[e] Production of cotton lint given in thousands of bales, production of tobacco in millions of pounds.

and consistent growth during the six-year period. Whereas these averages and trends are in themselves impressive, they serve mainly to pose the major question: was the 27 percent trend growth in crop output during the Second Plan period a weather phenomenon, or was there a more fundamental structural transformation accounting for most of the growth? In attempting to answer this question it is useful to examine first the increased use of improved inputs that might explain the growth — that is, to provide a rather crude but descriptive agricultural production function for West Pakistan.

Water. Any analysis of agriculture in West Pakistan must begin with a study of the irrigation system, for except in the relatively small rain-fed area in the northern portion of West Pakistan, the agriculture of the region directly depends on irrigation water from the world's largest irrigation network. This system, the northern

portion of which was installed between 1880 and 1930, delivers about 59 million acre feet of irrigation water (m.a.f.) annually to a cultivated area of about 26 million acres. However, production in the Indus Basin area is hampered by water deliveries that are low relative to the area commanded and by the considerable variation in canal discharges. As a result, water is the key input in the basin region, which produces about 80 percent of the total provincial output.[3]

Prior to 1957/58 individual farmers could do little to supplement their meager water supplies. The public canal system was outside the purview of individual decisions, and traditional means of supplementing water supplies, such as the Persian wheel, were too inefficient for large-scale water development. Furthermore, there was relatively little increase in public water supplies at the field level between 1947/48 and 1957/58. To be sure, marginal improvements were effected in the existing canal system, several canals were run somewhat above their designed capacity, and a start was made on several major barrage areas in southern West Pakistan.[4] But these were in part offset by the vagaries in canal flows resulting from the Indus Basin dispute with India.

One irrigation program in the earlier period does, however, deserve special comment. For approximately thirty years the Department of Agriculture had been sinking a limited number of small mechanical tubewells for private farmers.[5] These wells were designed to tap the high-quality underground aquifer or reservoir filled by the leakage of water from canals and rivers. Although the water delivered by the wells was only marginally important — the Department drilled only six hundred wells between 1950/51 and 1954/55 — these installations helped to spread a new water tech-

3. For the importance of irrigation water as an input to production, see Walter P. Falcon and Carl H. Gotsch, "Relative Price Response, Economic Efficiency, and Technological Change: A Case Study of Punjab Agriculture" in Gustav F. Papanek, ed., *Government Policy and Private Enterprise in Pakistan* (Cambridge: Harvard University Press, 1967). Only about 25 percent of the wheat, 1 percent of the cotton, 7 percent of the rice, and 2 percent of the sugarcane are grown on a rain-fed basis in the former Punjab.

4. Although the Guddu and Ghulam Mohammed Barrage projects were begun earlier, little agricultural development was effected by them before the Second Plan period; most will not occur until the Third Plan period.

5. For history, see Ghulam Mohammed, "Private Tubewell Development and Cropping Patterns in West Pakistan," *Pakistan Development Review* (Spring 1963), pp. 1–53.

nology, which was to play a critical role in the Second Plan period.[6]

This description of irrigation in West Pakistan gives only the scantiest picture of a complicated system. Nevertheless, it suggests two important points: that irrigation water was an input with a very high marginal-value product, especially in certain critical periods, and that a tubewell technology, known for years on the subcontinent, had in the First Plan period begun to be disseminated in West Pakistan to farmers *and* to private firms in the business of sinking wells.

Both of these factors were probably necessary conditions for one of Pakistan's most amazing developments during the Second Plan period — the surge in private tubewell installations.[7] In 1959/60 about 1,350 tubewells were installed, of which approximately two-thirds were sunk by private drillers using a simple percussion technique. By 1963/64 the number of annual installations had accelerated to 6,600. (See Table 9.4.) As of July 1, 1965, it was estimated that a total of over 31,500 private tubewells had been installed, primarily in the cotton and rice regions of the former Punjab. Of this total, about three-fourths were powered by diesel engines, the remainder by electricity.[8]

The private tubewells installed were of various shapes and sizes. From a technical engineering point of view many were not very efficient, but they all had one point in common: they were extraordinarily profitable. Installation costs ranged between Rs.5,000 and Rs.12,000, with the shallower electric wells in the rice area at the lower end of the scale and the deeper diesel wells in the cotton area relatively more expensive. Most of these wells were installed

6. For an excellent nontechnical discussion of tubewells in West Pakistan, see R. Revelle, "Water," *Scientific American* (September 1963).

7. Another important factor was the liberalized import policy. Whereas most of the pumps and engines were manufactured locally, the freeing of basic commodities such as pig iron meant that the small shops producing the equipment could acquire the necessary inputs. See W. P. Falcon and S. R. Lewis, Jr., "Economic Policy and the 'Success' of Pakistan's Second Plan" (mimeo, Harvard Center for International Affairs, November 1966).

8. The rapid acceleration in installations was mostly unexpected and unnoticed. As a result, there was some initial controversy about the tubewell data cited here, which were acquired in a census undertaken by the Institute of Development Economics in conjunction with the Department of Agriculture. Later recounts in proposed public tubewell project areas and cross-checks with land revenue and electrical connection records generally verified the accuracy of the original I.D.E. survey.

Table 9.4. Location of private tubewells by district, summer 1964.

District	Total tubewells installed	Total electric tubewells	Total diesel tubewells	No. installed in 1963/64
Gujrat	719	299	420	274
Sargodha	352	181	171	109
Lyallpur[a]	1,063	291	772	301
Jhang	1,540	448	1,092	304
Mianwali	228	107	121	60
Sialkot	2,458	434	2,024	503
Gujranwala[b]	4,234	1,270	2,964	1,170
Lahore	1,607	856	751	504
Montgomery	4,055	1,175	2,880	1,049
Multan	5,148	624	4,524	1,345
Mozaffagarh	443	—	443	142
D. G. Khan	220	—	220	40
Bahawalpur	398	26	372	122
Bahawalnagar	273	3	270	87
Rahimyar Khan	443	9	434	177
Sheikhupura[c]	460	117	343	125
Subtotal	23,641	5,840	17,801	6,312
Former Northwest Frontier Province[d]	359	310	49	88
Southern Zone[d]	1,000	50	950	200
Total private tubewells	25,000	6,200	18,800	6,600

Source: Institute of Development Economics Survey, completed by Department of Agriculture field staff.

[a] Excludes Jaranwala Tehsil, an administrative subdivision of a district, which falls in SCARP I (the first Salinity Control and Reclamation Project).

[b] Excludes Hafizabad Tehsil, which falls in SCARP I, but includes Ferozwala Tehsil of Sheikhupura District.

[c] Estimated number of private tubewells in Sangla Hill and Sheikhupura Tehsils of Sheikhupura District, Hafizabad Tehsil of Gujranwala District, and Jaranwala Tehsil of Lyallpur District. The major parts of these tehsils are included in the SCARP I project area.

[d] Estimated.

by cultivators with 25 acres or more, but there were important exceptions. In the Gujranwala area, for example, perhaps 20 percent of the installations were made by town investors who had little or no land.[9] In addition, there was widespread selling of water as smaller farmers attempted to utilize more fully the capacity of their tubewells.

9. Tipton and Kalmbach Inc., *Salinity Control and Reclamation Program No. 4 Upper Rechna Doab, West Pakistan* (West Pakistan Water and Power Development Authority, June 1965), p. II-3.

By any standard the benefits produced by the tubewells were large, both to the individuals who installed them and to the entire economy. A typical well averaged about one *cusec* in delivery; that is, it could produce about 2 acre feet of water in a 24-hour day.[10] Annual utilization averaged about 2,400 hours, or about 200 acre feet per well. In total, therefore, the estimated 25,000 wells installed during the Second Plan period increased the annual rate of irrigation water available at the field level by about 5 million acre feet.

The 25,000 wells represented an initial investment on the order of Rs.250 million, a sum thought impossible in West Pakistan's traditional agriculture. This investment was an important stimulus to the small-scale machine industry. Whole streets in such cities as Multan, Lyallpur, Lahore, Gujranwala, Sialkot, and Daska are now lined with shops manufacturing pumps and engines, and the skill, ingenuity, and training demonstrated in these shops have been impressive.[11]

Measured in value terms, the returns from the wells were very large. Assuming Rs.1,100 per year as average depreciation charges, and approximately Rs.3,000 per year as operating expenses, the cost per acre foot of water averaged about Rs.20. In the case of cotton, where approximately 2.5 acre feet of water per acre were typically used, the total water cost approximated Rs.50 per acre. The gross return was on the order of Rs.240 per acre, clearly a profitable venture even if the other small costs of production were included.[12] In several more detailed sets of calculations Ghulam

10. Harza Engineering Co., *Reconcissance Survey of Private Tubewells* (West Pakistan Water and Power Development Authority, February 1965), appendix, table 1.

11. Daska is a particularly interesting town in this respect. A visit in 1961 revealed only a few machine shops. By mid-1965 Daska had become one of the main diesel-engine centers: over 120 shops were engaged in production, and output totaled about 250 engines per month.

12. The figure Rs.240 assumes 8 maunds of seed cotton per acre at Rs.30 per maund. (One maund = 82.2 pounds; one Rs. = $0.21.) An alternative calculation of the marginal revenue product of tubewell waters was made by Tipton and Kalmbach, Inc., *Salinity Control*, p. F-26. Using a linear programing framework, they estimated the value of an additional acre foot of water distributed October–May and November–April to be Rs.106 and Rs.97, respectively. The so-called Revelle Report (*Report on Land and Water Development in the Indus Plain* [Washington, D.C.: The White House 1964]), p. 428, also using a programing technique, estimated the value of water at Rs.66 per acre foot for Kharif (spring-planted) season. In their Tarbela Report for Priority Area 1, the Harza Co. obtained even higher estimates of value—188 rupees per acre foot at the dam, or about 270 rupees at the head of the watercourses. Although there are some differences in assumptions behind these estimates, all the calculated benefits greatly exceed the capital and operating charges of pumping water.

Mohammed estimated that the annual net income from tubewell installations ranged between Rs.3,000 and Rs.17,000, depending on the size of farm and the type of installation; he also reported that the investment payout period was generally less than two years.

General profitability was one major reason for the rapid spread of tubewells. Their acceleration in numbers in the 1960's was also aided by public policy. Rates of return, always considerable, were increased by relatively higher and more stable prices for agricultural products, by lower-cost power as a result of the government's electrification program, and by increased availability of pump materials under the import liberalization program. An acceleration in tubewell numbers might have been expected in any case if they followed the typical pattern of innovation in agriculture, but the increase in profitability speeded the process, as did the demonstration effect of the public tubewell development program.

The exact contribution of the private tubewells to the growth of aggregate agricultural GNP is difficult to measure. Primarily, the difficulty is one of sorting out from short series of aggregated data the three main effects of tubewells: increasing the intensity of cultivation by decreasing fallow, improving the yields per acre, and changing the composition of output, generally toward higher-valued products. Ideally, a measure for each component would be as follows. In the base year t for the ith crop:

$$\text{Production}_{ti} = I_{ti} \cdot C_{ti} \cdot Y_{ti} \cdot A_t$$

where

P = gross production of crop i
I = overall intensity of cultivation (in percent)
C = composition of the cropping pattern (in percent)
A = commanded area
Y = yield per acre

After the installation of the tubewells and assuming, say, year $t + 5$:

$$P + \Delta P = (I + \Delta I) \cdot (C + \Delta C) \cdot (Y + \Delta Y) \cdot A$$

$$\Delta P = \underbrace{(\Delta I \cdot C \cdot Y \cdot A)}_{\text{Intensity effect}} + \underbrace{(\Delta C \cdot I \cdot Y \cdot A)}_{\text{Composition effect}} + \underbrace{(\Delta Y \cdot I \cdot C \cdot A)}_{\text{Yield effect}}$$

In any case, at the start of the Second Plan period the revised Master Plan indicated that the total field availability of irrigation water (wells plus surface) in the Indus Basin was approximately 59 million acre feet — 34 m.a.f. in the Northern Zone and 25 m.a.f. in the Southern.[13] Therefore, private tubewells alone during the Second Plan accounted for about a 9 percent increase in irrigation water supplies. This increase in water supplies probably had an equally direct impact on irrigated crop production. It thus appears that private tubewells accounted for about one-fourth of the total 27 percent increase in the value of crop output.[14]

This last assumption implies a constant marginal productivity of water with increased supplies. Such a proposition appears reasonable over a 10 percent range, given the large amounts of uncultivated land and underemployed labor and bullocks available in both seasons, the low yields, the cropping pattern changes that this water allowed, and the increased flexibility in total water use that was possible with tubewells. For example, the application of water at certain critical stages because of a tubewell installation was likely to have a very high return. These factors should have been more than sufficient to offset any tendency toward diminishing returns that might have been expected if water supplies had been increased without changing the time distribution. Survey work now in progress in West Pakistan by the World Bank should provide more light on this subject, but pending its completion, the proportionality assumption appears reasonable.

In summary, private tubewells played a critical role in the increased agricultural performance of West Pakistan. During the Second Plan, besides their overall contribution to the gain in the value of major crops, their concentration in the cotton and rice area of the Northern Zone were major reasons for the spectacular recent growth of these commodities.[15] Moreover, the wells gave tangible

13. For the unrevised figure, see Harza Engineering Co., *Program for Water and Power Development in West Pakistan through 1975* (West Pakistan Water and Power Development Authority, January 1964), p. 41.

14. This calculation assumes that 80 percent of gross value of crop production comes from irrigated lands. Thus, $.80 \times .09 = .072$, or about one-fourth of the 27 percent.

15. Multan Division, for example, produces about 40 percent of Pakistan's total cotton. The 10–15 percent annual rates of growth in cotton during the Second Plan were highly correlated with the installation of over 10,000 private tubewells in the region. The rapid growth of rice in the Gujranwala area can be accounted for similarly. W. P. Falcon and C. H. Gotsch, "Agriculture in West Pakistan: Past Progress and Future Prospects" (mimeo, Pakistan Planning Commission, December 1964), pp. 14–15 and Appendix D.

evidence of the rural resources that were available for high-return, nontraditional investments in agriculture.

Although the private tubewell development is especially interesting because of its large, unplanned nature, it was definitely not the only element in the water-improvement program of the Second Plan. Indeed, the combined *public* tubewell and surface water developments were of almost equal importance. The first Salinity Control and Reclamation Project, covering some 1.2 million acres (SCARP I), reached completion in 1961. It was the first of many contemplated projects in a widespread public program in the field of water development and salinity control that has attracted worldwide attention.[16]

SCARP I consisted of approximately 2,000 deep turbine tubewells, which averaged about 3 cusecs in delivery. In 1963/64 these wells supplied more than 2.5 m.a.f. of supplemental water. This water was pumped in part for the leaching of salts and in part for the consumptive use of plants. The increased acreage, the improved yields, and the changes in the composition of output that the public tubewells permitted were the main factors in approximately doubling output at constant prices (see Table 9.5).[17] These changes in output raised the incomes of cultivators, though the suddenness and concentration of the water input severely strained the marketing, storage, and transportation facilities of the area. In addition to SCARP I, approximately 0.5 m.a.f. of irrigation water was delivered in the last year of the Second Plan by public wells in Chaj Doab (SCARP II).

There were also a few public tubewells operative in the Southern Zone near Khaipur. In the former Sind, however, neither public nor private tubewells were significant factors. Several reasons account for this, the most prominent being the limited area (approxi-

16. See, for example, Revelle, "Water"; the Revelle Report; A. V. Karpov and R. Nebolsine, "Indus Valley: Key to West Pakistan's Future," *Indus* (December 1960), pp. 2–10 (January 1961), pp. 4–13 (March 1961), pp. 4–10 (April 1961), pp. 9–18 (May 1961), pp. 4–20 (November 1961), pp. 4–32 (January 1963), pp. 7–14.

17. For a fuller discussion, particularly of the impact of extension activities in the project area, see U.S. Agency for International Development, "Progress and Evaluation, Salinity and Reclamation Project Number One (SCARP I), West Pakistan" (mimeo, April

Table 9.5. Increase in net value of production resulting from tubewell installations, SCARP I.[a]

Crops	Irrigated crops (thousands of acres)		Net value of production (thousands of Rs.)		
	Before tubewells	1963/64	Before tubewells	1963/64	Net change (percent)
		Rabi[b] *(fall-planted)*			
Wheat, barley	179.2	381.3	8,958	24,787	+178
Pulses	13.4	9.3	323	327	+ 1
Oilseeds	25.4	14.5	330	305	− 8
Berseem	83.2	181.5	29,129	71,642	+146
Fruits, vegetables	5.0	11.3	3,250	7,359	+126
Miscellaneous	8.0	3.2	144	58	− 60
Subtotal	314.2	601.1	42,134	104,478	+148
		Kharif (spring-planted)			
Rice	104.2	157.3	8,339	14,465	+ 74
Cotton	106.5	91.2	5,964	6,749	+ 13
Sugarcane	61.5	78.9	12,316	23,681	+ 92
Maize	9.3	57.1	547	5,312	+870
Kharif fodder	84.9	134.7	12,308	22,494	+ 82
Miscellaneous	6.6	35.5	117	639	−470
Subtotal	373.0	554.7	39,591	73,340	+ 85
Grand Total	687.2	1,155.8	81,725	177,818	+118

Source: Government of West Pakistan Directorate of Land Reclamation, "Progress of Reclamation in SCARP I (mimeo, November 1962); Government of West Pakistan Land and Water Development Board, "Progress Report for the Period October 1963 to September 1964, SCARP I" (mimeo, 1964); Ghulam Mohammed, "Private Tubewell Development and Cropping Patterns in West Pakistan," *Pakistan Development Review* (Spring 1965).

[a] This table implicitly assumes that weather and other factors were the same in the before-and-after calculations. Although the assumption is not strictly true, the differences do not appear to have been large.

[b] The proportionately large increase in winter crops results primarily from the fact that a substantial part of the area received only summer water prior to the installation of tubewells.

mately 15 percent) underlain with nonsaline ground water directly suitable for irrigation purposes. Also important was the fact that much of the former Sind suffers from regressive tenure arrangements, which tend to discourage investment by the individuals who actually cultivate the land.

The contribution of the public tubewells to agricultural growth, as in the case of the private wells, can not be determined precisely. However, the SCARP I data indicate that increases in output were somewhat less than proportional to improvements in water supplies. Several reasons may be adduced for this nonlinearity. First, the project was too limited, and tubewell capacity did not exist for the critical sowing periods to permit the planting of maximum acreages. This factor, coupled with the pricing of tubewell water on an acreage rather than volume basis, gave rise to extremely high seasonal applications of water per acre. Studies by the World Bank consultants indicated that irrigation deltas of as much as 100 inches per acre were being applied to rice, and 60–70 inches to berseem (Egyptian clover). With these high deltas, returns were bound to diminish sharply at the margin. Second, the SCARP I area was a severely waterlogged, saline area, and that portion of the water used primarily for reclamation purposes had a very low direct effect on production. Therefore, even though public tubewells increased total irrigation supplies in West Pakistan by about 5 percent, they increased output by only about 3 percent during the Second Plan period.

Between 1960 and 1965 progress was also made on a number of public surface-water projects. Included in this category are the Guddu, Ghulam Mohammed, and Taunsa Barrage developments and a number of smaller schemes outside the Indus Basin. Preliminary estimates indicate that approximately 0.8 million acres of new area were affected.[18] In addition, about 2 million cropped acres received increased irrigation deltas. In total, an increase of about 3 m.a.f. of water is estimated to have been utilized for crop production from these sources. However, a firm conclusion must await the final updating of irrigation data.

Although the figure 3 m.a.f. represents approximately 6 percent of the total irrigation supply of the Indus Basin, this water clearly had a less-than-proportionate effect on output. Unlike tubewell installations in settled areas, the development and settlement of new agricultural lands involve relatively long time periods. In the Ghulam Mohammed Barrage area the problems have been particularly difficult, and reported yields in that area are much lower than

18. Pakistan Planning Commission, "Targets of Crop Production for the Third Five Year Plan" (mimeo, January 1965), table 2.

production is due to the 4–5 million acre increase in the area treated with plant protection. When a 15 percent yield factor is applied to the approximately 15 percent additional cropland covered, over 2 percent of the growth in gross production becomes directly attributable to plant-protection measures. In addition, these measures helped to "save" increases obtained from the other factors.

Much has been written about the necessity for, and potential of, improved seed varieties that are fertilizer responsive.[22] Whereas the future looks very promising in West Pakistan, especially in the case of wheat, most observers agree that improved seeds have been only marginally important in explaining the recent growth performance.[23] That seed improvements did not progress farther may be explained by the lack of good foundation stock for many commodities, bureaucratic difficulties in multiplying good seeds, and several transfers of the responsibility for distribution among government agencies. As a result of all these difficulties, most of the seed improvements came from farmer-to-farmer transfers of relatively better *desi* (local) varieties.

Limited survey work indicates that about 3 million additional acres (1965 relative to 1960) were sown with locally improved seeds during the Second Plan. If a 10 percent yield factor is applied to the approximately 6 percent of the total area affected, it explains slightly less than 1 percent of the five-year growth. Since measuring increases from farm-to-farm seed sales is extraordinarily difficult, the data presented here are very rough and probably conservative. Nevertheless, even if the data are off by a factor of 200 percent, as seems unlikely, the conclusion must still remain that "improved" seeds were not a major element in West Pakistan during the Second Plan period.

22. See, for example, N. E. Borlaug, "Accelerated Wheat Improvement in West Pakistan and the Revolution in Agriculture" (mimeo, Ford Foundation, April 1965); A. C. McClung, "Accelerated Rice Research Program for East Pakistan in Cooperation with the International Rice Research Institute (IRRI)" (mimeo, Ford Foundation, May 1965); R. W. Herdt and J. W. Mellor, "The Contrasting Response of Rice to Nitrogen: India and the United States," *Journal of Farm Economics* (February 1964), pp. 150–160.

23. Experiments with Mexican varieties have indicated a possible tripling of wheat yields under farm conditions. Borlaug, "Wheat Improvement in West Pakistan." The past results were sufficiently impressive that about Rs.0.5 million was allocated in 1965 for the importation and disbursement of approved Mexican varieties to leading West Pakistan farmers.

Several other factors were potentially important in explaining the increase in output not directly attributable to "hard" inputs. Among the most important were the more than additive effects of using several inputs in combination and improved agricultural techniques, including more intensive use of traditional factors of production such as hand and bullock labor.

Both types of factors are, of course, difficult to quantify. However, with regard to interaction effects, experimental studies indicate that the increase in yield resulting from the simultaneous application of fertilizer and water is significantly more than additive. For example, the results of various trials throughout the subcontinent show approximately a 25 percent gain in fertilizer response as a result of an adequate water supply. Such evidence, coupled with Ghulam Mohammed's finding that private tubewell farmers used significantly more fertilizer than nontubewell farmers, leads to the conclusion that the interaction effects from these two inputs alone may have been substantial.

Given the low level of extension efforts during the period, it was unlikely that much of the residual output could be attributed to new methods of plowing, weeding, or harvesting. In most cases, improvement would have required the adoption of better and more expensive implements; the failure of all but the very large farmers to move in this direction is a matter of record. Except for the tubewell, therefore, the technology factor was probably overshadowed by production increases attributable to a more intensive use of hand and animal labor.

There were two reasons for expecting increases in output from a more intensive use of the traditional factors. The first is the effect of an increasing man-land ratio. Population growth for the Second Plan period has been estimated at about 2.5 percent per annum, well above the rate of increase in the availability of new cultivatable area. A second reason for expecting a greater commitment of hand and animal labor is the significant improvement in the prices received by farmers relative to prices paid. Economically motivated farmers would respond to the improved terms of trade by moving upward along their "traditional" production function and hence along the aggregate supply curve. Such an increase in output should be distinguished from increases that result from an upward shift in production functions stemming from an investment in inputs such

as water or fertilizer. In summary, these factors seem capable of accounting for the residual growth of approximately one-half percent per year.

In addition to interaction effects and movement along the traditional production function, many other forces were at work. Some of them, such as soil conservation or improvements in livestock breeds, undoubtedly had a positive effect on production; others, such as the increase in waterlogging and salinity, acted negatively. But five years is not a very long period in which to expect significant changes in these variables; on balance they probably tended to cancel one another out.

Recently there has been a great deal of concern about the decline in output due to waterlogging and salinity. However, these problems have been building up for from 50 to 100 years, and a clear distinction must be made between the absolute levels that are a partial explanation of the present low yields in West Pakistan, and the changes in effect that are likely in a five-year period. It is commonly estimated, for example, that the equivalent of from 50,000 to 100,000 acres are being lost through waterlogging and salinity each year.[24] Over a five-year period this loss would amount to at most 500,000 acres, which would in turn have the effect of reducing the gross value of crop production by a total of only about 3 percent. (See Table 9.7.) While we do not minimize the difficulty of waterlogging and salinity problems, in the short run their effect was small relative to the vast improvements in irrigation.

Summary of Growth Factors. It is possible to explain the 27 percent trend growth in major crop output during the Second Plan period in very broad quantitative terms. The public and private groundwater development increased irrigation water availability by over 8 million acre feet and also improved the time distribution of water to farmers. These qualitative and quantitative improvements helped to increase the utilization of underemployed land, labor, and bullocks and were directly responsible for more than one-third of the increase in crop output. Moreover, the groundwater-development program, and the control that it gave farmers over critical water supplies, helped to "induce" the use of other improved inputs, such as fertilizer. In addition to the 10 percent

24. Revelle Report, p. 63.

Table 9.7. Estimated effects of waterlogging and salinity in the Second Plan period.

Crops	Composition of cropping pattern (percent)[a]	Thousands of acres	Yield (maunds)	Decrease in production (thousands of tons)	Prices 1959/60 (Rs./ton)[b]	Decrease in gross production value (millions of Rs.)
Rice	4	20	10	7.3	545	4
Wheat	28	140	11	56.4	410	23
Minor grains	10	50	9	16.5	350	6
Pulses	15	75	8	22.0	390	9
Sugarcane	6	30	380	417.6	50	21
Oilseeds	9	45	6	9.9	670	7
Fruits, vegetables	9	45	70	115.4	325	38
Cotton	19	95	9	31.3	900	28
Total	100	500	—	—	—	136[c]

[a] Cropping patterns and yields are representative of average data for the Northern Zone. See study prepared by Harza Engineering Co. for West Pakistan Water and Development Authority, *Program for Water and Power Development in West Pakistan through 1975* (January 1964).
[b] Prices are those of the National Income Commission for 1959/60.
[c] The gross value of total production in 1960/61 was Rs. 4290 million.

growth from groundwater, approximately 4 percent of the growth came from surface-water development, 5 percent from fertilizer, and 8 percent from improved seed, plant protection, and other residual factors.

Table 9.8. Sources of increased crop output, West Pakistan.

Sources	Percent per year
Private tubewells[a]	1.4
Public tubewells	0.6
Surface water	0.7
Fertilizer	1.0
Plant protection	0.4
Seeds	0.2
Residual (interaction, improved practices, increased labor intensity, etc.)	0.6
Total growth	4.9

[a] Cropped area increased about 3 percent per year during the Second Plan period. This increase has been included under the water categories, since water, not land, is the binding resource in most parts of West Pakistan.

The sustained West Pakistan agricultural growth, summarized in Table 9.8, was clearly more than a weather phenomenon. The table, and the analysis that underlies it, are important for several reasons: first, it provides a picture of what has happened in rural areas of West Pakistan; second, it draws attention to the major inputs that have been the quick contributors to agricultural growth; and third, it suggests a general technique for projecting future growth. It should be added, however, that the investments directly responsible for growth under the Second Plan depended on the public policy toward agriculture, discussed in a later section.

EAST PAKISTAN: MAGNITUDE AND SOURCES OF RECENT GROWTH

Given the great differences between the irrigated Indus Basin and the monsoon rice agriculture of East Bengal, the close coincidence between the general performance of agriculture in the two regions is striking. After a stagnant period between Partition and the end of the First Plan, the rural sector in the East as well as the West grew remarkably during the Second Plan. In recent years East Pakistan has become almost self-sufficient in terms of rice. This accomplishment again raises the question: does it represent a climatic phenomenon or a structural change in agriculture?

Although the recent agricultural growth has been fairly widespread in East Pakistan (see Table 9.9), the major contributor to growth has been rice. Hence, we will concentrate primarily on

Table 9.9. Growth of value added in East Pakistan agriculture, 1959/60 to 1964/65 (1959/60 prices).

Items	Percent per year*
Total agriculture	3.0
Major crops	3.2
Minor crops	2.7
Livestock	2.0
Forestry	3.1
Fishery	2.9

Source: Computed from Central Statistical Office, *Interim Report of the National Income Commission*, Appendix XIV. Data for 1964/65 supplied directly by the Central Statistical Office.

* Least-squares estimate of "b" in the equation: $\log Y = a + B \cdot \text{time}$.

this commodity, which contributes nearly 70 percent of the crop value added.[25] Most of the analysis will also be made on the basis of trends, although analyzing the growth rate for agriculture in East Pakistan is far more difficult than in the western province. In East Pakistan general knowledge about agriculture is more limited, and the effect of weather is much more dominant. Floods, droughts, and hurricanes are common occurrences, and the different permutations and combinations of weather effects are almost infinite. As a result of the weather factors, fluctuations about trends in production are very large — as much as 20 percent in successive years. These large, weather-induced variations in production make it difficult to estimate with assurance the magnitude of growth in short periods, and the use of trends or averages over longer periods is also not without its difficulty. Given this caveat, however, what can be observed quantitatively about agricultural growth between plan periods, and about progress within the Second Plan period?

Table 9.10 provides information on rice for three periods. It

Table 9.10. Five-year average of rice production by season, East Pakistan.

Season	Pre-Plan 1950/51 to 1954/55	First Plan 1955/56 to 1959/60 (thousands of tons)	Second Plan 1960/61 to 1964/65
Aus	1,829	1,939	2,437
Aman	5,345	5,231	6,765
Boro	335	344	500
Total	7,509	7,514	9,702

Source: Planning Commission, *Handbook of Agricultural Statistics*, pp. 72ff.

indicates the stagnant nature of rice production during the 1950's, when the decline in production in the Aman season offset the gains in the Aus and Boro seasons.[26] To be sure, Aman production during the First Plan period was marked by floods of record proportions, but the net impression for the period 1950/51 to 1959/60

25. W. P. Falcon and C. H. Gotsch, "An Analysis of East Pakistan Agriculture during the Second and Third Plan Periods" (mimeo, Pakistan Planning Commission, May 1965), p. 52.

26. Aus, Aman, and Boro refer to the different seasonal types of rice, harvested in July, December, and March, respectively.

is one of large fluctuations about a rather steady level.[27] The Second Plan period registered a marked difference, with average production approximately 30 percent greater than under the First Plan and with gains in production for all types of rice.

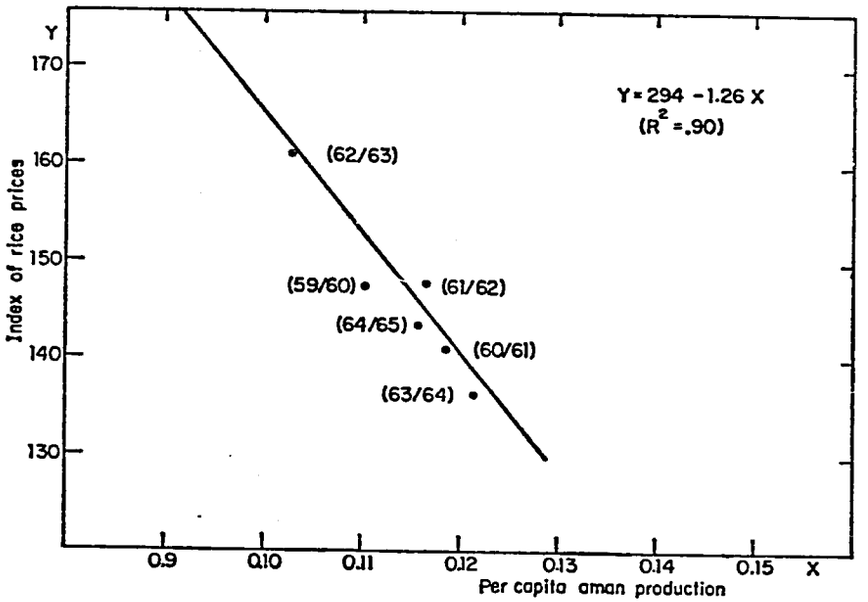

FIGURE 9.1

Relationship between per capita Aman rice production and average February to March rice prices, East Pakistan

It has sometimes been implied, usually without supporting evidence, that the reported growth in East Pakistan rice production during recent years represents nothing more than statistical manipulation.[28] Although the agricultural data do have definite limitations, such a charge does not appear warranted. In the first place, significant improvements have been made in data collection. The start of cluster-sampling for the area data and the beginning of crop-cutting experiments for yield calculations have provided important cross-checks on judgment methods and have generally ver-

27. The year 1955 is one of the "maximum flood" bases used by the East Pakistan Water and Power Development Authority in calculations for flood and drainage projects.

28. See, for example, K B. Griffen and B. Glassburner, "Financing Development Plans in Pakistan," *Pakistan Development Review* (Autumn 1965), p. 3.

ified their relative accuracy.[29] In addition, the production data are consistent with the price performance of the Second Plan years. This consistency is substantiated by the simple yet revealing price-quantity models for rice shown in Figures 9.1 and 9.2. Figure 9.1

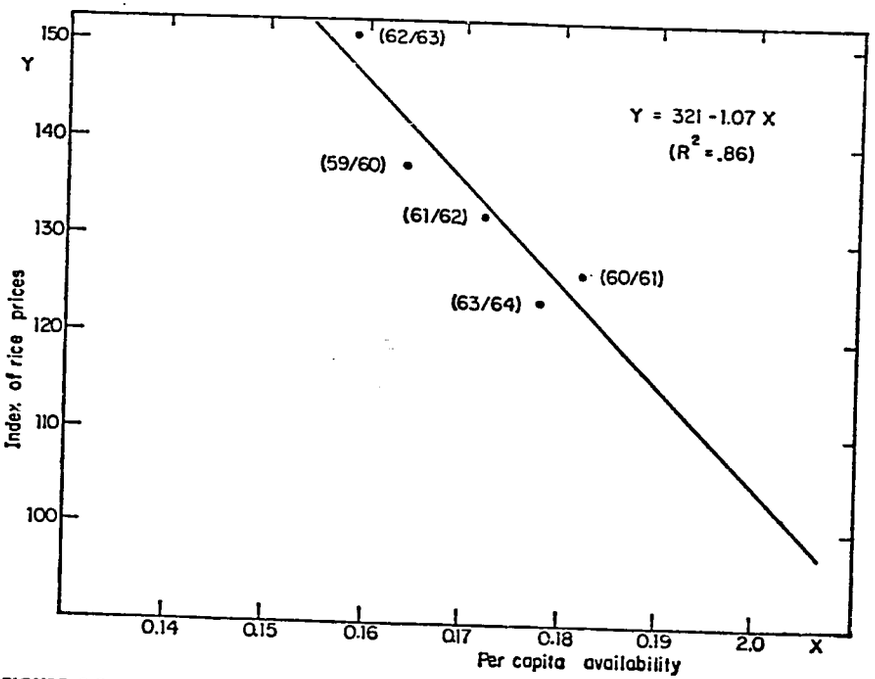

FIGURE 9.2

Relationship between per capita rice availability and annual rice price

indicates the relationship between Aman rice production per capita (the major type of rice and the major contributor to production fluctuations) and the rice price prevailing in forty retail markets between December and February. There is a strong relationship between the variables ($R^2 = .90$), and if the production data had been artificially adjusted to any substantial degree, there would have been little reason to expect this close correlation and the reasonable price relationship it implies.[30] Figure 9.2 shows a similar strong

29. East Pakistan Directorate of Agriculture, "Sample-Survey Operations and Crop-Cutting Experiments Conducted by the Bureau of Agricultural Statistics, 1962/63" (Dacca, 1963).

30. Neglecting certain problems of specification and statistical identification, Figure 9.2 indicates a mean price elasticity of demand for rice in East Pakistan of about −0.75 for the period 1959/60 to 1964/65.

relationship for average annual prices and total rice availability per capita. These models, although very crude, help confirm the fact that a 3.4 percent annual growth in production did occur.

Further insight into the growth in rice production is obtained by disaggregating total production figures by seasons as well as by acreage and yield. Table 9.11 indicates that in the Aus season the

Table 9.11. Annual growth rates of rice yield, acreage, and production by season, 1959/60 to 1964/65.

Season	Percent per annum[a]		
	Yield	Acreage	Production
Aus	0.8[b]	2.1	2.9
Aman	2.5	0.8	3.3
Boro	3.6	2.6	6.2
Total	2.1	1.3	3.4[c]

Source: Computed from Planning Commission, *Handbook of Agricultural Statistics*, pp. 72ff.

[a] Least-squares estimate of "b" in the equation: $\log Y = a + b \cdot \text{time}$.
[b] No trend at the 5 percent level of significance.
[c] In terms of total contribution, Aus rice accounted for about 20 percent of the growth, Aman rice for 70 percent, and Boro rice for about 10 percent.

gain was primarily from acreage increases; in Aman, the season when the acreage sown is already near the physical maximum, the gains came almost entirely from increased yield; and in Boro about 40 percent of the increase arose from additional area and 60 percent from higher yields. Overall, approximately two-thirds of the increase in rice production came from increased yield and about one-third from additional area. Moreover, even though the rate of growth in Boro rice was the most rapid, its contribution to the total growth in rice production was limited (10 percent) because of the relatively smaller size of the Boro harvest. In fact, over 50 percent of the total increase in rice production between 1960/61 and 1964/65 can be explained by improved Aman yields.

Acreage Effects. Boro acreage grew about 2.5 percent per year, or about 25,000 to 30,000 acres annually, during the Second Plan period. One important factor in this growth was the increased irrigation capacity for the winter season. For the seven years ending

in 1964/65 the East Pakistan Agricultural Development Corporation (EPADC) supplied approximately 1,500 more power pumps, which irrigated nearly 100,000 additional acres (see Table 9.12).

Table 9.12. Low-lift pump irrigation in East Pakistan.

Year	Number of pumps	Area irrigated
1958/59	772	30,000
1959/60	1,130	49,000
1960/61	1,267	65,000
1961/62	1,543	98,000
1962/63	2,024	133,000
1963/64	2,456	156,000
1964/65	2,238	131,000

Source: J. Hendry and U. Hpu, "East Pakistan Agriculture during the Third Five Year Plan" (mimeo, East Pakistan Planning Department, July 1964), p. 15; 1964/65 data supplied by the East Pakistan Planning Department.

Since it is estimated that from 80 to 85 percent of the area affected by power pumps went into rice production, the EPADC power-pump program alone explains nearly 15,000 acres out of the annual increase of 25,000 acres in Boro rice. Moreover, the assured water supply on the additional acreage was undoubtedly a cause of the increase in average Boro yields.

The remaining increase in area may be attributed primarily to two factors. East Pakistan Water and Power Development Authority (EPWAPDA) schemes accounted for perhaps 3,000 additional acres on an average annual basis. The residual, about 10,000 acres per annum, probably resulted from a continuation of a long, upward trend in Boro acreage from indigenous irrigation methods. This increase, which is more easily measured in the eight years immediately following Partition, when there were few mechanical pumps, seems to have continued throughout the Second Plan period.

Since 1947/48 there has been a steady long-run increase of around 1 percent per year in the Aus area, or about 120,000 acres annually. One reason for this improvement in output was the continued development of indigenous irrigation facilities that permitted cropping in the Aus season. A second reason was the pressure of population and the resulting expansion into marginal lands — marginal in terms of flooding, rainfall, or soil characteristics. Finally, part of the increase in acreage stemmed from the reclamation of

land along the coastal areas of southern East Pakistan. For example, some of the large increase in the Barisal District derived from improvements in the coastal embankments. Many of the structures had seriously deteriorated following Partition and the departure of a large number of Hindu *Zamindars* (landowners), who were instrumental in maintaining them. These dikes are gradually being replaced through large, public-investment programs, and they should be an even more important contributor to increased production in the future.

There was very little growth in Aman acreage between 1959/60 and 1964/65. It is clear that land use in that season was already "tight" in a physical sense.[31] Aman rice was harvested from nearly 15 million acres each year, which compares with a provincial total of only about 22 million acres of cultivated area. When crop rotations are considered, and when other Aman crops are deducted, there appears to have been little scope for extension of Aman area during the Second Plan period. To the extent that there was an increase, it was probably a result of labor pressure and, to a limited degree, improvement in coastal embankments.

In total, slightly more than one-third of the growth in rice during the Second Plan came from bringing increased area under rice cultivation. The major causal factors for this acreage increase were the extension of irrigation facilities, the push into marginal lands because of population pressure, limited reconstruction of coastal embankments, and some change in rice culture from a one-crop to a two-crop system of Aus and transplanted Aman.[32]

Yield Effects. Approximately 2.1 percent out of the total 3.4 percent increase in rice production during the Second Plan resulted from yield improvements. Unfortunately it is impossible to distinguish by season the various inputs that were used to improve rice yields, so it is necessary to take up the various causal factors one at a time without regard to season.

Fertilizer was one of the major inputs that raised rice yields during the Second Plan period. In 1958/59 only 7,400 nutrient tons were distributed; by 1964/65 this figure had risen nearly sixfold.

31. J. Hendry and U. Hpu, "East Pakistan Agriculture during the Third Five Year Plan" (mimeo, East Pakistan Planning Department, July 1964), pp. 1–75.

32. The acreage under other major crops, such as sugarcane, jute, and oilseeds, also increased during the Second Plan period. Hence, the increase in the area under rice can not be ascribed to a "substitution effect."

Table 9.12. Fertilizer use in East Pakistan, 1958/59 to 1964/65 (in tons).

Year	N	P_2O_5	K_2O	Total
1958/59	7,141	244	0	7,385
1959/60	12,057	1,036	792	13,093
1960/61	19,423	3,122	492	23,337
1961/62	19,202	3,174	945	22,868
1962/63	23,657	1,936	1,979	26,537
1963/64	35,350	11,397	2,880	48,726
1964/65	33,740	8,610	1,965	44,315

Source: L. Mears and U. Hpu, "The Role of Fertilizer in Increasing the Growth Rate of Production of Major Crops during the Third Plan in East Pakistan" (mimeo, East Pakistan Planning Department, December 1964), Table 5.

(See Table 9.13.) It is estimated that approximately 75 percent of the total fertilizer was applied to rice and that on the average each pound of fertilizer nutrient increased cleaned rice production by about seven pounds.[33] Thus, the 37,000-ton increase in the annual use of fertilizer on rice probably accounted for an increase of about 260,000 tons of rice. On an annual basis, therefore, fertilizer alone accounted for an almost 0.5 percent increase per year in rice yields during the Second Plan period.

Increased plant protection activities were another cause for the improved yield performance. As shown in Table 9.14, the area treated with preventive or curative plant-protection measures increased from 427,000 acres in 1959/60 to 4.8 million acres in 1964/65. Since about 75 percent of the pesticides were applied to rice, approximately 3.3 million additional rice acres were protected during the Second Plan period. When a 10 percent yield factor is applied to the 8 percent of the area covered, pesticides appear to have accounted for about a 0.3 percent per year increase in rice production.

The development of new and improved seeds is potentially one of the most important means for increasing rice yields per acre. Although major improvements are yet to come in East Pakistan, the

33. H. Rashid, "Outline of a Proposed Strategy for Increased Agricultural Growth during the Third Plan Period" (mimeo, East Pakistan Planning Department, November 1964), p. 30; L. Mears and U. Hpu, "The Role of Fertilizer in Increasing the Growth Rate of Production of Major Crops during the Third Plan in East Pakistan" (mimeo, East Pakistan Planning Department, December 1964), appendix I.

Table 9.14. Field crops treated with plant-protection measures, 1959/60 to 1964/65.[a]

Year	Acreage (in thousands)
1959/60	427
1960/61	716
1961/62	919
1962/63	2,115
1963/64	2,811
1964/65	4,781

Source: Government of East Pakistan, Department of Plant Protection, "Progress Report" (mimeo, various monthly issues).

[a] Excludes aerial spraying.

spread of relatively improved local varieties was an important contributor to growth during the Second Plan period. The seed program was initiated in 1952, with a major emphasis at the beginning on seed selection by the specific-gravity method and on seed treatment for fungus.[34] The Department of Agriculture also released a number of improved varieties of rice. By 1964/65 it is estimated that farmer-to-farmer sales, plus very limited distribution by government agencies, permitted about 20 percent of the rice area to be covered by the better-quality rice seed.[35] Apparently these improved seeds produced yields about 15 percent greater than yields from the usual local varieties. A combination of these yield and acreage factors suggests that, between 1959/60 and 1964/65, seeds accounted for an annual increase in rice production on the order of 0.5 percent per year. This calculation may in fact be conservative. Certainly, the potential for seed development was large. As Rashid stated: "No less than sixty improved varieties have been successfully introduced by the Directorate of Agriculture in the last 15 years . . . The improved Aus and Shail transplanted Aman varieties yield about 20 percent more than the majority of local varieties. In 1957/58, the improved varieties really caught on . . . and very soon covered big areas . . . By 1961/62, there was a definite increase in production, at least half of which is attributable to seeds." [36]

34. A. Alim, *Rice Cultivation in East Pakistan* (Dacca: Food and Agricultural Council, 1956), pp. 42ff.

35. By 1964/65 over 3.2 million maunds of rice seed were being treated annually by the Department of Agriculture.

36. Rashid, "Proposed Strategy for Increased Agricultural Growth," p. 26.

Labor, Technology, and Rural Works. The combined effects of fertilizer, plant protection, and improved seeds have been estimated to account for about 1.3 percent out of the total 2.1 percent yield increase per year. If another 0.1 percent yield effect is added as a result of more controlled water supplies from irrigation and drainage facilities, about 0.7 percent per year still remains to be explained by other factors.

One explanation for this residual growth centers around the expanding population and the increased ratio of agricultural labor force to cultivated acreage. Between 1950 and 1965 average farm size showed a significant decline. The 1960 Census of Agriculture indicated that over 50 percent of the farm holdings then consisted of less than 2.5 acres each. When coupled with a larger number of workers per farm, this decline in acreage per farm significantly increased the labor intensity per acre. The general increase in labor intensity in turn affected crop production in several ways. First, it encouraged higher cropping intensities on the smaller farm. Such a tendency is illustrated in Table 9.15, which shows that farms in

Table 9.15. Farm size in East Pakistan, 1960.

Size of farm	Number of farms (percent)	Cropping intensity (percent)[a]	Cultivated area (percent)	Family working members per cultivated acre
Less than 0.5 acre	13	165	1	11.8
0.5 to 1.0	11	170	2	3.7
1.0 to 2.5	27	165	13	1.6
2.5 to 5.0	26	156	27	0.9
5.0 to 7.5	7	148	20	0.6
7.5 to 12.5	7	141	19	0.5
12.5 to 25.0	3	134	14	0.3
25.0 to 40.0	—[b]	128	3	0.2
Greater than 40.0	—[b]	115	1	0.1

Source: Government of Pakistan Ministry of Food and Agriculture, *1960 Pakistan Census of Agriculture* (October 1962), p. 39.

[a] Complete double cropping would give a 200 percent intensity. Total number of farms was 6,139,480; total cultivated area was 19,138,109 acres.

[b] Less than 0.5 percent.

the 1 to 2.5-acre category generally had about a 15 percent higher cropping intensity than those of 5 to 7.5 acres.[37] Second, the increased pressure of population probably meant larger quantities

37. The intensity effect, earlier included in the area expansion, is presented here only to give a more complete picture of the labor pressure

of traditional labor per cropped acre and consequently higher yields.[38] This relationship has been emphasized in several reports. For example, A. K. M. G. Rabbani in his definitive study on jute stated: "In the major jute-producing areas . . . the coefficient of labor was found to be highly significant . . . The input of labor was found to account for nearly 50 percent of the total variation in the yield of jute fibre . . . The elasticity of labor production . . . was found to be 0.88 and was not statistically different from unity. This suggested that a 10% variation of labor input per acre accounted for nearly 10% variation of yield rate of jute fibre." [39]

Similarly, Nurul Islam presented data that showed greater yields per acre for smaller farms.[40] M. Habibullah stated: "Labor plays an inseparable role in agricultural production. The volume, variety, and efficiency of labor is an important determinant of output." [41] Finally, the importance of increased traditional labor was emphasized by Alim.[42] He presented empirical data showing that the difference in yield as a result of one versus three weedings of Aus rice may be as much as 7.5 percent and that line sowing and other related operations versus broadcasting of Aman rice can improve yields from 8 to 18 percent.

A third factor, which is related yet distinct, involved changes in technology and corresponding increases in labor per acre. For example, the shift to the "Japanese Method" of rice culture involves a series of labor-intensive operations that increase yield per acre substantially. Alim reported experiments showing that the Japanese Method gives 38 percent greater output per acre. Similarly, the Japanese team at Comilla indicated 94 percent greater Aman yields, involving about 19 percent more labor, from improved methods of cultivation, including fertilizer.[43]

38. "Traditional" here means an increase in common cultural practices requiring additional labor, such as more weeding. The term does not imply a radical change in technology that may also require more labor, such as a shift to the "Japanese Method," which involves a package of activities such as transplantation, fertilization, or water control.

39. A. K. M. G. Rabbani, "Jute in the World Economy: A Statistical Study," unpub. Ph.D. dissertation, University of London, 1964, p. 346.

40. Nurul Islam, "Concepts and Measurement of Unemployment and Employment in Developing Economies," *International Labour Review* (March 1964), p. 254.

41. M. Habibullah, *The Pattern of Agricultural Unemployment* (Dacca University: Bureau of Economic Research, 1962), p. 38.

42. Alim, *Rice Cultivation in East Pakistan*, pp. 27, 45.

43. Japanese Agricultural Mission to Pakistan under the Colombo Plan, "Seventh Annual Report" (mimeo, August 1963).

Undoubtedly the most important cause of increased labor intensity was the decline in the land-man ratio. Not to be overlooked, however, is the effect on traditional labor inputs of radically altered "terms of trade" for agriculture. S. R. Lewis' calculations showed that prices received by farmers in East Pakistan between 1951–54 and 1961–64 rose 30 percent while the index of prices paid fell nearly 20 percent.[44] Although the quantitative effects of such a change in relative prices on agricultural output is difficult to establish, the notion that some upward movement along the "traditional" production function has taken place is entirely consistent with the observed increase in labor intensity.

A final group of production effects that are included in the "residual" are associated with the Rural Works Program.[45] The most important direct effects from this labor-intensive program resulted from improved drainage as over 5,000 miles of drainage canals were renovated in both 1963/64 and 1964/65. These improvements helped in reducing flood losses, although some of the roads constructed under the program probably deterred drainage in several regions.

Thus, there is little question that increased labor intensity, brought about by population pressure, changed technology, changes in agricultural terms of trade, and the Rural Works Program, was an important element in the improved yields. Whether it accounted for 0.7 percent of the 2.1 percent growth in rice yields during the Second Plan period can be questioned; nevertheless, that figure is certainly within the range of possibility in view of the fact that the rural population was growing at over 2.5 percent per year.

Summary of Growth Factors. Progress in East Pakistan agriculture during the Second Plan period was encouraging. Unlike the stagnant era of the previous ten years, rice production in this period grew on a trend basis at about 3.4 percent per year. This measured growth was a definite reality, not a mere statistical manipulation. Approximately one-third of the growth resulted from extension of area, the remainder from increased yields, especially during the Aman season. Important factors in the area expansion

44. S. R. Lewis, Jr., and S. M. Husain, "Relative Price Changes and Industrialization in Pakistan, 1951–1964," *Pakistan Development Review* (Autumn 1966), pp. 408–431.

45. For the Rural Public Works Program, see R. V. Gilbert, "The Works Programme in East Pakistan," *International Labour Review* (March 1964), pp. 213–226.

included the shift into marginal areas as a result of population pressure, the extension of low-lift irrigation facilities, some improvement in coastal embankments, better drainage and hence less loss from flooding, and increased indigenous irrigation facilities. Major elements in the improved yields were expanded fertilizer use, better plant protection, improved seeds, and more extensive irrigation and drainage facilities. Quantitative estimates of these contributions are summarized in Table 9.16.

Table 9.16. Sources of increased crop output, East Pakistan.

Sources	Percent per year
Area expansion (including effects of low-lift pumps, WAPDA projects, population pressure)	1.3
Yield improvement	
Fertilizer	0.5
Plant protection	0.3
Seeds	0.5
Irrigation, drainage	0.1
Residual: increased labor intensity, improved technology, rural works	0.7
Total growth	3.4

IMPACT OF AGRICULTURAL POLICY UNDER THE SECOND PLAN

So far we have dealt at length with the physical aspects of the increase in agricultural production under the Second Plan. But physical analysis is only a part of the story, and probably the lesser part in terms of the lessons it provides to other countries. Of greater importance are the rural institutions and agricultural policies that evolved after the late 1950's, for they created the economic climate that permitted or induced the use of improved physical inputs.

"Pragmatic" is a word heard often in discussions concerning Pakistan's economic policy of this period, and indeed it probably best conveys the attitude of the Pakistan government on a broad range of issues. From the late 1950's onward, there were a number of bold government policy actions in agriculture, most of which were aimed directly or indirectly at improving the price and income incentives to farmers. Although it is not possible to go into the history and complete details of all these actions, three examples covering the major steps will indicate the general direction of policy during this period. These examples also show the extent to which farmers responded to the improved economic climate.

Export Duties and Bonuses. The reduction of export duties on cotton and jute and the provision of export-bonuses on fine-quality rice were relatively simple measures for improving prices to farmers on three of the most important export crops. The duty system of taxation, which was really a revenue measure, had long had the adverse effect of altering internal price ratios *against* export commodities in which Pakistan appeared to have a comparative advantage. These duties were sizable, and because of the relatively large price responses that farmers had historically demonstrated in the cases of cotton and jute, their effects on production were substantial.[46] In short, these duties produced rupee revenue at a considerable cost in terms of lost production *and* lost foreign exchange.

In the case of cotton, for example, the export duty on American varieties was Rs.115 per bale in 1958. The negative effect of this duty on the cotton prices that farmers received was on the order of 25 percent.[47] In the post-1958 era there were several duty reductions, and by 1964/65 the cotton duty had been lowered to a nominal Rs.25 per bale.[48] The farmer-incentive argument played an important role in these reductions, and certainly harvest cotton prices were much stronger than they would have been in the absence of the policy of lowering duties.[49] The reductions were clear cases, therefore, of government policy raising the absolute and relative price of cotton and thus contributing to the rather spectacular growth in cotton production.

In the case of jute, the duty-reduction policy was initiated only late in the Second Plan period. In December 1964 export taxes

46. See Falcon and Gotsch, "Price Response, Economic Efficiency, and Technological Change." The price elasticity of supply for cotton and jute have been estimated at 0.4 and 0.7, respectively.

47. This calculation assumes that 15 maunds of seed cotton produce one bale of 392 pounds, that the export demand was elastic, and that the harvest price was Rs.30 per maund of seed cotton.

48. In one sense, the drop in duty after 1958 continued an earlier policy. However, the early changes were the result more of an attempt at internal trade stabilization during and after the Korean War than of a concern with farmer incentives.

49. Despite many outcries to the contrary, it appears that most of the reductions in duty were passed back to producers. In any event, cotton harvest prices to farmers remained an almost constant ratio of the Liverpool price minus the duty.

were halved from Rs.20 to Rs.10 per bale. Because of the nature of export demand for raw jute, and because of the lack of information on jute prices received by farmers in East Pakistan, much less can be observed about the specific effects of the duty reduction. It is clear, however, that internal wholesale jute prices were much stronger in 1964/65 than they had been in the two previous years. Moreover, the change in jute prices altered *relative* price ratios in favor of jute. In 1964/65, for example, the average wholesale jute-to-rice price ratios were about 25 percent and 40 percent greater than they had been in 1963/64 and 1962/63, respectively. Since there is a strong relationship between this price ratio and jute production the following year, the downward trend in jute production was reversed in 1965/66.[50] Hence, even though the price policy on jute was too little and too late, given the normal lagged response, to affect the Second Plan production of jute, government policy in the final year was one of the factors that set the stage for a large expansion during the first year of the Third Plan period.

Decontrol, PL 480, and the Works Program. A second policy lesson centers around the general decontrol of agriculture that took place after 1958. This decontrol is particularly interesting because of the way in which the government of Pakistan used surplus agricultural commodities provided under U.S. Public Law 480 as an effective instrument of agricultural policy.

The bureaucratic controls that existed in Pakistan in 1958 can only be described as extensive and cumbersome. Many of the regulations, such as the restrictive zoning of surplus areas and the compulsory sale of foodgrains to the government at less than market prices in those regions, were introduced during World War II. They had continued through partition and were still in effect to varying degrees at the start of the Ayub regime. There was also strict acreage zoning of cotton varieties in West Pakistan to prevent the mixing of staple lengths, and jute acreage was licensed in East Pakistan in an attempt to restrict output and to take advantage of the presumed inelastic export demand for jute and jute products.

Even more controls were added under Martial Law Regulations.

50. We take for granted a desire by the government to expand jute production. Whether expansion is the proper policy, given the duopoly position of Pakistan in the world jute trade and the competitiveness of jute with local rice production, is a subject for separate study.

As M. Haq stated: "Price and profit controls imposed by the Martial Law regime seem to have sprung from the belief that [the] free market invariably tries to "exploit" and there is some unique level of price and profits which is "fair" both for producers and consumers. This showed a fundamental lack of understanding of [the] market mechanism coupled with an excessive faith in administrative efficiency and benevolence. These medieval ideas of a "just" price naturally led to several absurdities." [51] By November 1958, fourteen "essential" commodities were under price regulation, and eighty-seven other items were regulated through various profit laws.[52] Even though many of the regulations were not totally enforced, they had a net negative influence on agriculture. One glaring absurdity was that the prices of foodgrains were held down in the surplus regions. In addition, the government, always an object of concern and suspicion among villagers, contributed to uncertainty about prices and deliveries through its forced procurement system.

The first effect of these regulations was to lower prices and to provide strong disincentives in the most productive agricultural regions. Second, because of the inadequacy of the rationing procedure, prices were inordinately high and wildly fluctuating in urban and deficit areas. The contrast in the case of wheat in West Pakistan can be seen vividly in Figure 9.3. Prices in Lyallpur, a surplus area, and Peshawar, a deficit region, show a close correspondence *prior* to the Martial Law regulations in 1958. This close correlation was to be expected in the absence of effective controls because of the good rail connection between these two cities. However, with the militarily enforced controls in late 1958, Lyallpur prices were depressed, Peshawar prices quickly rose, and the seasonal pattern of price movement was aggravated. Thus, the country had the worst of both worlds.

Much to the credit of President Ayub, the control system in the economy did not last long. In February 1959 a start was made on relaxing distribution and export controls, and controls on profit margins were drastically reduced. In January 1960 rice rationing was virtually abolished in East Pakistan, and the sale of rice, except

51. M. Haq, "Rationale of Government Controls and Policies in Pakistan," *Pakistan Economic Journal* (March 1963), p. 9.

52. Much of our historical discussion of controls is based on A. F. A. Husain, "Price Distribution and Controls in Pakistan," *Pakistan Economic Journal* (June 1961), pp. 17–25.

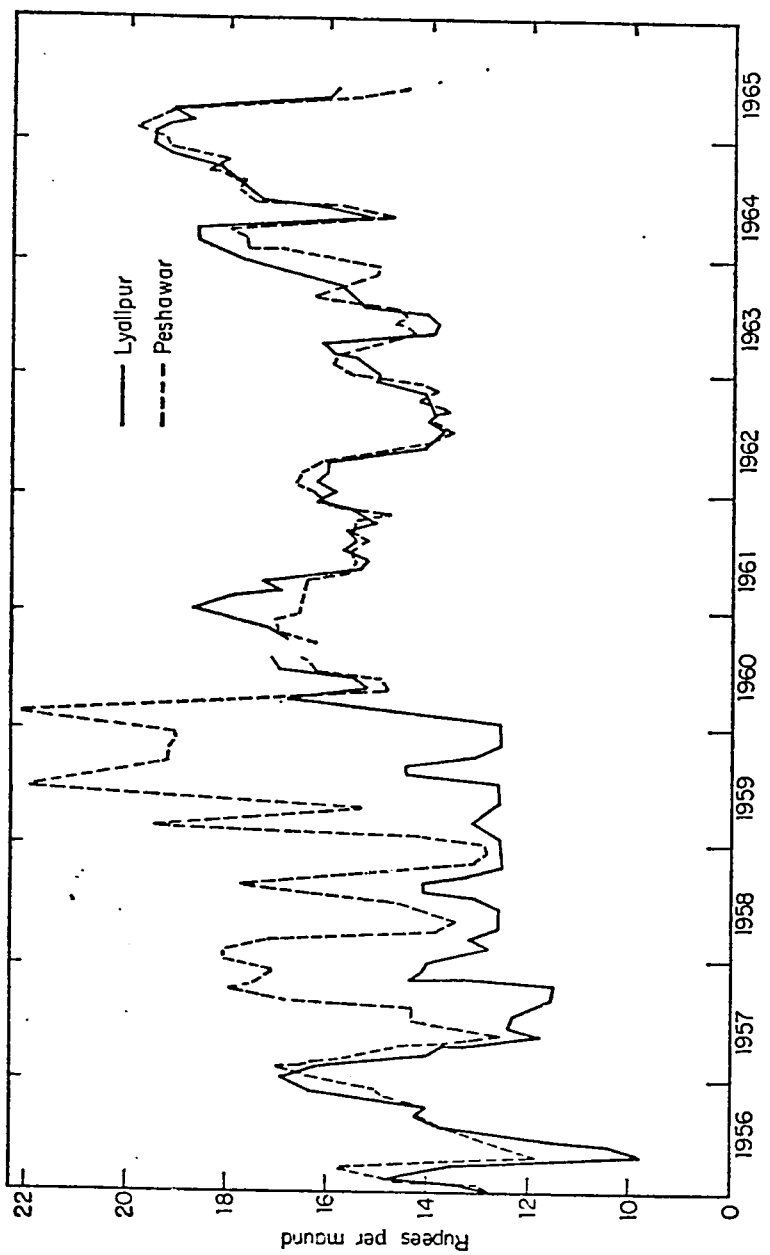

FIGURE 9.3
Monthly wholesale wheat prices at Lyallpur and Peshawar, West Pakistan, January 1956–December 1963.
Source: Government of Pakistan Central Statistical Office, *Statistical Bulletin* (monthly issues).

in a five-mile border belt, was placed on a voluntary basis. At that time arrangements were also made with Burma for the import of up to 300,000 tons of rice annually to serve as a buffer in the event of short crops and rising prices.

An even larger decontrol action took place in April 1960. In spite of many dire predictions, the direct controls on wheat movements, wheat prices, and wheat rationing were abolished in West Pakistan.[53] Distribution was left instead to the private trade without any of the previous licensing restrictions and buffer-stock system was initiated. Under this system the government guaranteed farmers a minimum price of Rs.13.50 per maund of wheat. Sales to the government were voluntary, and the government entered usual market channels only when prices dipped below the statutory minimum. A ceiling was placed on wheat-price movements by establishing a release price of Rs.16 per maund, raised to Rs.17.25 in the summer of 1966. When prices rose above that level, the government released wheat into the market. In part these stocks came from government wheat procured from the support operation, but since the government was never especially vigorous in implementing its support activities, the bulk of this wheat came from wheat supplied under the expanded PL 480 program.

Because PL 480 was so critical to the entire decontrol policy, and because it has always been a source of considerable controversy, a few additional observations on the program are warranted.[54] There can be no doubt about the importance of PL 480 to the development of Pakistan's *total* economy during the Second Plan period. In the first place, approximately 15 percent of West Pakistan's wheat was supplied under Title I auspices, that is, through

53. To a considerable extent, the decontrol throughout West Pakistan was made possible by the one-unit rule passed in October 1955. Under this provision the former states and provinces of West Pakistan were consolidated into one large province. This unity contrasts markedly with the particularism of India, where individual states still exercise considerable control over foodgrain movements and prices.

54. For PL 480 in Pakistan, see C. Beringer, *The Use of Agricultural Surplus Commodities for Economic Development in Pakistan* (Institute of Development Economics Monograph No. 12, January 1964); R. V. Gilbert, "The P.L. 480 Programme for the Third Plan" (mimeo, Pakistan Planning Commission, March 9, 1964); W. P. Falcon, "Consistency of U.S. Policy towards P.L. 480, with Special Reference to Pakistan" (mimeo, Pakistan Planning Commission, March 1965); Ghulam Mohammed, "P.L. 480 and Agricultural Development during the Third Plan Period" (typescript, Institute of Development Economics, January 1966).

sale of U.S. surplus commodities for nonconvertible currencies. Its import permitted a stabilization of wheat prices in the Rs.14 to 18 per maund range, which in turn provided industry with the key wage good at stable prices. Price stability along with import liberalization were two important factors in permitting West Pakistan industry to grow at about 15 percent per annum in the 1959/60 to 1964/65 period.

In several other respects PL 480 commodities were so important as to be almost indistinguishable from hard-currency assistance. If it is assumed that the PL 480 assistance was an addition to total foreign assistance and that in its absence other types of aid would not have substantially increased, PL 480 transfers certainly helped relieve the critical foreign-exchange bottleneck. Without them, either foreign exchange would have been required for food imports, thereby decreasing the availability of producer imports in both provinces, or the threat of inflation would have required a drastic reduction in the size of the development plan. Either alternative could have seriously impaired the development of the general economy.

The effect of PL 480 on the agricultural sector per se was less clear but probably as positive in the long run. First, substantial investments within the agricultural sector were offset against PL 480 imports. Top priority was assigned to the Indus Basin program for the necessary irrigation replacement works on which the future of much of the rural economy of West Pakistan depends. Second, the PL 480 program was a critical element in the decontrol movement. Without the expanded program, the relaxation of controls might never have occurred, or at least decontrol might not have survived. It is only possible to speculate about such a consequence, but the disincentive and uncertainty aspects of a continued control system could have been disastrous.

The disincentive aspects of the prior control system highlight another aspect of PL 480 assistance. Much has been written about the negative price effects and hence the disincentives to agricultural production of PL 480 shipments. These arguments generally start with a basic assumption that perfect competition, in terms of product flows, prevailed initially. But in West Pakistan the shift from a very low controlled price in surplus areas to a PL 480 buffer-stock system did not lower and perhaps even increased prices and incentives for wheat production in "surplus" regions. (See Figure 9.3.)

The program also aided agricultural development in West Pakistan in a more subtle way. Many observers have rightfully argued that farmers could increase incomes from shifting from lower-valued subsistence crops, such as wheat and sorghums, to cash crops. However, because of uncertainty in prices and yields, farmers in Pakistan had long known that it made better sense to grow sufficient food for home consumption rather than to specialize and depend on the government's market for foodgrains. Since PL 480 wheat added an important element of stability to the foodgrain market, farmers soon learned that they could purchase foodgrains at reasonable prices in the market. PL 480 thus added an impetus for farmers to move into the higher-valued cash crops. Although this shift did not make the foodgrain self-sufficiency proponents in either Pakistan or the United States particularly happy, it was desirable from a broader economic point of view and no doubt contributed to the higher relative rates of growth in cash crops shown in Table 9.3.

In East Pakistan the net effect of PL 480 on the rural sector was also positive, though the mechanism was quite different. PL 480 commodities were used primarily in support of the Rural Works Program, which had several remarkable features.[55] First, it represented one of the initial attempts by government to reduce the severe seasonal unemployment and underemployment that existed in the rural areas of East Pakistan. This problem was of major consequence, since over half of the 7.5 million man-year equivalents of unemployment estimated for 1964/65 were in East Bengal.[56] Second, the program relied heavily on local initiative and organization. Plans of surprising complexity were developed and implemented by farmers and officials at the lowest levels of government. Finally, the financial support of the program came from the sale of a number of PL 480 commodities, primarily wheat. The financing of the program was particularly revolutionary, for many in government firmly believed that the rice eaters of East Bengal would never eat wheat.

The Works Program was tested on a pilot basis in 1962/63 in Comilla Kotwali Thana, an administrative subsection of one dis-

55. Much of this discussion is based on Gilbert, "The Works Programme in East Pakistan."

56. Planning Commission, *Third Five Year Plan*, p. 153.

trict, and expanded to the entire province in succeeding years. The program's primary emphasis was on drainage, and in 1963/64 and 1964/65 a combined total of over 10,000 miles of drains were excavated. Although insufficient research has been conducted on the effects of the program, the net result seems to have been beneficial. The drains did not prevent flooding per se, but they increased the velocity of the flood runoff and thus helped to reduce flood losses. Rice plants, for example, can withstand total submersion for about forty-eight hours, so that reducing the time of flooding from three to two days can have a significant effect on production.

In addition to drainage, farm-to-market roads were emphasized. Over 25,000 miles of *kutcha* (secondary) roads were constructed in both 1963/64 and 1964/65. These connected many heretofore isolated villages, which in turn reduced factor costs and increased product prices. Finally, the Works Program helped to put increased purchasing power into the hands of villagers. The combined inflow of some Rs.450 million into rural areas between 1962/63 and 1964/65 — particularly to part-time farmers — made sizable funds available for further agricultural investments. In many respects these funds helped to substitute for the very inadequate system of organized rural credit.

To the surprise of many, the financing of the Works Program proved successful. After considerable debate, the decision had been to pay Works Program laborers in cash rather than in wheat. The great fear at the time was that this procedure would prove inflationary: rupees would be put into circulation; there would be no effective demand for wheat, because the East Pakistanis were rice eaters; hence, excess demand would be generated for rice and other commodities not supplied under PL 480. Documents going back to the Bengal Famine Report of 1943 were cited as grounds for this expectation.

The Works Program proved, however, that rice eaters would eat wheat *if the price were right*. With an internal subsidy of approximately one-third the value, considerable wheat was sold in the open market, and more than sufficient rupees were generated to finance the Works Program. Though East Pakistan consumers had shown no willingness to substitute wheat for rice when wheat was non-subsidized, they were quite responsive to the favorable change in the relative price of subsidized wheat. One crude piece of empirical

research estimated the marginal elasticity of substitution between rice and wheat to be greater than two when the ratio of wheat to rice prices was about one-half.[57]

Thus, for the first time a government policy was designed to attack seasonal underemployment. The Works Program created about fifty million man-days of employment in both 1963/64 and 1964/65. It created productive investments, which directly and indirectly aided agriculture. It was planned and implemented principally at the local level, where it had been claimed that no administrative capability existed. And it was paid for by a commodity that had been thought unacceptable in the East Pakistan context.

At the same time, PL 480 was not perfectly administered in either province, and it caused certain problems. On the administrative side, some of the early regulations for flour mills concerning the proportion of PL 480 wheat purchased to total wheat milled were superfluous. Since for historic reasons many mills were in wheat-surplus areas of West Pakistan, these restrictions had the effect of impairing the market for locally produced wheat; they were later changed. At other times the government was reluctant to support the minimum price or to release adequate PL 480 stocks to prevent prices from rising above the established ceiling. In East Pakistan there were difficult problems of storing wheat in a monsoon climate. Moreover, the "like commodity" clause of the PL 480 agreement caused Pakistan considerable difficulties for several years. The basic problem was that although Pakistan was deficient in wheat and had a surplus in rice, her coarse-rice exports were not permitted by the United States under the PL 480 re-export restriction because they were deemed to be "like" commodities.[58] Nevertheless, the expanded PL 480 program played a positive role in Pakistan's Second Plan performance. It was a critical ingredient in both the decontrol movement and the Rural Works Program, which are considered by most as among the highlights of the improved agricultural performance.

Input Subsidies and Input Distribution. Government policy generated incentives in yet a third way, through the pricing of improved agricultural inputs. Major subsidies were provided on such items as

57. W. P. Falcon and C. H. Gotsch, "A Note on the Foodgrain Situation in East Pakistan" (mimeo, Pakistan Planning Commission, June 1964).
58. See Falcon, "Consistency of U.S. Policy towards P.L. 480."

fertilizer, plant protection, and irrigation water by the central and provincial governments. The net result was to make the price of these inputs very low by world-price standards.

In the case of plant-protection activities, the government provided the service at no charge to farmers, and the extension staff of the Department of Agriculture spent a large portion of its time — perhaps 60 percent — on plant-protection activities. Even though there were obvious limits on the extent to which the extension personnel could directly cope with the problems of pest control and a large opportunity cost in using the staff in this manner, the program did spread pesticide technology throughout large portions of both East and West Pakistan.

The subsidy on fertilizer, another key input, averaged about 50 percent during the Second Plan period. In part, this subsidy compensated for the relatively high production costs of government-operated factories; nevertheless, its net result was to set an internal fertilizer price that was about 30 percent less than the world price at the official exchange rate.[59] With these subsidies the average return on fertilizer for the farmer was generally greater than four to one — a very appealing investment. (See Table 9.6.) These subsidies were borne on an equal basis by the central and provincial governments and were a major financial item in the Development Program. For example, in 1962/63, the middle year of the Second Plan, fertilizer subsidies amounted to about 15 percent of the entire development allocations for agriculture.[60]

During the early years of the Second Plan the subsidy features of the fertilizer program, though important, were not sufficient to induce rapid utilization because of severe difficulties in distribution. In West Pakistan fertilizer movement was the exclusive responsibility of the rural cooperatives, except in a few project areas under Agricultural Development Corporation (ADC) jurisdiction. In East Pakistan distribution to the farmer was at first generally handled by the Department of Agriculture and later by the East Pakistan ADC. There were a variety of reasons that fertilizer distribution was inefficient. In West Pakistan many cooperatives purchased fertilizer from government factories on credit, and often they also sold to farmers on a credit basis. Collections at the farm level were not always easy, and at times attempts at collection were not even vigorous. Indeed, many cooperatives found it convenient for accounting purposes to carry fertilizer that had already been distributed as stocks on hand rather than as accounts receivable. Since there were limits on the amount that cooperatives themselves could purchase from the factories without payment of earlier orders, a curious anomaly arose. The *reported* stock position rose at the same time that a strong fertilizer black market was springing up in the countryside.

59. From the beginning of the fertilizer program in Pakistan, fertilizer was heavily subsidized, but only after 1957/58 was sufficient fertilizer available to make any real difference to either the national budget or the development of agriculture.

60. *Handbook of Agricultural Statistics*, Pakistan Planning Commission, June 1969, p. 31.

On January 1, 1964, fertilizer distribution in West Pakistan was changed. In an act that took considerable courage, and which indicates both the government's pragmatism and its reliance on incentives, distribution was turned over to the private trade. Approximately five hundred "stockists" were appointed by the West Pakistan Industrial Development Corporation to serve as dealers at the local level. An attempt was made to keep some controls on pricing and markups, although many of the restrictions were not in fact enforceable, given the supply-demand situation in the rural areas. But the government went most of the way in accepting implicitly the advice of a former agricultural advisor: "The Government must learn to govern in areas in which it has competence — and to stand by in a fatherly posture where it is less efficient than the private citizen in hot pursuit of a rupee!" [61]

The results of this shift to private trade were remarkable. Within eight months the stock position went from a reported surplus of 250,000 tons in terms of ammonium-sulphate to a deficit (unfilled orders) of 125,000 tons. Although the reported surplus was probably greater than the actual supplies, the change was nonetheless spectacular. It was so rapid, in fact, that a lag in the placement of government import orders, coupled with a seasonally tight world fertilizer market, resulted in serious shortages in West Pakistan during much of 1964 and 1965.[62]

61. J. R. Motheral, "The Effect of Government Policy and Programs on Agricultural Production in Pakistan" (mimeo, Harvard Center for International Affairs, 1960).

62. In late summer of 1965, after the period covered by this chapter, first-priority fertilizer distribution was again given to the cooperatives — although now

In East Pakistan fertilizer distribution at the farm level was also opened to private trade in the early 1960's. This change was an important element in the large spurt in East Pakistan fertilizer consumption. But in the East no less than the West rapid private sales coupled with a lag in government procurement from abroad meant that fertilizer supplies were extremely tight in the last year of the Second Plan. In such situations the continued subsidy on fertilizer could be questioned, although the import policy rather than the subsidy should probably be faulted.

The incentive policy of the central and provincial governments led to other measures. Subsidies were provided for example, for tractor rentals, the digging of tubewells, and irrigation water — some of which were very controversial. Another controversial policy area was land reform. In neither province were any effective changes made in holding size or tenure conditions during the Second Plan period. However, insofar as it was the large farmers who spearheaded efforts to increase production, the failure to carry out drastic land reform may have even had a positive effect on agricultural growth. This aspect of government policy still awaits a detailed and critical appraisal.

CONCLUSIONS

The agricultural policy aspects of Pakistan's Second Plan must be considered a bright spot in the government's program. Designed to stimulate output by providing incentives for the use of improved inputs, they were a great success. Their performance had a profound influence on the entire economy of Pakistan. The near tripling of the agricultural growth rate was a major factor in permitting the total economy to grow at over 5 percent annually, in allowing exports to expand at 7 percent annually, and in providing

on a cash basis. This about-face was caused in part by aid difficulties, severe foreign-exchange pressures, and a tight world market for fertilizer. The government's view, seriously questioned by many, was that control of black marketing and the rationing of fertilizer could be handled more easily through the cooperatives. Many of the cooperative chairmen were politically strong at the grass-roots level, which undoubtedly was another factor in the switch. Given the demand situation existing in 1965, the cooperatives were probably capable of distributing the limited supplies. However, whether they can manage the expanded program called for in the Third Plan seems doubtful. This step backward in fertilizer distribution in West Pakistan may prove to be very costly.

sufficient jobs to prevent a rise in unemployment. Two questions immediately arise from this success story. What are the lessons that other countries should draw from the Pakistan experience? And is the Second Plan performance likely to be accelerated, or at least sustained, under the Third Plan?

To some, the Pakistan case shows only that a relatively large number of commercially-minded farmers with access to fair-sized holdings and thirty million acre-feet of inexpensive ground water can make agricultural development easy. Such a statement is only a half-truth. It overlooks the two basic lessons of Pakistan's Second Plan: the importance of achieving the right division in the agricultural development program between the public and private sectors, and the importance of incentives as a tool for inducing development activity in the agricultural sector.

All too often in the past, discussions about agricultural development have focused only on specific investment projects in the public sector. Whereas these schemes may be very important in particular geographic areas — such as the SCARP I region — direct public investments in agriculture are likely to suffer severe limitations in increasing output. This handicap is particularly serious when, as in the case of Pakistan, agriculture consists of millions of small decision-units. Thus, the agricultural sector is vastly different from the manufacturing sector, where a decision to double or triple domestic output in the public sector can be made almost overnight, though it may be very costly. Such a decision is not technically possible in the agricultural sector.

The limitations on increasing agricultural production via direct investment underscore the importance of incentives for farmers who are not directly affected by public investments. One lesson of the Second Plan was that the government of Pakistan did recognize the importance of these incentives. It used a variety of instruments — export-tax policy, input subsidies, price support-stabilization policy, and PL 480 policy — to create a favorable economic atmosphere. And to the surprise of a great many, the supposedly unresponsive farmers of Pakistan reacted to price and income opportunities.

The second important lesson of the Second Plan concerns the relative roles of the public and private sectors in agriculture. The private sector responded to the favorable economic climate, especially in developing and using fertilizer and water. But the public

sector was also vital, both for what it did and for what it had the sense not to do. Public investments in ground-water development, for example, had a high payoff, particularly with regard to the spread of private tubewell technology. A similar effect can be expected from the public importation and distribution of new Mexican wheat varieties undertaken during the last year of the Second Plan. The Rural Public Works Program showed that something productive could also be done with seasonally unemployed agricultural labor.

These positive contributions of the government were important and impressive. Equally impressive was the government's ability to resist the temptation to do things that it probably could not have done as well as the admittedly imperfect market. Foremost in this category was the grain trade, where quick and decentralized decisions were vital. The focus of the government during the Second Plan period was in helping to improve the working of the market rather than in taking over the extremely difficult marketing function. The move after 1964 to return the distribution of some improved inputs to the private trade was another case where the advantages of decentralization and the profit motive were recognized. Although there were probably other fields, such as pesticide distribution, where scope still existed for a change in the public-private role, the Second Plan period showed that the public and private sectors' contributions in agriculture could be complementary rather than competitive.

A third insight gained from the Pakistan experience involves the "package" of inputs required for an effective agricultural development effort. To be sure, improved inputs yield a higher return when used simultaneously than when used singly or even in pairs. But the difficulties of carrying out an integrated program involving all inputs are much greater than if efforts can be directed toward identifying and breaking a single major constraint. In the case of the former Punjab, water was the main bottleneck, and the large private and public investments made in irrigation were very profitable irrespective of the availability of fertilizer, plant protection, or improved seeds. While a package approach has much to recommend it, a growth-oriented agricultural policy must also consider the trade-off between technical efficiency and ease of focus and administration. The successful concentration on irrigation water and to some extent on fertilizer in the former Punjab highlights the necessity for evaluating this trade-off before embarking on a complex multifactor program.

Finally, the Pakistan experience showed that it was possible to have a major PL 480 program without creating serious inflationary or disincentive problems. In West Pakistan through foodgrain decontrol and cropping-pattern adjustments it was possible to accommodate without negative effects a program that provided about 15 percent of foodgrain supplies. In East Pakistan it was possible at appropriate prices to offset labor-intensive development investments with PL 480 wheat in a once strictly rice-eating society.

These are obviously not the only conclusions that might be drawn, nor is it likely that the lessons can be applied to all countries at all times. Nevertheless, they were major factors in Pakistan's ability to exceed most of the Second Plan targets. Moreover, if Pakistan continues to emphasize the quick-response inputs for agriculture and to follow the same sensible economic policies, the future appears very bright.