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THE FUTURE OF THE GREEN REVOLUTION IN WEST PAKISTAN: A CHOICE OF STRATEGY[1]

I

An overview

A DOUBT has come to persist in certain quarters that the much talked-about green revolution in fact never occurred in West Pakistan. It is not important what name is given to this phenomenon. What is important is to understand its components in their true perspective. For decades the agriculture in West Pakistan had remained stagnant. Then suddenly within a period of two to three years spectacular increases in the agricultural production occurred. The wheat production went up from its traditional figure of 4 million tons in 1966–7 to more than 6 million tons in 1967–8, adding about 1,000 million rupees to the GNP. Rice production in 1969–70 was up by 78 per cent over 1966–7. The increase in maize production in 1967–8 was 47 per cent over 1964–5. Different people would describe this phenomenon in different words but the fact that this three-pronged breakthrough occurred in only three years, from 1967 to 1970, shows that it could have only been adequately described by a word such as 'revolution'.

Another fallacy which has persisted is that the green revolution has been precariously based on Mexican wheat and IRRI rice. No doubt these two seeds have been the major engines of growth in West Pakistan's agriculture but an equally important aspect, which must not be lost sight of, is that the foundations of green revolution had in fact been gradually laid in the years prior to the commercial introduction of Mexican wheat and IRRI rice in 1967–8. To quote an example, in late 1963 there was an excess stock in West Pakistan of about 250,000 tons of fertilizers but by November 1964 not only had all the excess stocks been disposed of but the WPIDC factories had unfilled orders of 185,000 tons. Coupled with this outburst in fertilizer usage

[1] Director, Planning and Evaluation, West Pakistan Agricultural Development Corporation, Lahore. This paper has been written in a personal capacity and the views presented here do not necessarily reflect the official thinking of the WPADC. The author would like to thank Professor W. C. Thiesenhusen, Dr. Jerry Eckert, and Dr. Dilawar Ali Khan for their valuable comments on an earlier draft and Mr. Noor Ahmad for assisting him in handling of data.

was the tremendous initiative shown by the West Pakistani farmers in putting up tubewells. A rapid growth in private tubewells which had been going on for a number of years even prior to 1964 gained a further momentum in the years after 1964. In fact mid-1964 was the real turning-point in the history of agricultural development in West Pakistan.

The three major components of green revolution in West Pakistan have been an investment in private tubewells, high-yield seeds, and increased use of fertilizers. Therefore, although this green revolution is more broad-based than a mere chance acceptance of 'miracle seeds', yet it is not broad-based enough to have become institutionalized in the agricultural system of West Pakistan. So in a nutshell, although the green revolution did occur, it has yet to become institutionalized. A great deal of sustained effort is still needed to see this green revolution through into an era of expanding technology and self-perpetuating growth. On the other hand, the green revolution has already created a whole set of second-generation problems relating to equity, marketing, and prices, which must be dealt with adequately, if the growth, already achieved, is to be sustained and accelerated. Also it must be admitted that lasting progress is not achieved through occasional breakthroughs. It can be sustained only through institutions which on one hand are permanent enough, so that the policy-makers and the farmers are able to set their sights on the long-range and on the other hand flexible enough to be able to accommodate the fluctuating needs of agricultural progress. In the institutionalization of green revolution, an area which would require first attention of the government is that of a highly tuned agricultural policy based on a careful quantitative analysis of relationships now obtaining in the agriculture of West Pakistan.

The problem

It is being said that the phenomenon of green revolution in West Pakistan is leading her to a serious problem of 'duality' or 'polarization' of the farm population into two distinct sectors—a progressively modern sector and the other a regressively backward sector. This problem of 'duality' has two aspects—inter-regional and intra-regional. Inter-regional in that the new technology is dependent on increased use of water and fertilizer and is thus applicable to only 50 per cent of the total cultivated area which receives irrigation (25 million acres). Thus Pakistan must work hard to find a new technology for its

'barani'[1] areas, otherwise this may create a difficult problem of regional equity. The problem may perhaps also be intra-regional in that the new technology may have been adopted by relatively better-off farmers possessing more than 25 acres of land. Thus the rich farmers may become richer and the poor poorer.[2]

Secondly, under the pressure of abundant harvests, there is a great downward pressure on farm prices. As a result the large farmers find that in order to cut their costs they have to expand the acreage and make their operations more commercially oriented. In their case, once investments are made in fixed assets (such as tractors), the short-run cost function becomes lower than the long-run cost function.[3] Since fixed costs are costs forgone in the short-run, it does not affect the short-run supply of output. Prices of the produce can fall to the levels that cover only variable costs and not fixed costs. The impact of such a situation can be disastrous to small farmers whose total costs are largely variable. Therefore it is contended that unless a special effort is made to take this new technology to the smaller farmers, the green revolution will give rise to socially explosive problems of income distribution.

This is the problem which we intend to examine in this paper. It has two main components. In Part II of this paper we will examine the hypothesis that the green revolution has not yet reached the small farmers, particularly those in the backward and barani areas, while in Part III we will analyse the two distinct choices of models or strategies which are open to West Pakistan, namely (i) concentration of development effort on the top 25 per cent of the farmers possessing at least 12½ acres of land or (ii) making a special effort to take the technology of the green revolution to all the farmers in all the regions of West Pakistan. A conclusion based on the above discussion is presented in Part IV.

II

Extent and spread of the green revolution

The question raised in Part I of this paper can be answered by formulating the following hypotheses:

[1] Rainfed.

[2] In case of small subsistence farmers in the non-monetized sector, the poor will not get poorer *per se* but, of course, they will get relatively poorer as compared with the rich farmers who will get richer.

[3] When the fixed costs are not included in a short-run average cost curve, then obviously this curve would fall below the long-run average cost curve which includes both the variable costs and fixed costs.

1. that farmers with small holdings have been unable to adopt dwarf wheats as economically they face great risk and uncertainty with new varieties;
2. that the small farmers have been unable to finance complementary production inputs which push dwarf wheats to higher yields i.e. fertilizers, water, pesticides, etc., and therefore they need special price incentives and special credit and extension support in order to adopt the new technology;
3. that there are no intra-regional and inter-regional differences in sharing of benefits of the green revolution.

Hypothesis 1: that farmers with small holdings have been unable to adopt dwarf wheats as economically they face great risk and uncertainty with new varieties.

In the summer of 1969 an extensive survey of 502 farmers was conducted by Dr. Mushtaq Hussain[1] in the districts of Rawalpindi, Sahiwal, and Lyallpur (in the Punjab Province), Dadu, Hyderabad, and Nawabshah (in the Sind Province). Though the data were primarily used to measure the opportunity cost of switching from local wheats to Mexican dwarf varieties, the reported results give us some idea of the use of the new varieties in these districts. Dr. Mushtaq Hussain's survey showed that the districts of the Punjab and Nawabshah in the Sind, with average farm size of less than 17 acres had at least 25 per cent of their total farm area sown with Mexican dwarfs. On the other hand, the larger farms of Hyderabad and Dadu districts (34 acres and 42·60 acres respectively) had proportionately less of their area (14 per cent) sown with the new varieties.

The Planning and Development Department, Government of the Punjab,[2] has carried out 751 interviews in forty randomly selected villages of Lyallpur, Sahiwal, and Sheikhupura districts. This survey revealed that about 73 per cent of the respondents' total wheat acreage was sown with Mexican wheats during Rabi[3] 1969/70 (Table 1).

According to the survey report,

a very high percentage of farmers, 85%, has adopted the use of Mexican wheat seed by now. Although for all farmers combined the percentage of farmers that

[1] Sayed Mushtaq Hussain, 'Price Incentives for the Production of High Yielding Mexican Varieties of Wheat', *The Pakistan Development Review*, vol. x, winter 1970, pp. 448–68. For a summary of this paper and some of the other studies reported here confer Refugio I. Rochin, *The Impact of Dwarf Wheats on Farmers with Small Holdings in West Pakistan: Excerpts from Recent Studies* (Islamabad: mimeograph, Apr. 1971).

[2] Government of the Punjab, Planning and Development Department, Statistical Survey Unit, *Fertilizer and Mexican Wheat Survey Report* (Lahore, 1970).

[3] Winter crops; summer crops are known as 'Kharif'.

sow some Mexican wheat slightly increases as the holding size become larger, the increase is insignificant. Similarly for all farmers combined the type of tenure had no significant influence on the percentage of farmers that adopted Mexican wheat.[1]

During 1968–9 the West Pakistan Agricultural University, Lyallpur,[2] carried out a survey of 446 farmers in Toba Tek Singh Tehsil of District Lyallpur. Of their sample 71·30 per cent were peasant

TABLE 1. *Mexican wheat acreage as percentage of all wheat acreage during Rabi 1969–70, by size and tenure of holdings: Lyallpur, Sahiwal, and Sheikhupura Districts*

Size of holding	*Owner holdings*	*Owner-cum-tenants*	*Tenant holdings*	*All holdings*
Up to 12·5	71·0	80·4	66·7	72·5
> 12·5 to 25	63·3	71·7	69·2	68·0
> 25 to 50	71·9	92·7	81·9	82·0
> 50	73·2	87·3	57·3	78·6
All sizes	69·4	80·5	70·0	73·4

SOURCE: Government of the Punjab, Planning and Development Department, Statistical Survey Unit, *Fertilizer and Mexican Wheat Survey Report* (Lahore, 1970), p. 38.

proprietors, 6·28 per cent were owner-cum-tenants and 22·42 per cent were tenants. Of the farmers surveyed 26·90 per cent had holdings ranging between zero and 6·25 acres, 38·57 per cent between 6·25 and 12·50 acres, 26·68 per cent between 12·50 and 25 acres, and 7·85 per cent had holdings of 25 acres or above. This survey showed that 75·34 per cent of the farmers were growing some Mexican wheat of whom 66·34 per cent were growing only Mexican wheat. This survey further showed that the percentage of total farm area sown to Mexican varieties was 26·01 per cent in the case of farmers possessing holdings of up to 6·25 acres, 33·39 per cent in the case of farmers possessing holdings from 6·25 to 12·50 acres, 32·10 per cent in the case of farmers having holdings of 12·50 to 25 acres, and 41·72 per cent in case of farmers possessing holdings of 25 acres or more.[3] This study also revealed that in case of peasant proprietors, 47·64 per cent of their

[1] *Fertilizer and Mexican Wheat Survey Report* (Lahore, 1970), p. 37.

[2] A. Saeed Khan, Ali Mohammad and Bashir Ahmad, *Economics of Wheat Cultivation and its Impact on Cropping Patterns and Agricultural Practices in Toba Tek Singh Tehsil of District Lyallpur, 1968–69* (Lyallpur: West Pakistan Agricultural University, Socio-Economic Research Project) (under publication).

[3] Some allowance should be given to the fact that smaller farmers had to devote relatively a larger share of their wheat acreage for home consumption for which local wheats were invariably preferred. This trend has now almost disappeared in view of the high opportunity cost of local wheats.

total wheat acreage was devoted to Mexican varieties. The corresponding figures were 56·32 per cent and 47·96 per cent in the case of owner-cum-tenants and tenants respectively. The above shows that neither the size of the holding nor the type of tenure had any significant effect on the adoption of Mexican varieties of wheat in Toba Tek Singh Tehsil.

During 1970 Mr. Refugio I. Rochin[1] conducted a survey in the Hazara District of 143 barani farmers, who were interviewed to see if they were using dwarf wheats and with what result. Among the respondents, 96 per cent had less than 12 cropped acres and 70 per cent had less than 5; the average size of holding that was cultivated was about 4·9 acres per family. In addition, the families averaged between 9 and 10 people; about 2 to 3 per cropped acre. About 8 per cent were tenants and the rest were owners of the land they had under plough. According to the findings, change was taking place at a very rapid rate with the adoption of new dwarf wheats (particularly Mexipak-65) and fertilizer. Out of the total sample, only two had never heard of Mexipak at the time of the interview and 98 (69 per cent) were already dwarf wheat adopters.

Particularly striking is the realization that there was very little crop research done under barani conditions to identify better wheat varieties for barani farmers. Instead it was found that barani smallholders initially experimented with handfuls of seed (borrowed from neighbours and purchased locally), observed the results with their own experiments, and increased the area sown with dwarf wheats the following season.

Results of this study confirm significant differences in yield between dwarf and desi wheats by a consistently wide margin; enough to make the adoption of dwarf wheats by barani smallholders a profitable investment; dwarf wheats outyielded local wheats by over 100 per cent on the three-year average from 1967–8 to 1969–70. However, since rainfall is so important to barani wheat cultivation, it should be noted that the areas surveyed (in Mansehra and Abbotabad Tehsils) received a relatively normal rainfall (around 15 inches) from early October to late April 1967–70.

During 1971 Mr. Lowdermilk[2] carried out interviews with 353

[1] Refugio I. Rochin, *Dwarf Wheat Adoption by Barani Small Holders of Hazara District: Technological Change in Action* (Islamabad: Ford Foundation Preliminary Report, 1970).

[2] Max K. Lowdermilk, *Preliminary Report of the Diffusion and Adoption of Dwarf Wheat Varieties in Khanewal Tehsil, West Pakistan* (Ithaca: Cornell University Mimeograph, 1971).

farmers drawn from a random sample of thirty villages in Khanewal Tehsil of Multan District. Lowdermilk's survey dealt with a wide range of farm sizes. Generally, he reports a very rapid diffusion of dwarf wheat varieties for all farm size categories (Table 2).

TABLE 2. *Percentage of sample farmers reporting cultivation of some dwarf wheat by Rabi season and expecting to cultivate in 1970–1*

Size of holding	*1966–7 or before*	*1967–8*	*1968–9*	*1969–70*	*Expect in 1970–1*
2·5 < 7·5	8	66	71	81	85
7·5 < 12·5	10	69	90	91	86
12·5 < 25	8	66	86	90	93
25 < 50	14	71	88	94	95
50 >	39	88	95	99	99

SOURCE: Max K. Lowdermilk, *Preliminary Report of the Diffusion and Adoption of Dwarf Wheat Varieties in Khanewal Tehsil, West Pakistan* (Ithaca: Cornell University Mimeograph, 1971), p. 4.

During April 1972 a survey of village Harmoia (Chak No. 104 J.B.) in Lyallpur District was carried out by the author. This village was selected at random out of the villages of Lyallpur District, excluding the villages lying in its surgar-cane belts.[1]

The total number of farmers in this village was 133, out of which the land of ten farmers was found to be affected by salinity and it was considered advisable to exclude them from the sample. Out of the remaining 123 farmers, 57·72 per cent were peasant proprietors, 30·08 per cent were owner-cum-tenants and 12·20 per cent were tenants. With regard to the size of holdings, 27·64 per cent farmers had holdings of up to 6 acres, 52·03 per cent had holdings between more than 6 acres and 12·50 acres, 18·17 per cent between more than 12·50 and 25 acres, whereas 1·62 per cent had holdings of more than 25 acres.

This survey showed that 96·75 per cent of the farmers were growing some Mexican wheat. This survey further showed that 86·99 per cent of the farmers were growing only Mexican wheats. The corresponding percentages were 79·41 in case of farmers having holdings of up to

[1] Under the Government regulations the sugar mills in West Pakistan must purchase sugar-cane from farmers located within a certain radius, normally of 10 to 20 miles, depending on the size of the mill. This policy has a significant effect on the cropping pattern. Thus to assess the impact of new technology, particularly with regard to Mexican wheats, it was considered desirable to eliminate the villages lying in the sugar-cane belts.

6 acres, 90·63 in case of farmers having holdings of more than 6 acres to 12·50 acres, 86·96 in case of farmers having holdings of more than 12·50 to 25 acres, and 100 per cent in case of farmers having holdings of more than 25 acres.

The following table shows the adoption of Mexican wheat by farm size.

TABLE 3. *Mexican wheat adoption by farm size in Harmoia Village, District Lyallpur—Rabi, 1970–1*

Size of holding (acres)	*Total farm area (acres)*	*Acreage sown to wheats*	*Percentage of farm area sown to wheats*	*Acreage sown to desi wheats*	*Percentage of wheat area sown to desi wheats*	*Acreage sown to Mexican wheats*	*Percentage of wheat area sown to Mexican wheats*
Up to 6·0	146·125	74·25	50·81	8·00	10·78	66·25	89·22
> 6·0 to 12·5	575·00	266·25	46·30	9·00	3·38	257·25	96·62
> 12·5 to 25·0	352·00	160·25	45·52	7·00	4·37	153·25	95·63
> 25·0	69·00	19·00	27·53	..	..	19·00	100·00
All sizes	1132·125	519·75	45·91	24·00	4·62	495·75	95·38

It is evident from the above table that only a small acreage was sown to local varieties of wheat by all categories of farmers except the largest. During the survey, it was revealed by these farmers that they had resorted to local wheats due to an acute shortage of irrigation water during Rabi, 1970–1. All these farmers further revealed that, had there been no constraint of irrigation water, they would have grown only Mexican wheats. Although the above table does indicate that the small farmers are facing a constraint of resources (irrigation water) to some extent, we may conclude that the farm size does not have any significant effect on the adoption of Mexican wheat.

In terms of tenure, our survey revealed that in the case of peasant-proprietors 92·16 per cent of their total wheat acreage was devoted to Mexican varieties. The corresponding figures were 98·28 per cent and 100·00 per cent in the case of owner-cum-tenants and tenants respectively. Our survey further revealed that 78·88 per cent of peasant-proprietors, 97·30 per cent of owner-cum-tenants and 100 per cent of the tenants were growing only Mexican wheats. Thus, according to our survey the type of tenure had no effect whatsoever on the adoption of Mexican varieties of wheat.

In view of the above evidence, we can safely reject the hypothesis that farmers with small holdings have been unable to adopt dwarf wheats.

Hypothesis 2: that the small farmers have been unable to finance complementary production inputs which push dwarf wheats to higher yields i.e. fertilizers, water, pesticides, etc., and therefore they need special price incentives and special credit and extension support in order to adopt the new technology.

Eckert[1] interviewed 115 farmers in the Sahiwal District during 1969. He broke down his sample into two categories on the basis of size of crop acreage; those with 25 acres or less and those with 25 acres or above in size.

Significant among Eckert's findings was that both farm size categories produced similar wheat yields. On the small and large farms, desi wheats averaged 16·54 and 15·35 maunds[2] per acre respectively; dwarf wheats averaged 22·04 and 24·48. However, there were moderate differences in some input levels. Small farmers had higher labour land ratios (represented by bullock pair-hours used per acre), slightly lower seed rates and lower use of phosphatic fertilizers, but appreciably larger doses of farmyard manure. Differences in the number of irrigations and rates of nitrogen application between farm size groups were negligible. Dr. Eckert concluded that there was no conclusive evidence to suggest that small farmers were not able to compete with large farmers in terms of yield in Sahiwal District.

Dr. Eckert's conclusion is also supported by a study carried out by the West Pakistan Agricultural University. The yield differentials as reported by this study also show no significant differences between large and small holdings in Toba Tek Singh Tehsil of Lyallpur District (Table 4).

In the sample of the earlier mentioned survey of the Punjab Planning and Development Department, the farmers with up to 12·50 acres had 37·3 per cent of the land (of which small owners held 20·7 per cent of the total acreage, owner-cum-tenants 8·6 per cent and tenants 8 per cent). 83·3 per cent of these small farmers, as compared with 98·1 per cent in the more-than-50 acres category, were using fertilizer at the time of the interview; owner-cum-tenants used the most fertilizer and tenants were just slightly below the farmers who owned their land. 16·7 per cent of the small farmers did not use fertilizer. However, 79·8 per cent of these non-users said they could not arrange funds to purchase fertilizer, while 35·2 per cent of the non-users also

[1] Jerry Bruce Eckert, 'The Impact of Dwarf Wheats on Resource Productivity in West Pakistan's Punjab (East Lansing: Michigan State University; unpublished Ph.D. dissertation, 1970).

[2] 1 maund = 82·286 lbs.

cited the lack of water as a limiting constraint on the ability to use fertilizer.

Table 5 shows that there are moderate differences in the amount of fertilizer used on Mexican dwarf wheats by farmers operating under different forms of tenure with the same size of holding. It is evident,

TABLE 4. *Yield differentials between local and Mexican varieties of wheat among different size of holdings, 1968–9*

Size of holding (acres)	*Local varieties*	*Mexican varieties*	*All wheats*
		(maunds)	
Up to 6·25	17·75	22·00	20·50
> 6·25–12·50	18·00	23·50	22·50
> 12·50–25·00	15·25	26·12	23·25
> 25·00	13·50	23·00	22·00
All sizes	16·75	24·25	22·50

SOURCE: A. Saeed Khan, Ali Mohammad and Bashir Ahmad, *Economics of Wheat Cultivation and its Impact on Cropping Patterns and Agricultural Practices in Toba Tek Singh Tehsil of District Lyallpur, 1968–69* (Lyallpur: West Pakistan Agricultural University, Socio-Economic Research Project) (under publication).

TABLE 5. *Nutrient pounds of nitrogenous fertilizer per acre applied to Mexican wheats by size of holding and tenure: Lyallpur, Sahiwal, and Sheikhupura District, 1970*

Size of holding	*Owner holdings*	*Owner-cum-tenants*	*Tenant holdings*	*All holdings*
Up to 12·5	44·1	36·5	41·1	41·3
> 12·5 to 25·0	48·0	49·4	40·4	47·0
> 25·0 to 50·0	75·4	52·5	62·8	62·7
> 50·0	58·9	66·7	49·7	62·3
All sizes	52·0	49·0	45·5	49·7

SOURCE: Government of the Punjab, Planning and Development Department, Statistical Survey Unit, *Fertilizer and Mexican Wheat Survey Report* (Lahore, 1970).

however, that large farmers used more nitrogen per acre than small farmers and, hence, came closer to the optimum yield giving dosages recommended for dwarf wheat production.

According to the earlier quoted Rochin's survey of small barani farmers in Hazara District, 53 per cent of the dwarf wheat users also applied fertilizer to their crop; most of these were using it for the first time. It has been hypothesized by Rochin that off-farm remittances

from family members working outside Hazara (mostly in Karachi in low-paying service-sector jobs) have made it possible for the barani smallholders of the district to finance and assume the risk from adopting new seed and fertilizer. According to the Punjab Planning and Development Department's survey of the three irrigated districts of the Central Punjab, 85 per cent of the farmers have adopted the dwarf wheats. Of the 15 per cent of the farmers who did not grow any Mexican wheat, 43 per cent cited lack of water as the main reason and 37 per cent said they preferred the taste of desi wheat.

On the basis of Lowdermilk's findings, the most limiting constraints on the smallholders' ability to raise overall crop production appeared to be water and credit (which could be used to purchase fertilizer and other factors of production, including tubewell water). In particular, farmers with less than 25 acres reported 'that sufficient tubewell water was not easily available to them for Rabi 1969–70'.[1] The same category of farmers also reported that fertilizer was not easily available for the same growing period. On the subject of credit, relatives, neighbours and/or friends were shown to be the main sources of credit for all farm size groupings. However, 32 per cent of the farmers with 50 acres or more cited the bank as an important source of credit while banks were rarely cited by the rest of the respondents.

A study on the peasant proprietors in Sahiwal Tehsil of Sahiwal District carried out by Muhammad Shafique[2] has revealed that 95 per cent of the peasant proprietors owning 5 acres or less than 5 acres of land expressed their need for credit. This percentage declined to 90 per cent in the case of peasant proprietors possessing holdings of 7·5 to 12·50 acres and to only 55 per cent for those possessing holdings of 12·50 to 25 acres. This shows that the smaller farmers are facing more difficulties than the larger farmers in meeting their credit needs.

Also Lowdermilk's survey revealed that small farmers reported least contacts with the Government workers. In Lowdermilk's view 'extension personnel gravitate to the large farmers to a great degree. Contacts with small farmers are surprisingly few. Knowledge of extension workers is also greatly related to farm size.'[3]

The survey of Harmoia village conducted by this author revealed the following yield differentials:

[1] Lowdermilk, op. cit., p. 36.

[2] Muhammad Shafique, 'Short and Medium Term Credit Needs of the Peasant Proprietors class in Sahiwal Tehsil' (Lyallpur: West Pakistan Agricultural University, unpublished M.Sc. (Agri.) thesis, 1966).

[3] Lowdermilk, ibid.

TABLE 6. *Yield differentials in local and Mexican varieties of wheat among different sizes of holdings in Harmoia village, 1970–1*

Size of holding (Acres)	*Local wheats*	*Mexican wheats*	*All wheats*
		(maunds)	
Up to 6·00	17·86	23·92	23·27
> 6·00 to 12·50	17·16	24·75	24·49
> 12·50 to 25·00	18·00	23·09	22·87
> 25·00	..	25·00	25·00
All sizes	17·64	24·13	23·83

The statistical analysis of data presented in the above table showed that there was no significant difference in Mexican wheat yields of small and large farmers. The following table shows the yield differentials among different tenures:

TABLE 7. *Yield differentials in local and Mexican varieties of wheat among different tenures in Harmoia village, 1970–1*

Type of tenure	*Local wheats*	*Mexican wheats*	*All wheats*
		(maunds)	
Peasant-proprietors	17·60	24·60	24·05
Owner-cum-tenants	18·00	25·84	23·74
Tenants	..	23·40	23·40
All types	17·65	24·15	23·85

The analysis of data presented in the above table showed that there was no significant difference between the Mexican wheat yields obtained by peasant-proprietors, owner-cum-tenants, and tenants.

The following three tables show the extent of fertilizer usage on various crops by various categories of farmers in Harmoia Village of Lyallpur District:

Tables 8 and 9 show that all categories of farmers are using some fertilizer on both local and Mexican varieties of wheat. Table 10, however, shows that the quantity of fertilizer used increases with the farm size, indicating that the larger farmers came closer to the optimum yield giving dosages recommended for Mexican wheats.

Table 11 indicates the importance of various difficulties faced by various categories of farmers in Harmoia village in using as much fertilizers as they would have liked to.

TABLE 8. *Percentage of farmers in various categories of holdings using some fertilizer on various crops in Harmoia village, Rabi 1970–1 and Kharif 1971–2*

Size of holding (acres)	*Local wheats*	*Mexican wheats*	*Cotton*	*Sugar-cane*	*Maize*	*Green fodder*
			(Percentages)			
Up to 6·00	85·71	96·77	76·92	93·75	88·23	94·12
> 6·00 to 12·50	83·33	98·41	90·19	95·31	87·50	87·50
> 12·50 to 25·00	100·00	100·00	90·91	95·65	87·96	100·00
> 25·00	..	100·00	100·00	100·00	50·00	100·00
All sizes*	87·50	98·32	87·13	96·04	87·15	91·87

* Percentages in the row 'All sizes' have been weighted according to number of cultivators in each category.

TABLE 9. *Fertilized area as a percentage of total area under different crops by size of holdings in Harmoia village, Rabi 1970–1 and Kharif 1971–2*

Size of holding (acres)	*Local wheats*	*Mexican wheats*	*Cotton*	*Sugar-cane*	*Maize*	*Fodder*
			(Percentages)			
Up to 6·00	84·37	96·60	85·48	94·66	87·94	80·47
> 6·00 to 12·50	80·55	99·51	99·14	98·35	87·49	83·85
> 12·50 to 25·00	100·00	100·00	90·51	94·66	85·10	90·98
> 25·00	..	100·00	100·00	100·00	36·36	83·73
All sizes*	87·50	99·29	94·74	96·57	84·20	82·26

* Percentages in the row 'All sizes' have been weighted according to number of acres in each category.

TABLE 10. *Nutrient pounds of nitrogenous fertilizer per acre applied to various crops by size of holdings in Harmoia village, Rabi 1970–1 and Kharif 1971–2*

Size of holding (acres)	*Local wheats*	*Mexican wheats*	*Cotton*	*Sugar-cane*	*Maize*	*Fodder*
Up to 6·00	19·18	51·39	64·07	85·50	50·16	45·79
> 6·00 to 12·50	22·89	60·49	64·85	83·66	48·46	53·42
> 12·50 to 25·00	47·08	61·30	59·45	76·10	51·37	46·31
> 25·00	..	74·57	60·64	73·08	101·20	40·48
All sizes*	42·76	60·01	62·84	80·80	50·79	50·60

* The figures in the row 'All sizes' have been weighted according to acreage in each category.

TABLE 11. *Main reasons for not using as much fertilizer as desired by various categories of farmers in Harmoia village during Rabi 1970–1 and Kharif 1971–2*

Size of holding (acres)	*Cultivators reporting some difficulty*	*Main reasons for not using desired amount of fertilizer*			
		Lack of credit	*Shortage of irrigation water*	*Non-availability of fertilizer when required*	*Fertilizer sale point too far off***
		(Percentage of fertilizer users)			
Up to 6·00	100·00	94·12	20·59	2·94	2·94
> 6·00 to 12·50	95·31	87·50	21·87	12·50	6·25
> 12·50 to 25·00	60·09	56·52	17·39	4·35	8·70
> 25·00	50·00	..	50·00	..	..
All sizes*	89·43	82·11	21·13	8·13	5·69

NOTE: The percentages in the rows may add to more than 100 due to the reason that the farmers may have more than one reason for not using the desired amount of fertilizer.

* The percentages in the row 'All sizes' have been weighted according to numbers of farmers in each category.

** The nearest fertilizer sale point is at a distance of 12 miles.

The above table shows that the smaller farmers in the first two categories faced much greater constraints in using the desired amount of fertilizers. The lack of credit was the most important constraint faced by all categories of farmers except the largest. The second most important constraint was the lack of irrigation water. The non-availability of fertilizers at the right time and the distance of fertilizer sale point were also quoted as difficulties to varying extents, by all categories of farmers except the largest.

During our survey of Harmoia village we also asked the cultivators what, according to them, were the main constraints on the farm production. Their answers have been tabulated in Table 12.

This table clearly shows that irrigation water followed by credit were the most important constraints felt by the farmers in Harmoia village. It is interesting to note that the larger farmers stated plant protection as the most important constraint on the farm production.

Our survey further revealed that the smaller farmers were seldom visited by the extension agents of the Agriculture Department, while only a very small number of larger farmers had been visited by Extension agents occasionally. None of the farmers having holdings of up to 12·50 acres was visited by the Extension agents. This finding

and a similar observation by Lowdermilk quoted earlier must, however, be evaluated against the proposition that in the irrigated plains of West Pakistan it is not the larger farmers who need the Extension agents, rather the position is the other way round.

TABLE 12. *Main constraints on farm production faced by different categories of farmers in Harmoia village, Lyallpur District, during Rabi 1970–1 and Kharif 1971–2*

Size of holding (acres)	*Irrigation water*	*Credit*	*Fertilizer*	*Improved seed*	*Plant protection*
			(Percentage of farmers)		
Up to 6·00	88·23	94·11	14·70	..	..
> 6·00 to 12·50	92·18	62·50	25·00	6·25	7·81
> 12·50 to 25·00	72·91	43·43	43·48	13·04	8·69
> 25·00	50·00	..	..	50·00	100·00
All sizes*	86·99	66·66	25·20	6·50	7·31

NOTE: The percentages in the rows may add to more than 100 due to the reason that farmers may have faced more than one constraint.

* The percentages in the row 'All sizes' have been weighted according to number of farmers in each category.

The evidence of the present and other authors given above indicates that while the smaller farmers do face relatively more severe constraints of irrigation water and credit, the difference in the severity of these constraints is not serious enough to have caused any significant differences in the yields obtained by the small farmers as compared with large farmers. It seems that small farmers are able to offset the severity of these constraints, to some extent, by making changes in their input mix, relying to a greater degree on the resources available on the farm, i.e. farm labour and farmyard manure.

In view of the evidence presented above, we would tend to reject the hypothesis that small farmers have been unable to finance complementary inputs and that they need special price incentives and special credit and extension support in order to adopt the new technology. However, we are of the view that there is need for a more extensive survey before we are in a position categorically to reject this hypothesis.

Hypothesis 3: that there are no intra-regional and inter-regional differences in sharing of benefits of the green revolution.

Dr. Eckert's survey in Sahiwal District and the West Pakistan Agricultural University's and the present author's surveys in Lyallpur

District had revealed no significant differences in the dwarf wheat yields of small and large farmers. Although the evidence presented above does indicate that small farmers are facing a relatively more severe constraint of resources as compared with larger farmers, particularly with regard to irrigation water and credit, this constraint is not so severe that it would inhibit the adoption of new technology by small farmers to any significant extent. The small yield differentials that have been noticed between large and small farmers are primarily due to the fact that large farmers are able to use more nearly optimum dosages of fertilizer coupled with irrigation water. Clearly, yield differentials are not large enough to have created as yet any serious problem of 'duality' or 'polarization'. This, however, does not mean that we can afford to be complacent; urgent and co-ordinated action is needed with regard to enhanced credit and irrigation water supplies to the small farmers. These facts must be kept in mind while planning for the irrigated agriculture in West Pakistan.

The physical production, however, is only a part of the total benefits: the quantum of benefits accruing to small or large farmers is also a function of the prices received by them. It is also pertinent to note that the socio-political risk involved in 'duality' is not a function of the rate of adoption of new technology *per se* but of difference in the quantum of benefits flowing to different groups of people and different regions. It has been observed that in West Pakistan a major supply increase generated by the new technology exerted a great downward pressure on the harvest prices of foodgrains, e.g. the harvest price of wheat fell down to Rs. 13.00 or even Rs. 12.00 per maund during 1967–8, as against the support price of Rs. 17.00 per maund fixed by the Government. In such circumstances the quantum of benefits flowing to the farmers becomes a function of the ability of the farmers to sell their produce at the Government support price. If the institutional arrangements set up by the Government for this purpose have a bias towards the larger farmers, this would obviously lead to a gap in the quantum of benefits which flow to these two categories of farmers.

A West Pakistan Agricultural University's study carried out by Muhammad Mansha[1] in Lyallpur District has shown that the Government procurement facilities are not being utilized to a large

[1] Muhammad Mansha, 'An Evaluation of Wheat Procurement Scheme in Lyallpur District' (Lyallpur: West Pakistan Agricultural University, unpublished M.Sc. (Agri.) thesis, 1971).

extent by the smaller farmers. This study has revealed that farmers possessing holdings of up to 7·50 acres did not sell any wheat to the Government procurement centres during 1970–1, while farmers having holdings between 7·50 and 25 acres sold 2·41 per cent of their marketed surplus to the Government procurement centres. This percentage increased to 7·29 per cent in the case of farmers holding more than 25 acres.

The Planning and Development Department's survey[1] referred to earlier had also revealed that the smaller farmers, possessing less than 12·50 acres of land, did not sell any wheat to the Government procurement centres during 1968–9, while the percentage of farmers who sold some wheat to these centres was 0·4, 4·0, and 5·1 in the case of farmers possessing holdings of 12·50 to 25 acres, 25 to 50 acres, and more than 50 acres respectively. On the other hand, our survey of Harmoia village in Lyallpur District revealed that none of the farmers, whether small or large, had sold any wheat to the Government.

On the basis of the above evidence we would hesitate in rejecting the hypothesis that there are no intra-regional differences in the quantum of benefits of the green revolution.

As far as the inter-regional sharing of benefits is concerned the position is quite different. As compared with the average yield of 22·04 maunds per acre of dwarf wheat on farms below 25 acres and of 24·48 maunds per acre on farms above 25 acres in the irrigated Sahiwal District, as reported by Eckert, the dwarf wheat yield was only 18·85 maunds (3-year average) in the barani Hazara District, as reported by Rochin. Here it is also pertinent to note that Hazara District does not represent true barani conditions of the Soan Valley, Derajat, Cholistan, and Baluchistan. Dr. Mushtaq Hussain's survey revealed a difference of more than 8 maunds in the yield of Mexican wheat in barani Rawalpindi District and irrigated Lyallpur District.

In order to gauge the spread of new technology in the true barani conditions, we carried out a survey of village Draggar in Talagang Tehsil of Campbellpur District during February 1972. The total number of farmers in this village was 43, out of whom 62·79 per cent were peasant-proprietors, 27·91 per cent were owner-cum-tenants, and 9·30 per cent were tenants. With regard to the size of holdings, 34·78 per cent of the farmers had holdings of up to 6 acres, 25·60 per cent had holdings of more than 6 to 12·50 acres, 27·91 per cent had

[1] Government of the Punjab, Planning and Development Department, Statistical Survey Unit, *Fertilizer and Mexican Wheat Survey Report* (Lahore, 1970), p. 52.

holdings of more than 12·50 acres to 25 acres, and 11·62 per cent had holdings of more than 25 acres. This survey revealed a minimal adoption of Mexican wheat during Rabi 1970–1; only half an acre of Mexican wheat was sown by one farmer in the more than 6 to 12·50 acres category. Fertilizer was being used by only 6·6 per cent of farmers having holdings of up to 6 acres, 17·77 per cent of farmers having more than 6 acres to 12·50 acres, 16·66 per cent of farmers having more than 12·50 acres to 25 acres, and 20 per cent of farmers having more than 25 acres. Those farmers who did not use any fertilizer cited lack of water as the sole reason. We also asked the farmers what, according to them, were the main constraints on their farm production. While all categories of farmers listed lack of water as a constraint, lack of credit was quoted as a constraint by 53·33 per cent of farmers having holdings up to 6 acres, by 36·36 per cent of farmers having more than 6 acres to 12·50 acres, 8·33 per cent of farmers having holdings of more than 12·50 to 25 acres, whereas farmers having more than 25 acres did not feel that lack of credit was a constraint on farm production.[1]

Thus we find that while the rate of adoption of new technology in the barani areas receiving an adequate rainfall had been very rapid, there was a considerable difference in yields in these areas as compared with the irrigated plains of West Pakistan. On the other hand in the drier barani areas, not only were the yields very low, but the adoption of the new technology was also minimal. In view of this, we do not reject the second part of the hypothesis that there are no inter-regional differences in the sharing of the benefits of 'green revolution'.

III

Although the policy recommendations for the future development of agriculture in West Pakistan which flow from the analysis presented in Part II of this paper are clear enough, in view of the prevailing planning and financial climate we would like to discuss these in the context of two policy models which are presented below. Although, due to a quick adoption of new technology by the small farmers, these two models have become somewhat diffused as far as the irrigated plains of West Pakistan are concerned, nevertheless a clear-cut distinction between these two models would help the Government in arriving at correct investment decisions.

[1] It may be relevant to note that in this district, almost all household incomes are supplemented by employment in the armed forces.

A. *Squeezing the Kulaks*

The first model recommends the continuation and consolidation of the trends of change which are already apparent in West Pakistan's agriculture, i.e. helping only those farmers who have the wherewithal to adopt the new technology. This model has all the essentials of the Mill–Marshallian model (except for the problem small subsistence farms) in which the Government tries to push the speed of the 'agricultural treadmill' by priming the pump and then squeezing the yeomanry in the interests of sustained economic growth. In other words, this model recommends concentration of the scarce public resources on those farmers who already possess an adequate resource base, giving them all the policy and institutional support with a view to capturing the large agricultural surpluses generated by them. This model places a premium on the skills and management abilities of the farmers. A small inefficient farmer is left way behind in this model and is either forced to live on a barest minimum margin or is pushed out of the agricultural sector. While these peasants/sharecroppers continue to exist on the farms, agriculture renders a welfare service to the non-farm sector. When they are pushed out, these farmers have a social cost to the economy which presently is being estimated at Rs. 15,000 per worker displaced.[1]

The timing in this model is rather crucial. It would be fine if the rate of displacement of farm workers were equal to the rate of their absorption by the non-farm sector of the economy. This is, however, seldom possible. In West Pakistan non-farm employment grew at a rate of 4·5 per cent per year, a rate which in the postwar period has been exceeded only in Taiwan. Even if this rate were to continue until 1985, workers in the rural sector would still increase from 7·4 million (in 1961) to 12·2 million. On the other hand, the rate of displacement is expected to increase under the dynamics of this model. The concentration of public effort on larger farmers would quickly increase their capabilities of adopting 'mechanical-engineering' technology at a rapid pace, thus further accentuating the employment problem. This in fact is already happening in West Pakistan and is the result of a mistaken notion that agriculture cannot really be modernized without a large-scale introduction of farm machines. This notion in turn is perhaps based on failure to distinguish between social costs and profitability and private costs and profitability. An

[1] S. R. Bose and E. H. Clark, 'Some Basic Considerations on Agricultural Mechanization in West Pakistan', *The Pakistan Development Review*, vol. ix, 1969, p. 291.

interesting fact to note in this connection is that Pakistani farmers have to pay only one-half of the amount of wheat which the world farmers have to pay for a tractor of equal design and power.[1] This paradox thus reflects in a situation in which a relatively cheap input (labour) is being replaced by a relatively dearer input (capital). The prices artificially maintained by the Government measures thus make the private marginal productivity of investment in tractors considerably higher than it is in advanced countries and higher than its marginal social productivity at home.

The dynamics of this model in the case of India has been dramatically brought into focus by Michael Lipton[2] as follows:

> For India's planners, the role of agriculture has been to provide surpluses—of food, workers, finance—for industry. This implies pushing resources to the big farmers, who will use them to increase their food sales to the cities, their savings in city banks, and probably their stock of machines to replace workers migrating to the city. In this sense the New Strategy—the policy of using the undisputed boon of improved seeds so as to benefit the big farmers—is just the old urban bias in new guise. So is the exclusive emphasis on Incentives (which the big farmers can afford most easily), to the neglect of Institutions needed only by the poor.
>
> Clearly the rich farmer—the 10 per cent of India's farmers who will get the improved seeds—benefits hugely. His output doubles, his prices fall by perhaps 15 per cent in the long term and even if his input costs rise by the same amount he is left 40 or 50 per cent richer. The townsman, rich or poor, benefits too; workers and jobless from cheaper food, employers (private or State) from the consequent easing of the pressure for wage rises. The worst-off 30 per cent of Indian agriculturists—with no land at all, or with too little to feed their families without doing outside work—benefit too: their food is cheaper, and their *short-run* job prospects better as there is extra demand for fertilizer appliers, weeders and harvesters and often double-cropping. The *long-run* job affects are likely to be harmful, as bigger and richer farmers are almost certain to seek, on an increasingly massive scale, to replace men by machines. But in the short-run all the townsmen, the richest 10 per cent of agriculturists, and the poorest 30 per cent all seem to gain.
>
> The sufferers—not from the new seeds but from the way they are being allocated—are the middle 60 per cent of India's agriculturists, making up over 40 per cent of her people. Such men grow enough to feed their families and sell a small food surplus; they hire in more labour than they hire out; but they are

[1] Hiromitue Kaneda, 'Economic Implications of the Green Revolution and the Strategy of the Agricultural Development in West Pakistan', *The Pakistan Development Review*, vol. ix (1969), p.127.

[2] Michael Lipton, *India's Food Problem: Facts and Moods or Richer Farmers Gain Most* (Stanmer: University of Sussex Institute of Development Studies, Communications Series No. 47, Dec. 1969), p. 3, also published in *The Times* Survey of India, 13 Oct. 1969.

seldom able to use the new seeds profitably. They suffer in every way. As food sellers their prices fall. As buyers of labour they face wages rises.'

Contrary to expectations, fortunately the position in West Pakistan as shown by the empirical analysis in Part II of this paper is not so dismal. The small farmers in the irrigated plains of West Pakistan who are perhaps much more 'plugged into the system' than are the Indian or Latin American small farmers and also due to their better resource base seem to have been able, to a large extent, to adopt the new technology. The only problem areas for them seem to be the shortage of irrigation water, credit, and adequate price supports.

The usefulness of this model, particularly in the initial stages of development cannot be overrated. West Pakistan should consider itself fortunate in that even after fifteen years of planned development, this model, which is relatively inexpensive, is still largely applicable in her socio-political context. This model would become still more acceptable if the rate of labour displacement on West Pakistan farms, and thus its social costs, are kept at a minimum. This can be done by adopting public policies which will inhibit adoption of 'mechanical-engineering' technology rather than aid it. This model in the context of West Pakistan would, however, pose a problem of regional equity in that the new technology is mainly relevant to the irrigated areas which form only 50 per cent of the total cultivated area of West Pakistan.

B. *Pampering the peasants*

The second model has been built around the assumption that in order to achieve a lasting progress in the agricultural sector, the new technology must be taken to each and every farmer; only then a framework for a self-perpetuating growth would be established. In the case of this model, however, the economic theory is not as obliging as in the case of the former, in providing a theoretical framework. The objective of an economy is of course 'Pareto-optimality', but Pareto-optimality is an 'empty box', having no notion of distributive justice. Moreover, it is difficult to specify the social welfare function of a nation. Whilst the rules for attaining an optimum efficiency in the use and allocation of resources, under a given pattern of income distribution, are clearly definable and generally acceptable, their significance is dependent upon the nature of the social welfare function relating to gains and losses of a particular individual and groups and the

optimum distribution of real income. Thus although the concept of a social welfare function is clear enough, the determination of its empirical content, which must rest upon consensus in a particular society, encounters serious conceptual and practical difficulties. Nevertheless, it is not difficult to admit that the transfer of one rupee from a millionaire to a starving person would increase the satisfaction of the latter more than it decreased the satisfaction of the former. That this is a value judgement is not denied, but on the other hand maximization of output *per se* can hardly be accepted as a sound objective, particularly in this age. Nevertheless, even from a purely economic angle, this model can be supported, if it can be proved that by adoption of the former model, the economy will move away from rather than towards the 'production possibility frontier'. It seems that under the dynamics of the former model this might well be the case due to the unemployment and social turmoil caused: the economy will operate on or near the production possibility frontier, only if it is able to absorb efficiently all the workers pushed out by the agricultural sector.

The choice of technology in this model will perforce have to be of 'biological-chemical' nature rather than of 'mechanical-engineering' type. Here it is of interest to note that 'biological-chemical' technology in West Pakistan is relatively more expensive as compared with the advanced countries. For example, in Japan it takes 2·4 lb. of wheat to buy one lb. of nitrogen, while in West Pakistan it takes more than 3 lb. of wheat to buy 1 lb. of nitrogen.

The operational strategy of this model is based on the selection of project areas, with a view to improving the economic position of small farmers by undertaking an intensive programme of extension, farmer education and training, supervised credit, production planning, marketing, provision of farm machinery on hire, intensification and diversification of agriculture according to optimal cropping pattern and encouraging farm co-operatives on commercial lines.

The proposed programme is built around the integrated and intensive use of a 'package of inputs and services' that will help cultivators achieve greater production and productivity. Basic items in the 'package' are intensive technical guidance to the farmers in planning their farm operations and management, intensive demonstration work to show the advantages and techniques involved in improved practices and new technology, provision of adequate production credit based on approved farm plans, and timely availability of needed inputs in each village. The main features of this new approach are:

1. adequate farm credit based on production potential, made readily assessable through simple procedures;
2. adequate supplies of fertilizers, pesticides, improved seeds, and improved farm implements readily accessible through village stores;
3. price-incentives to the farmers through ensuring that they receive the guaranteed government prices for wheat and rice;
4. marketing arrangements and services to enable the farmer to obtain the full market price for his produce;
5. intensive educational, technical, and farm management assistance made available in every village through the project staff and mobilization of the resources of existing departments;
6. planned improvement of farm holdings through preparation of farm plans for each farm;
7. village improvement plans through the mobilization of village leadership and the resources of nation-building departments; and
8. mobilization of village labour to undertake local public works such as drainage, sanitation, and roads.

This model can be criticized on the following grounds:

(i) Co-ordinated attack on all the fronts is not possible over a large area.

(ii) The project/area approaches to development, except in case of irrigation projects where the objective is quite different, have not proved very successful.

(iii) This is an expensive strategy in that the cost per cultivated acre is exorbitant; in West Pakistan the cost of such a project has been calculated to be more than Rs. 10.00 per acre as compared with only Rs. 1.12 per acre of the normal agricultural extension scheme of the Department of Agriculture.

(iv) It might be wasteful in terms of scarce resources: it may entail concentration on physical eye-catching investments having a high social cost. Normal services such as agricultural extension may suffer due to concentration on such tasks as provision of tractor services, credit, construction of food stores, etc.

(v) It may dilute the development effort by diverting the scarce financial and administrative resources to smaller farmers, who

are not in the best position to use them e.g. the best use of scarce agricultural credit can be made by the innovating medium and large farmers rather than the small.

(vi) It is administration-intensive: executive capacity is a scarce resource in Pakistan, having a high opportunity cost.

(vii) It may also be administration-persistent: services once provided are difficult to withdraw.

(viii) A government agency entering the field of production or marketing credit has to compete with moneylenders who have certain advantages. No doubt the moneylenders charge high rates of interest but they are very responsive, have simple procedures and are able to supervise closely. Also supervised credit is very difficult for the government to administer for thousands of small farmers having no collateral.

(xi) Concentration on small farmers has a large number of disadvantages anyway; for example in respect of credit, it would unavoidably lead to a much lower loan recovery rate. It would also almost certainly lead to soft interest rates which in turn place a limit on the expansion of the credit system beyond a relatively smaller size. At the present stage of development in West Pakistan, if an investment cannot at least compound an interest rate of 12 per cent, then it is not a good investment; soft credit may encourage wrong investments.

(x) An even more serious problem in the project/package approach is that these are difficult to operationalize on the ground, e.g. in case of credit it is very difficult to eliminate the cumbersome procedures of the agricultural banks; alternatively efficiency can only be achieved at a high cost of low recoveries.

(xi) In view of scarce resources, both financial and managerial, investment on a functional basis, such as on fertilizers, improved seeds, etc., may give better results.

(xii) The various components of the package approach i.e. improvement in extension, supply of inputs, credit, marketing, etc. do not necessarily operate as a vehicle of technological change simply because they have been combined together. If the resource base of the farmers is inadequate, the package programme will not have much influence, unless some basic changes in the agrarian structure are effected.

IV

Concluding remarks

The policy recommendations for the future development of agriculture in West Pakistan which flow from our analysis in Part II of this paper are:

(*a*) provision of cheap fertilizers and tubewell materials;
(*b*) a vigorous breeding programme for the new seeds;
(*c*) a hard-hitting price support and credit programme;
(*d*) a land reform programme which is oriented not so much towards the lowering of the upper limit on the land holdings but towards raising of the minimum size of holdings to more than 12·50 acres;
(*e*) a vigorous search for a 'relevent technology' for the barani areas.

While the programmes initiated under the above five categories would be equally available both to the small and large farmers, it should be particularly seen that the small farmers are not left out.

In the present context of West Pakistan agricultural development *vis-à-vis* the current public sector resource position, we are of the view that a more relevant theoretical framework is provided by the first model discussed in Part III of this paper. The current financial situation demands that the Government continues to use its resources as selectively as possible with a view to getting maximum return per rupee invested but in order to diffuse any socio-political risks involved in this model, an effort should be made to streamline the existing institutions so that their services are readily available to the small farmers and instead of creating expensive institutional arrangements for reaching the small farmers, main reliance should be placed on agricultural and taxation policies. In this context we would like to make the following specific suggestions:

(i) The government is spending annually about 100 million rupees on fertilizer subsidy. The situation does seem anomalous in that C. & F. Karachi price and cost of production of urea at the local Esso plant is about Rs. 400.00 per ton, which even after adding Rs. 100.00 of distribution incidentals is considerably lower than the subsidized price for urea of Rs. 570.00 per ton.[1] The cost of production at the newly established Dawood-

[1] A major share of subsidy is consumed by the high-cost public-sector plants.

Hercules Plant is considerably lower than Esso. Thus with the removal of price control on fertilizers, coupled with planned increases in the production capacity, fertilizer prices are likely to fall much below the present subsidized level, thereby reducing the credit requirements both for large and small farmers. Also by rationalization of the system of agricultural subsidies, funds can be spared for investments in areas showing greater promise.

(ii) The wheat and rice procurement organization and procedures should be streamlined so that small farmers no longer remain at a disadvantage as compared with more influential larger farmers.

(iii) The services of private sector should be utilized to the maximum in the areas of storage, marketing, and distribution of inputs, provided that in the case of subsidized inputs, a proper check is exercised on the distribution costs.

(iv) In the field of agricultural credit, a great service to agricultural sector could be rendered by private commercial banks if they would open branches in the rural areas, with a view not only to extending credit to the farmers but also to mobilize rural savings.

(v) In the field of extension, a great deal can be achieved by using cheaper extension media. In this connection, West Pakistan has already done well in reaching the small farmers through the Radio.[1]

In a nutshell, the formula for success in West Pakistan seems to lie in sharpening the present developmental focus on the 'biological-chemical' technology, while trying to reach the smaller farmer by increasing the efficiency and by reorienting the outlook and mission of existing institutions[2] through public policies and through considered changes in the social structure of agriculture rather than by creating new elaborate institutional arrangements. Also, efforts should be made for finding a suitable technology for the barani areas.

[1] Cf. Refugio I. Rochin, op. cit.

[2] These matters form part of the larger question of leadership and economic growth, which has been discussed by this author in his forthcoming book, *Essays in Economics and Politics*.