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**Summary Report**

**Seminars on  
Policy Issues for Enhancing  
Agricultural Productivity  
in Pakistan**

*September 9-19, 1993*

Editors  
Pervaiz Amir  
and  
Mazhar Hussain

**POLICY ISSUES FOR ENHANCING AGRICULTURAL  
PRODUCTIVITY IN PAKISTAN**

**Summary Report of Seminars on  
Policy Issues for Enhancing Agricultural  
Productivity in Pakistan  
September 9-19, 1993**

*Editors*

Pervaiz Amir  
Mazhar Hussain

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Asianics Agro-Dev International (Pvt) Ltd. Islamabad  
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## ABBREVIATIONS/ACRONYMS

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CEA	Chief Engineering Advisor
FED	Federation
FIG	Farmers Irrigation Group
FSR	Farming System Research
IA	Irrigation Authority
IARC	International Agriculture Research Center
NARC	National Agricultural Research Center
NARS	National Agriculture Research System
NFDC	National Fertilizer Development Center
O&M	Operation and Maintenance
OFWM	On-Farm Water Management
PAD	Provincial Agriculture Department
PARC	Pakistan Agricultural Research Council
PID	Provincial Irrigation Department
PWC	Provincial Water Commission
R&D	Research and Development
SCARP	Salinity Control and Reclamation Project
SMS	Subject Matter Specialist
TFP	Total Factor Productivity
TT	Transfer of Technology
WAPDA	Water and Power Development Authority
WSIPS	Water Sector Investment Policy Study

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We would like to acknowledge the generous support of USAID in providing financial assistance to organize these seminars, which we hope will make a strong positive impact on the agricultural economy of Pakistan. Two government of Pakistan's institutions, Agricultural Prices Commission and Flood Commission deserve special mention for supporting the major studies presented in the seminar. The generous financial assistance of the World Bank helped conduct the studies in a befitting manner.

Asianics and JMA are also grateful to the Govt. of Pakistan for co-sponsoring these seminars and for the invaluable assistance in organizing the sessions. Chemonics International, USA, extended several facilities to make the seminars a success.

Our special thanks to numerous participants including, academicians, senior officials, politicians, policy makers, agriculture economists, journalists, donor agencies and farmers who built energetic discussion which greatly facilitated formulation of policy recommendations.

*Pervaiz Amir (Senior Economist)*  
*Mazhar Hussain (Program Associate)*

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## BACKGROUND

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This set of five seminars presents policy recommendations from two large agricultural policy studies with a view to encourage discussion that enlarges, modifies, and sharpens those recommendations. These studies were commissioned by the Agricultural Prices Commission and Chief Engineering Advisor out of funds provided by the World Bank. We purposely present the recommendations with minimum qualification or detail, in order to focus on areas of controversy in an attempt to move towards implementable change.

One study focussed on agricultural price policy and the other on institutions associated with development of irrigated agriculture. The focus is on policies that accelerate the rate of growth of agricultural sector in Pakistan so that it contributes maximum to overall development of the country, broadens participation in that growth and helps in rapid reduction of absolute poverty, all of which leads to environmental improvement. The policies reflect the superb agricultural potentials of Pakistan and the only modest extent to which those potentials are being realized.

The assignment for the studies grew from discussions at the Ministerial level of the Government of Pakistan in which it was noted that the Government has in hand a massive study of the potentials and the needs of the agricultural sector (the 1988 Report of the National Commission on Agriculture) in which a large number of recommendations, essentially all of which were useful, tends to be lost for lack of a sense of priority and sequences for implementation. The complexity and difficulty of governments in implementing more than a few important measures at any one time requires that priorities be strictly set.

After lengthy discussions it was settled that a major study would be undertaken of agricultural price policy and that it should approach those policies broadly; concurrently a study was to be undertaken of water sector institutions with a focus on what appeared to be the two priority areas -- irrigation institutions and the interface of agriculture, engineering and technology institutions with an emphasis on the interface between research and extension. Seed provision was seen as growing out of the research concerns. As the studies advanced it became increasingly apparent that fertilizer supply was still a major problem and therefore the studies should give some emphasis to analyze this issue.

It is also apparent that rural financial markets are an important area of current policy; but analysis of those issues was not undertaken.

The two studies were financed by the Government of Pakistan from World Bank provided technical assistance credits; the consulting firms of John Mellor Associates, Inc. and Asianics Agro-Development International (Pvt) Ltd. were commissioned to undertake the studies. A steering committee representing both the Federal and Provincial Governments was appointed. Draft reports of both studies have been completed and are under review.

Four major background studies were commissioned for the agricultural prices study. They covered macro policy, infrastructural and educational expenditure requirements, an intensive survey of price policies, and a large modeling exercise to show technological potentials for increased production of selected agricultural commodities. Nine large background studies were commissioned for the water institutions study, covering water users associations, the agricultural research and extension systems and various aspects of input supply, particularly seed.

Two teams comprised in roughly equal proportions of distinguished international and national experts met in Pakistan, reviewed the studies and other materials and conducted interviews in the Provinces and Federal Capital. The draft reports and recommendations presented in these seminars reflect the product of those broad ranging enquiries and the distinguished backgrounds of mission participants.

Finally, the studies were pursued in the context of potentials for accelerating the agricultural growth rate from the current 4.3 percent rate to a 5.3 percent rate. That is achieved by accelerating the crop production growth rate to roughly a four percent rate and livestock to a 7.7 percent rate. The shift in output composition that comes from those quite different growth rates brings about a further acceleration of the overall agricultural growth rate to 5.6 percent after a decade of such growth. Such composition based acceleration in agricultural growth is normal in fast growth developing countries. Simply the multiplier effects of the accelerated agricultural growth take the growth rate of the overall economy from 5.1 percent to 6.4 percent and then to 6.8 percent.

To achieve these high growth rates will require major changes in policies. We present the product of our studies as a set of prioritized recommendations for achieving that result which will lead to major reduction in poverty and favorable environmental effects.

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## INTRODUCTION

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Government of Pakistan has been keen to develop agriculture at a faster rate to boost overall national economy and to improve net income and quality of life especially of small farmers.

The National Commission on Agriculture which submitted its comprehensive report in 1988 made a large number of recommendations to boost the national economy, essentially all of which were useful. However these recommendations tended to be lost for lack of a sense of priority and sequences for implementation. The complexity and difficulty of governments in implementing more than a few important measures at any one time requires that priorities be strictly set.

The Government commissioned JMA and Asianics to undertake two large studies, one on agricultural price policies and the other on institutions associated with development of irrigated agriculture.

The focus of the studies was on policies which will accelerate the rate of growth of the agricultural sector in Pakistan so as to contribute maximally to overall development of the country, to broad participation in that growth and rapid reduction of absolute poverty, and to enhancement of the environment.

Four of the five background papers in this seminar are based entirely on the two study reports and are presented by the principal contributors.

The fifth paper dealing with potentials for increased production of key crops is based on a comprehensive study by the Economics Wing of MINFA under USAID assistance. This study complements discussion of price policy with technical potentials and thereby leads into issues of institutional reforms.

The above studies have analyzed the various aspects of agricultural price policies, agricultural technology generation and dissemination, crop productivity, and reforms in the irrigation sector with the overall objective of enhancing productivity from the limited land and water resources.

Some measures proposed are inevitably controversial and not popular with certain vested interests who are likely to be affected adversely in the short run.

The main objective of these one-day intensive high level seminars being held in the provincial capitals and Islamabad, was to build consensus for major pricing and institutional policy changes in priority areas critical to increased production and productivity in Pakistan's agriculture.

The major recommendations of the background studies concern changes in the agriculture price policies, and providing improved technology packages to farmers by strengthening and streamlining the technology system consisting of education, research and extension, and supply of major inputs.

Finally, major reforms have been proposed in the present system of irrigation management to bring about increased efficiency in delivery and utilization of limited amounts of irrigation supplies.

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# MACRO POLICY NEEDS FOR ACCELERATING AGRICULTURAL GROWTH

by  
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*Islamabad*

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## A. PURPOSE

Macro-economic, trade, public investment and financial policies, in brief labelled as macro policies, profoundly affect the external environment in which micro-level decisions are made by farmers and other economic agents in rural areas. Frequently macro policies, singly and/or jointly, may be far more important than government policies with respect to prices of individual commodities in the determination of farmers' incentives.

Macro policies influence the distribution of income among income classes and sectors of the economy. In Pakistan, the thrust of macro-economic policies through most of its history has been to encourage manufacturing financed from an extraction of agricultural surplus. Policy-induced distortions in product and factor markets, however, had encouraged an inefficient use of resources within the manufacturing sector. By encouraging capital intensity, this pattern of development had meant high incidence of poverty and increased income and wealth inequality.

## B. PRINCIPLES

Macro policies that are neutral between the use of resources among sectors and processes of production accelerate the pace of agricultural development. Increased rural incomes resulting from rising agricultural prices and productivity stimulate non-agricultural production in rural areas. This form of rural growth linkage is at the heart of a proposal by Professor Mellor for the adoption of an employment-oriented, agricultural-based development strategy which generates growth and rapidly eradicates absolute poverty.

## **C. TRANSFER OF RESOURCES FROM AGRICULTURE -- A CONCEPTUAL AND FACTUAL BACKDROP**

The size, direction and methods of and the rationale for inter-sectoral resource transfers in Pakistan is a hotly debated topic. Opponents of direct taxation of agricultural incomes claim that the sector is transferring a substantial part of its income through distorted macro policies. The proponents of direct taxation maintain that this form of indirect taxation is inefficient and needs to be substituted with an alternative system of inter-sectoral income transfers.

### **1. Instruments of Agricultural Taxation**

In table 1, we present an analytical framework that classifies important tax, subsidy, public expenditure and non-tax measures as to whether the policy instruments are explicit or implicit or mixed and whether such measures are direct or operate through changes in inter-sectoral prices. However, financial policies that influence inter-sectoral allocation of funds (investment by agriculturists in non-agricultural activities) are not included in the table.

In the case of explicit measures, data on transfers are shown in government budget documents. In Pakistan, budget data for local government are not compiled and published in a comprehensive manner. The non-availability of such data for local government makes the coverage of transfers from explicit measures also partial. In the case of hidden transfers, conceptual and empirical difficulties make any estimate of transfer an arbitrary exercise.

Table 2 presents estimates of transfers from agriculture by a few selected scholars. The estimates are quite disparate as is evident from the last row which shows average annual outflow of resources for the period for which data are reported. The differences in results arise due to conceptual and methodological treatment of the underlying issues in widely divergent ways by different authors. Methodological differences aside, an important conclusion emerging from the studies is that though historically, beginning in 1950s, large amount of resources were transferred out of agriculture in Pakistan, there has been a significant downward trend in such transfers during 1980s. A part of the reduced outflow of resources from agriculture during 1980s is attributable to significant fall in world prices of some commodities and significant increases in domestic producer prices of the same commodities. A large part of the reduction in the agriculture surplus is, however, due to a major reduction in the extent of the overvaluation of the rupee in the

1980s brought about by the policy of a managed float of the rupee with US dollar since 1982.

**Table 1: A Classification of the Instruments of "Agricultural Taxation"**

	<i>Terms of trade directly affected</i>	<i>Terms of trade not directly affected</i>
Wholly explicit	Excise and Sales taxes Taxes/subsidies on non-competitive imports Production subsidies Input subsidies Food subsidies	Land taxes Income taxes Poll and personal taxes Other direct taxes
Partly hidden	Taxes/subsidies on exports Taxes/subsidies on competitive imports Differential exchange rates	---
Wholly hidden	Multiple exchange rates Marketing boards Monopoly procurement and price controls Interregional trade restrictions Buffer stock operations Pricing policies for public inputs.	---

*Source: J.M. Rao (1989), "Taxing Agriculture: Instruments and Incidence", World Development, Vol. 17, No.6.*

Table 2: Transfers from Agriculture

Years	Chaudhary and Kayani (1991)	Qureshi (1988)	Nasim (1991)				Ender (1992)	Chaudhary and Maan (1991)	Qureshi (1993)			Overall tax rate in Pakistan, i.e. Taxes as % of GDP	Direct taxes as a % of non-agri. GDP
	Net Commodity Taxes as % of value added in agriculture	Net Taxes as % of value added in Agriculture	Net taxes as % of value added in agriculture (a)	Net taxes + exchange rate appreciation effect as % of value added in agriculture (b)	Price and non-price transfers as % of value added in agriculture (c)	Price and non-price transfers + exchange rate appreciation effect as % of value added in agriculture (d)	Total Policy transfers as % of value added in agriculture	Total direct and indirect taxes as a % of value added in agriculture	Net Taxes as % of Value Added in Agriculture	Price and non-price transfers as % of value added in agriculture	Price and non-price transfers + exchange rate appreciation effect as % of value added in Agriculture		
	1	2	3	4	5	6	7	8	9	10	11	12	13
1972-73	4.97	6.93	7.20	6.39	0.11	-0.93	--	--	--	--	--	12.37	--
1973-74	14.89	36.37	19.61	32.49	10.94	23.79	--	--	--	--	--	13.47	--
1974-75	15.64	23.52	17.85	32.43	6.76	21.37	--	--	--	--	--	12.8	--
1975-76	7.39	13.47	8.68	19.68	-1.16	11.37	--	--	--	--	--	13.28	--
1976-77	6.57	5.93	7.02	18.68	-5.10	6.53	--	--	--	--	--	13.28	--
1977-78	2.22	19.70	4.43	14.64	-3.64	6.57	--	--	--	--	--	14.05	--
1978-79	2.62	-1.55	5.23	14.59	-2.55	6.80	--	--	--	--	--	14.66	--
1979-80	4.40	1.39	10.08	21.61	2.94	15.15	--	--	--	--	--	15.25	3.72
1980-81	7.79	10.00	14.23	27.84	7.11	20.73	--	43.92	--	--	--	15.66	--
1981-82	8.75	1.00	8.01	18.73	0.09	10.81	4	39.26	2.00	-21.83	-11.67	14.96	--
1982-83	4.48	5.56	5.77	12.77	-2.84	4.16	13	40.65	1.18	-28.52	-28.47	14.67	--
1983-84	7.63	6.44	7.62	16.32	0.11	8.81	5	45.42	1.26	-23.48	-14.30	15.69	3.43
1984-85	4.09	3.15	6.89	13.92	-0.04	7.03	4	36.26	1.81	-21.69	-12.84	14.87	3.15
1985-86	1.94	-6.34	2.85	8.40	-4.45	1.14	1	35.14	3.96	-23.78	-12.56	15.27	3.01
1986-87	6.96	-2.29	3.87	9.52	-3.63	2.02	5	45.51	3.90	-25.73	-15.95	16.11	2.98
1987-88	6.86	--	--	--	--	--	--	43.36	0.66	-17.74	-7.42	16.32	3.98
1988-89	6.66	--	--	--	--	--	--	41.13	0.25	-12.68	-4.48	17.46	3.36
1989-90	12.59	--	--	--	--	--	--	46.59	-0.23	-26.95	-19.34	17.38	3.16
1990-91	--	--	--	--	--	--	--	--	--	--	--	--	3.64
Mean	6.86	8.22	8.08	14.89	0.25	8.08	5.33	41.72	1.64	-22.49	-14.11	14.86	3.28

Note: -- indicate that data is not available.

Source: Column 1: Chaudhry, M. Ghaffar and Nighat Naheed Kayani (1991), "Commodity Taxation and Input Subsidies in Pakistan's Agriculture: A Preliminary Analysis" *The Pakistan Development Review*, Vol. 30, No.4.  
 Column 2: Qureshi, Sarfraz K. (1988), "Taxes and Subsidies on Agricultural Producers as elements of Inter-sectoral Transfer of Resources: Magnitude of the Transfer and Search for Policy Options", *Pakistan Development Review*, Vol. XXVII, No.4.  
 Columns 3 to 6: Nasim, Anjum, As'ha Akhlaque (1992), "Agricultural Taxation and Subsidies", *Financing Pakistan's Development in the 1990s*, Lahore: University of Management Sciences, Oxford University Press, Karachi.  
 Column 7: Ender, Gary (1992): "The Use of Producer and Consumer Subsidy Equivalents to Measure Government Interventions in Agriculture: The Case of Pakistan", *Pakistan Journal of Agricultural Economics*, Vol.1, No.1.  
 Column 8: Ghaffar Chaudhary and A. H. Maan (1993), "Taxation of Agriculture in Pakistan: Structure, Magnitude and Economic Implications in Agha Sajjad Haider et al (Eds). *Agricultural Strategies in the 1990s: Issues and Policies*, Pakistan Association of Agricultural Social Scientists, Islamabad.  
 Columns 9 to 12: Sarfraz Khan Qureshi, (1993), "Agricultural Prices Study" (Volume II), John Mellor Associates, Inc. Washington D.C.  
 Column 13: Chaudhry (1991), op. cit.  
 Column 14: Pakistan Economic Survey, 1992-93.

Chaudhary and Maan (1991)<sup>1</sup> show the highest transfer. Their estimates ignore the public expenditure benefitting agriculture but includes the indirect taxes paid by agriculturists as consumers, direct taxes and subsidies and implicit taxes and subsidies. The implicit taxes were evaluated by the authors at shadow exchange rates. The lowest estimate of transfer at an annual rate of 0.25 of agricultural value added is by Nasim<sup>2</sup>. He includes benefits of public expenditure but excludes the effect of overvaluation of exchange rate from his calculation. Methodological differences with respect to the measurement of overvaluation of the rupee, import or export parity prices and domestic prices and the coverage of instruments of the transfer explain the variations in the magnitude of transfers found in different studies.

#### **D. PRIORITY MACRO POLICY CHANGES**

Since in the early stages, the expansion of real rural income depends on growth in agricultural production, it is imperative that the public policies be so designed that they lead to an acceleration in agricultural growth. Three essential elements of the economic policy package are as follows:

##### **1. Improved Price Incentives:**

Increase in farmer incentives arises from four sets of policies:

- selected increases in output prices of crops for which Pakistan has comparative advantage and decrease in output prices of crops for which it has a comparative disadvantage.

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<sup>1</sup> M. Ghaffar Chaudhry and A.H. Maan (1991). Taxation of agriculture in Pakistan: Structure, Magnitude, and Economic Implications. Proceedings of Ist International Conference on agricultural strategies in the 1990's: Issues and policies (edt. Agha Sajjad Haider et al.), Islamabad. Pakistan Association of Agricultural Social Scientists, 1993

<sup>2</sup> Anjum Nasim and Asya Mukhtar (1991), "Agricultural Taxation and Subsidies", paper presented at the Conference on Financing Pakistan's Development in the 1960's organized by the Lahore University of Management Sciences, Lahore.

- Improved technology for crops and livestock sub-sectors and its effective dissemination to reduce cost of production.
- Improved rural infrastructure aimed at reducing the transaction costs for participation of farmers in the economic activity.
- Macro-economic policies that do not unduly discriminate against agriculture and also help attain macro stability.

*a. Output and Input Prices*

The paper by Professor Mellor treats this topic. Basing our argument on his analysis, we recommend an increase in the price of cotton which has a comparative advantage in Pakistan and a decrease in the price of sugarcane.

We further recommend gradual elimination of implicit subsidies on water, electricity and credit and open subsidies on fertilizer. The budgetary savings accruing from the elimination of input subsidies need to be devoted to improve the delivery system for these inputs. Subsidization of inputs in short supplies does not deliver the development gains expected from low input prices if the supplies of inputs are short and require a rationing mechanism.

*b. Expenditure on Research and Extension*

Investment in technology and its effective transfer may be more important than prices in increasing farmers' incentives. Financial allocations to agricultural research in Pakistan are inadequate, at present, despite some increase in the past in financial allocations, both in terms of total allocations and as percentage of value of agricultural output. In 1992, total allocations for the research system stood at Rs. 723 million and were 0.007 percent of value of agricultural output. Same figures for 1960 were Rs. 170 million and 0.0022 percent respectively.

Pakistan compares unfavorably with all developing countries and all Asian developing countries as it has spent a lower proportion of agricultural production on agricultural research. The under-investment in research in the past is responsible for a low rate of growth in total factor productivity (TFP) in agriculture. During the 1980s, there is a dip in the rate of growth in TFP.

The limited investment in agricultural research and extension in the past has paid rich dividends as the rates of return have been quite high. High rates of return also indicate that Pakistan has under-invested in research. The clear policy implication is that government should increase the allocation to the research system.

*c. Improvement in Rural Infrastructure*

Investments in sectors such as rural roads, electricity, rural education have both high rates of return and impact on the growth process in many favorable ways. For one, such investment leads to increase the supply response which makes price incentives more effective. These investments also reduce the transaction costs for farmers and other rural economic agents.

*d. Status of Infrastructure*

Unlike success stories seen in Taiwan, Pakistan has badly failed in the area of rural infrastructural development. Taiwan succeeded in providing universal rural education, universal electrification and universal access to all-weather roads for all villages. In contrast, Pakistan's indicators are poor. Road density at 0.19 kilometers per square kilometer in 1991 is far below than even Indian Punjab in 1985 which stood at 0.45 kilometers per square kilometer. The average distance of a village site from metalled road at 6 Kilometer in 1988 in Pakistan indicates limited access of rural people to all-weather roads. Rural literacy level of 17% in 1981 also shows limited access of rural people to basic education. The story for rural electrification is similar to rural roads.

*e. Inadequate Resources*

The poor infrastructural development is explained by limited resource allocation and wasteful use of resources within the sub-sector. During 1980s, as a part of the policy of expenditure restraint, development expenditure as percentage of total public expenditure fell from 40 percent in 1979/80 to 22 percent in 1992-93. The share of agriculture in total development expenditure fell from 23 percent in 1979-80 to 14 percent in 1992-93. No wonder that Pakistan, poorly placed relative to other developing countries, fell further behind due to too few resources allocated for rural infrastructure.

The investment needs for the expansion of rural network and rural education are vast even to reach the modest targets achieved by India. The additional cost of road expansion at Rs. 204 billion and rural educational expansion at Rs. 121 billion in 1990 prices is illustrative of the large investment requirements.

#### *f. Macro-economic Policy*

The extent of resource transfers from over-valuation shown in Table 2 were an indication of the adverse macro policies in the past. A change in real exchange rate, an important determinant of domestic agricultural prices relative to the prices of both home goods and non-agricultural goods, is a summary measure of the bias against agriculture arising from macro policies. It is important to prevent the real exchange rate from being overvalued so as not to impair the price competitiveness of agricultural tradable goods as overvalued currency is equivalent to a tax on exports.

Since 1982, through a managed float, Pakistan has succeeded in reducing the extent of overvaluation of the rupee. The margin between the free market and the official rate at 5 percent is an indication of no major overvaluation in the rupee. It is important, nevertheless, to monitor the exchange rate policy to avoid any substantial overvaluation of the rupee. In this context, a judicious macro-economic management of economy which emphasizes maintenance of low rates of inflation is also essential.

#### **2. Rural Tax Reforms**

The investment requirements for increasing the rate of growth in the agricultural sector are immense. Unless an effective tax system in rural areas is put in place, financing rural infrastructure may require a resort to inflationary financing with unfavorable macro implications for the growth of agricultural sector.

The introduction of an effective land and/or agricultural income is in order in this connection. Periodic re-assessment of the tax base for land taxation with a guarantee that exemptions for poor farmers are kept to a minimum can help raise resources for rural and agricultural development.

Please note that increased taxation of agriculture is being recommended to finance rural infrastructure and agricultural research system. Furthermore note that the proposed increased direct taxation only partially captures the increased gain of farmers from improved agricultural prices that we recommend.

#### **3. Improving Rural Financial Intermediation**

The lack of affordable formal credit was conceived as a constraint for adoption of new production technology and non-labor inputs. Between 1959-60 and 1991-92, institutional

credit in Pakistan had increased at 20 percent per year in real terms.

The access to formal credit has, however, been limited to medium and large farmers. Financial institutions also did not function as true financial intermediaries that mobilize deposits to make loans and improve their facilities for clients. Agricultural credit institutions have mostly channelled government-supplied funds to rural borrowers and have not reduced the administrative costs. Lack of competition and patronage has led to bad loans and inefficient operation.

Despite significant increases in the availability of rural credit in the past, the need for further expansion of rural credit is large. There is a patchy network of rural banks and farmers face high administrative costs and limited access to credit. Credit may be priced higher than in the past but the rural credit system needs to be expanded to enable farmers to avail credit when and where needed and in quantities demanded by them.

## DISCUSSION

There was considerable consensus on the need to provide a favorable macro-economic environment for the agriculture sector to enable it to play its due role in the broad-based agriculture-led strategy of development. Some areas of implicit disagreement nevertheless came out in the discussion. Only a brief summary of the disagreement is provided.

**First**, there was a less than full understanding of the fact that farmer's incentive to produce arise from two sets of policies: (1) increased crop prices; and (2) reduced cost of production from improved technology and its effective dissemination. Case for increased crop prices even when not based on international comparative advantage was often made to offset the policy induced bias against agriculture.

**Second**, the issue of high net transfers from agriculture in the past was often cited as a factor against raising resources from agriculture research. The elimination and/or reduction in the overvaluation of the domestic currency during 1980s has not been widely understood. There was a feeling that increased government expenditure benefitting agriculture be financed from intensive taxation of the non-agriculture sector. The fact that increased taxable capacity in agriculture resulting from higher level of public expenditure benefitting rural areas and other policy reforms provide a potential source of financing was not fully understood. In any case, waiting for urban areas to agree to finance agriculture development may postpone the onset of the era of vigorous broad-based process of agricultural development.

**Third**, the impact of the depreciation of the rupee was often seen an adverse factor for agricultural development as it was agreed that it raises the cost of imported inputs. The beneficial impact of the policy on farmer's income due to improved prices for export commodities was not appreciated.

**Fourth**, the issue of financing of increased rural infrastructure in Balochistan which has a low rural tax base linked with higher federal transfers. In other provinces, there was also an underlying sentiment in favor of transferring the financial burden of financing to the federal government. The role of local government in financing rural infrastructure is not widely understood.

**Fifth**, there was a widespread feeling that the government involvement in irrigation, rural credit and fertilizer supply has been a source of corruption for recommendations made in the presentation that policy reforms need to be supported by institutional reforms in the way government interferes in the agriculture sector.

Lastly, it was observed that local needs should guide the priorities of the provincial governments in the fields of agricultural research, rural infrastructure and input delivery systems.

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## COMMODITY PRICE POLICY - PRIORITY FOR CHANGE

*by*

**John W. Mellor**  
*President*  
*John Mellor Associates, Inc.*  
*Washington D.C*

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### **A. THE PROBLEMS**

There is at present substantial mis-allocation of resources in Pakistan's agriculture away from commodities in which Pakistan has a strong comparative advantage and towards commodities in which it is a relatively inefficient producer. Most important too few resources are allocated to cotton and too much, particularly of the most scarce water resource are allocated to sugar cane. In the longer run more resources should be devoted to high quality fodder crops for a rapidly growing livestock industry and to horticultural commodities.

Price policies play an important role in this mis-allocation of resources. The cotton price received by Pakistan's farmers is extremely low by world standards. The sugar price is high.

In addition, two sets of non-price policies have an important effect on real prices to farmers. Fertilizer, particularly including phosphate, but also including nitrogen, are chronically in short supply, with consequent high black market prices, poor quality, under utilization and much lower crop production.

Wheat production is substantially below the optimal levels of production in substantial part because of the fertilizer shortage, but also because of failure to mount an effective extension program to bring about known crop improvement measures. The result is yields roughly half those of the Indian Punjab (while Pakistan's cotton yields are some one-quarter higher than those of the Indian Punjab). With wheat production so far below potentials, Pakistan is a net importer of wheat and the appropriate domestic price is the

import parity price, which in turn is some 30 percent higher than international prices. Attempts by the government to hold down the wheat price has placed a substantial burden on public finance by requiring large import subsidies.

We also recommend removing the provincial subsidies on wheat. These are ostensibly consumer subsidies, but they are much more subsidies of inefficiency in the marketing and processing of wheat. It is doubtful if their removal would result in significant increase in the consumer price of wheat and wheat products. If the government were reluctant to remove both of these sources of lower prices, we would urge removing the one which is least efficient, that is the provincial subsidies. Retaining the import subsidy would leave the domestic wheat price halfway between the import and export parity price and increase the importance of success in the production program to achieve self-sufficiency in wheat production.

Price policy is a difficult and contentious area because of its important effects on the distribution of income among producer groups, income classes and regions. In that context the government needs professional, empirically based information. The Agricultural Prices Commission has done an excellent job of providing the needed information for government decisions. Its task would be more effectively performed if its budget regularized the collection of basic data, allowed more in depth empirical analysis of key issues and provided the guidance of a high level governing board representing government, producer, consumer and academic professional interests.

## **B. PRINCIPLES**

The basic principle of commodity price policy must be to encourage allocation of resources to commodities in which Pakistan has a comparative advantage, and to encourage optimal levels of input utilization and spread of productivity increasing technology. Such a price policy will help raise incomes and foster broad based growth. Present cotton and sugar pricing in particular work against this principle. Present policies that affect fertilizer supply and improved crop practices for wheat production both have deleterious effects on production and growth and show themselves in price relationships. The increased incomes from improved price policy and consequent improved resource allocation would provide the resources for solution of many problems, including some ancillary to the increased specialization implied in the price changes we recommend.

Particular note should be made of the misuse of cost of production information in debating price policy. The cost of production is of course high for commodities for which Pakistan is an inefficient producer and low for those for which it is an efficient producer. Raising prices because the cost of production is high, or depressing them (as for cotton) when the cost of production is low results in inefficient allocation of resources and slower growth.

### **C. MACRO PRICE AND TECHNOLOGY POLICY**

Before proceeding to discussion of specific commodity policies it is important to emphasize that macro policy and technology policy are both more important to growth than current, specific commodity price distortions. Major overvaluation of the exchange rate, large public finance deficits, management of financial markets which results in rationing of credit to rural people, failure to allocate adequate public resources to public goods such as rural roads and rural education, and public policies reducing or failing to increase competition in markets for agricultural commodities have profound effects on the level of production and income and the allocation of resources among sector and commodities.

Technology policy including the allocation of resources to research and the application of research to farm production is the most important dynamic aspect of agricultural growth. It is so important that the constant question about agricultural commodity price policy must be that of its influence on the progress of improved technology in agriculture.

### **D. SPECIFIC COMMODITY PRICE REFORMS**

#### **1. Cotton**

Cost of production studies show cotton to be an unusually profitable crop in Pakistan. That is despite the fact that the price of cotton is lower than that received in many other countries by the high costs of transporting cotton in Pakistan and a further some twenty percent reduction in the farm price due to a substantial export tax on cotton. The quality of cotton marketed in Pakistan is also low, a further source of loss to cotton farmers. We recommend removing the export tax and fostering increased competition in cotton marketing.

In the past decade of retarded growth in agricultural production in Pakistan, cotton has been the one bright spot, with rapid growth in production and yields. Cotton production would have grown even more rapidly if there had not been such a depressed price relative to that in other countries. Instead resources have gone relatively more to commodities in which Pakistan is not so efficient compared to other countries. The agricultural research system has been particularly productive in cotton, but the return to that research is depressed by the fact that price policy shifts resources away from cotton production.

Analyses of supply response to price show cotton to be more responsive than other major crops. Removal of the cotton export duty of 20 percent would bring a 15 percent increase in production, according to the supply elasticity figures used by the Economics Wing of the Ministry of Agriculture. That would of course also bring a 15 percent increase in production of cotton seed oil. That is equivalent to a 50 percent increase in the production of all other sources of vegetable oil in Pakistan and represents the easiest and fastest means of decreasing the massive net imports of vegetable oils.

Higher production of cotton would raise rural incomes and have favorable multiplier effects on rural non-agricultural employment, thereby diversifying the non-agricultural production base, which is now very heavily concentrated in cotton milling.

The present extremely low cotton price favors the low end of the textile industry, yarn production, relative to the higher value added sectors. Thus, higher cotton prices would provide a further favorable diversification within the textile industry.

Although the cotton textile industry seems to be strongly in favor of the present cotton pricing regime, it may not be desirable even from that point of view. Maintenance of current trends in consumption and production of cotton will see Pakistan as a net importer of cotton. That would suddenly boost the domestic price by the export duty, which would cease to be operative, and by the very high transport costs that now depress domestic prices way below international levels and would have the opposite effects if Pakistan became a net importer. In the meantime, as the net exports of cotton decline, the domestic textile industry is increasingly vulnerable to the effects of bad weather and pest attacks which may in any one year drive production below the levels of domestic production.

Even without the export duty the textile industry has a very favorable cotton price compared to major competitors because of the high transport costs--as long as Pakistan remains a major exporter of cotton. That is assisted by a strong agricultural research

system and the higher prices achieved by elimination of the export duty.

Removal of export duty would decrease government revenues. However, we recommend removal of the import subsidy on wheat as well as other subsidies, so that the net effect of our recommendations would not increase the public deficit.

Higher cotton prices will of course bring greater concentration in cotton production. In response, increased expenditure needs to be made from the consequently higher incomes to ensure that Pakistan's comparative advantage is maintained. For example, there should have been a much stronger basic science capability to deal with the cotton virus problem.

Pakistan would of course be more vulnerable to further declines in international prices of cotton if it increased its production. However farmers already receive prices far below international prices, so it seems unlikely that declines in international prices would make Pakistan's cotton farmers worse off than they are now.

## **2. Wheat**

At present, Pakistan is relatively less efficient in producing wheat than cotton. That is evidenced in part by the fact that while wheat prices are higher than world prices by transport costs, cotton prices are lower by transport costs and the large export duty; nevertheless cost of production studies show cotton far more profitable to grow than wheat. Studies of the Economics Wing of the Ministry of Agriculture show very large potentials for increased production through increased fertilizer use and improved crop practices. A reasonable time span for implementing a major program for increasing wheat production through improved technology and efficiency in production would result in production exceeding domestic consumption within five years.

While such a program were being implemented, Pakistan would remain a major importer of wheat. Free markets would set the domestic price somewhat higher than at present in order to cover all the costs of bringing wheat into the country.

In this complex circumstance our study recommends that the price be gradually raised over a few years to the import parity price. That would be achieved by the gradual withdrawal of the import subsidy on wheat, with a consequent saving of government revenues, that would offset the withdrawal of cotton export duty. Concurrently, a major commodity oriented program should be undertaken to raise wheat yields and to reduce the cost of production. It is our judgement that such a program will remove imports of

wheat. If so the price should be gradually reduced to export parity or an intermediate position -- perhaps similar to the present price.

Even with a major production program Pakistan would remain only marginally self sufficient in wheat. The result is that normal fluctuations in weather, shifts in demand for wheat from high transport costs neighbors like Afghanistan and other forces are likely to result in shifts between being net surplus and net deficit. That would under free market conditions bring fluctuations in price, of on the order of 60 percent as the country shifted back and forth between an export parity price and an import parity price. Under such circumstances it would be important to have analytical and administrative capacity to delineate and administer a price stabilization policy. A combination of domestic stocks and use of trade with subsidies would probably prove most efficient.

Wheat prices which were at one time a significant factor in the cost of living of low income people have become much less important with incomes and decline in the incidence of absolute poverty. Thus, provincial subsidies on wheat consumption are less important as is the price rise incident to removing the import duty on wheat.

In any case, the provincial subsidies on wheat seem more a mask for inefficiency in the marketing and processing of wheat than a true consumer subsidy. Since there is so much inefficiency in that subsidy, if a choice had to be made it would be preferable to remove the provincial subsidies and keep the import subsidy, relying on the production program to gradually eliminate imports and the subsidy.

With rising consumer incomes, even relatively poor people spend nearly as much income on milk and milk products as they do on wheat. Thus, higher wheat prices hit them doubly hard by the direct effect on wheat prices and by the indirect effect of shifting acreage from high quality fodder crops to wheat. Therefore, it is important that every effort be made to achieve the production increases for wheat from increased resource productivity rather than from price increases.

### 3. Sugar

The dominant concern in sugar pricing is optimal use of water. Higher returns are available in cotton, high quality fodder crops, and horticultural crops. In addition, the incentives for concentrating water on a small upstream acreage is adding greatly to environmental destruction. Thus, we recommend relatively lower sugar prices to begin the process of shifting area to crops more suitable to Pakistan's immensely productive

land and water resources. The most important consideration is to cease the expansion of the sugar milling industry since it creates fixed capital which argues economically and politically for increased sugar production.

The argument for increased dependence on imports for increasing sugar consumption is an efficiency argument-- the same resources will finance much more sugar if they are used in production of other commodities. Since sugar is so profitable to farmers at present price levels it is important that the hidden potentials in horticultural exports, in high quality fodder crops and associated livestock be facilitated by strong research and marketing programs. In order to restrain growth in sugar consumption and hence imports it is desirable to maintain the present level of sugar excise tax.

#### **4. Other Commodities**

We recommend higher water charges if those charges are allocated to improved canal maintenance and operations, a change which can only occur with radical change in irrigation management institutions.

We agree that high prices of oilseeds are sensible as a means of constraining consumption of vegetable oils, encouraging the dairy industry and encouraging research, even though it is long shot research, in finding high yield oilseed crops. The higher prices should not be expected to provide much increase in domestic production. Oil palm has such an immense comparative advantage in vegetable oil production, that Pakistan cannot be expected to compete. Note that in the face of high prices and immense expenditure on research, production of oilseeds other than cotton seed oil has steadily declined. In passing it is notable that for high quality oilseeds such as rape and mustard seed, the domestic price is well below international levels. Probably those quality vegetable oils should be exported to help pay for import of lower priced vegetable oils.

We emphasize the immense importance of increasing livestock production, the role of price policy in encouraging that but the even more important role of markets, infrastructure investment and research expenditure.

#### **E. AGRICULTURAL PRICES COMMISSION**

We note that Pakistan's agricultural prices commission is highly productive by international standards and we recommend changes and expansion that will take advantage

of this highly productive institution. We caution against misuse of cost of production data, which is now used in part to justify relatively higher prices for commodities Pakistan is inefficient at producing at the expense of commodities which it is efficient at producing.

## DISCUSSION

The wrap up seminar in Islamabad drew a particularly distinguished audience with spirited discussion. As usual, strong exception was taken to increased specialization in cotton. Arguments were given for emphasis on diversification - including more emphasis on sugarcane. This was again reinforced by the argument that developing countries should not respond to prices distorted by the action of developed countries. Further discussion emphasized that the real issue on foreign distortion was the certainty those distortions; and, that the new trade economies" emphasized the further benefits of specialization to realizing institutional scale economies. The acting chairman of the APCOM raised the question if Pakistan was ready for more specialization in cotton - noting the slow response to solving the current serious problem. A striking comment was made that underpriced more than cotton is agricultural research - suggesting the need to use more of it. Mr. Salman Farooqi, Secretary General, M/O Food & Agriculture emphasized in his closing remarks that all the dreams for the development of agriculture would not be realized if agriculture does not accelerate.

A similar format was followed in each province: an all day seminar with two tea and one lunch breaks; five presentations of about 20 minutes each; three appointed discussants taking an additional total of 20 minutes and 30 minutes of open discussion. The time for open discussion was short, in some cases clearly too short, but that was unavoidable given the correct decision to keep the seminars to an intensive one day. Considerable useful discussion occurred at the breaks and the lunch.

With the exception of Peshawar the attendance was high level from the several concerned ministries. In Peshawar the unexpected visit of the Prime Minister drew away several key people, particularly from planning. In all places, including Peshawar, a set of highly knowledgeable people not now in government attended and participated actively and very usefully in the discussion. The discussions were always at a high level and served to elucidate the points we were making as well as to bring out implications and ramifications that had escaped us.

In the ensuing discussion brief note will be made of the response to each of the five segments of the presentation. Emphasis is on disagreement or areas of additional knowledge.

Substantial questioning occurred to clarify the argument. The recommendations for

change in price policy focussed on cotton and sugar cane. Four areas of implicit disagreement came out consistently:

1. Widespread support for cost of production studies as the basis for setting prices - the study points out that this results in higher prices for commodities in which Pakistan is an inefficient producer and lower prices for the ones for which it is an efficient producer, with consequent mis-allocation of resources;
2. Considerable criticism of the Agricultural Prices Commission for not consulting with farmers enough and therefore not recommending sufficiently high prices -- the study points out the large consultation which goes on and explains why other considerations need to enter in and emphasizes the role of the APCOM as an advisory not a decision making body.
3. With respect to the recommendation for lower sugar cane prices, we noted in particular the point that a substantial number of farmers rely on sugar cane as an important source of income. It is a highly profitable crop at present prices and hence is an important part of the farming system. Those comments helped us understand the legitimate income distribution argument for high sugar prices. At the same time the current intrusion of sugar cane into cotton areas was drawn to our attention, reinforcing our concern that substantial misallocation of resources accompanies present sugar policy, reinforced by the low cotton price policy.
4. A similar point was made with respect to cotton -- that it does not occupy nearly as large an area as wheat and hence the impact of higher incomes for cotton were somewhat concentrated. In general, participants did not give much support for higher cotton prices -- reinforcing our view that the high profitability of cotton left cotton oriented farmers and others self satisfied with the current situation. The result is again misallocation of resources and a slower agricultural growth rate.

In both NWFP and Baluchistan the discussion focused on horticultural crops. The critical importance of infrastructure and marketing arrangements to the farm price was emphasized. Considerable useful discussion occurred as to how those costs might be reduced.

The discussion of fertilizer brought out an interesting point in Baluchistan. It appears that the government exercises more overt control of fertilizer marketing in Baluchistan with the result that there is a more concerted effort to see that adequate supplies arrive in the Province than is the case in the other provinces. It is notable in the report that the slowing in growth of fertilizer use is coincident with the claim of privatization. That underlines that privatization in the fertilizer industry is more apparent than real, that the government has an important oversight role to play and that prompt decisive action is needed in this area -- underlining the reports recommendations.

The discussion, in the provinces was surprisingly similar among the provinces, with the exception of the emphasis on horticulture in NWFP and Baluchistan and somewhat more emphasis on livestock in those areas.

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# PAKISTAN'S OPPORTUNITIES FOR EXPANDING CROP PRODUCTION: ECONOMIC AND FOREIGN EXCHANGE IMPACTS

*by*

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## **A. SUMMARY OF THE ANALYSIS**

This paper includes a study of the possible economic and foreign exchange impacts of programs and policies designed to increase the production of major crops in Pakistan. The potential for expanding production is investigated. Evidence presented indicates that Pakistan has considerable potential to further increase production and productivity of wheat, rice, cotton and sugar cane. This is concluded from comparisons of performance with: (1) Other countries, especially India's Punjab (2) better Pakistani farmers (3) on-farm and farming systems research and (4) crop-fertilizer response analysis.

Two programs are specified and analyzed in detail: "effective fertilizer program" and an "effective crop improvement program". For the fertilizer program to be effective, changes in policies and fertilizer programs would be required to eliminate shortages, improve the timeliness of availability of product to farmers and minimize adulteration. An effective crop improvement program involves stepping up the research and extension effort in Pakistan, making full use of research results already available and extending and demonstrating technologies and ideas to farmers. Considerable change in the agribusiness industries supporting agriculture is implied, notably for seed, fertilizer and other inputs. A trend scenario for Pakistan was pictured to provide a base for the analysis.

Crop production was projected over 5 years using 1992-93 as a base, using recent trends in crop yields and a conservative increase in fertilizer program and the effective crop improvement program against the base projection enabled comparisons of impact to be taken. Some key results are:

- total fertilizer offtake increased by amount of about 400,000 nutrient tons under effective fertilizer program, with amount applied per hectare increasing by 28 nutrient kg/ha.
- total crop production expanding by 28% as a result of the programs, which most of the extra output coming from cotton and wheat.
- gross farm income increasing by over 36 billion rupees because of the programs, which would add 2.9% of Pakistan GDP directly and about 5% overall to economic activity, while boosting employment by 2.5 million
- net foreign exchange gains of Rs. 30.7 billion, almost equal to the total import bill on petroleum products of Pakistan.

The potential gains from such programs are large. However, these will only be realized if farmers are given the production incentives to change and government provides policies and programs to encourage the initiatives. A key aspect of this would be moving farm prices in Pakistan closer to their international parity levels, thus providing much stronger price incentives to grow major crops. Without positive signals to farmers, there will be no changes. Without change, Pakistan's agriculture will continue to operate well below potential and the economy will continue to incur sizeable opportunity costs, because of production, income and employment foregone.

## **B. VIDEO PRESENTATION**

This analysis is based on three propositions:

- Pakistan's agriculture has the potential to produce more,
- Pakistan's farmers must benefit if they are to produce more, and;
- Pakistan's entire economy will benefit if farmers expand production in response to sound economic production incentives.

In order to assess the **alternative futures** for Pakistan's agriculture, we have examined **four scenarios** for five major crops: wheat, cotton, Basmati rice, coarse rice and sugar cane.

- The *Trend Scenario* is based on the continuation of the trends in yields and input use levels for the previous ten years.
- The *Effective Fertilizer Scenario* is based on a) the timely farm level delivery of fertilizer, b) no adulteration of fertilizer and c) added fertilizer primarily to bring about a better nutrient balance.
- The *Effective Crop Improvement Scenario* is based on a) the Effective Fertilizer program plus b) improved seed, planting time, pest control and so forth.
- The *Farm Level Price Scenario* is based on a) the Effective Crop Improvement program plus b) closing half the gap between the present farm level price in Pakistan and the appropriate parity price; the appropriate parity price for cotton is based on the export parity price while, at the present time, for wheat it is based on the import parity price.

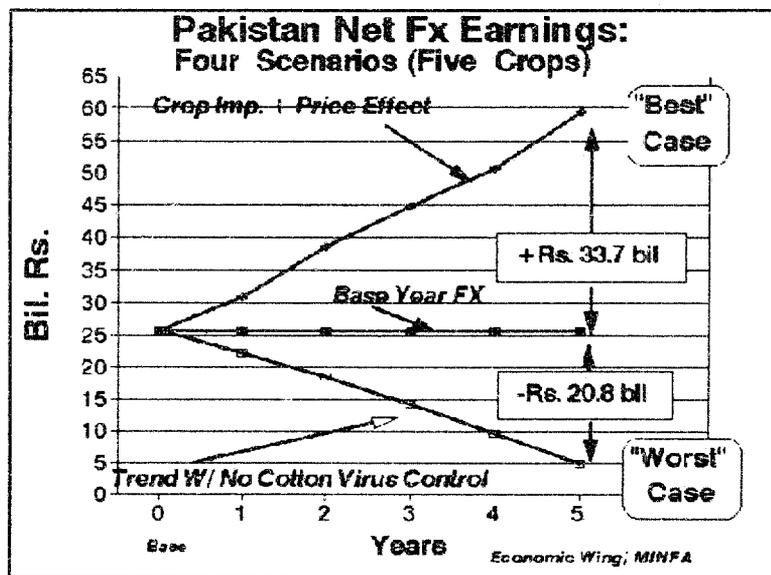
The estimated impact of the production expanding scenarios (the last three scenarios) over the Trend Scenario at the end of a five year program are significant as shown in the table below. The dramatic difference in net foreign exchange earnings is even greater if it is assumed that the cotton virus is not controlled (Trend B for cotton) with the result that under the Trend Scenario, cotton production would not increase over the base year level.

#### **Impact of Production Expanding Scenarios Over Trend a/**

<i>Impact Indicators</i>	<i>Effective Fertilizer Program</i>	<i>Effective Crop Improvement Program</i>	<i>Farm Level Price Program</i>
Gross Farm Income	Rs. 16.8 bil. (+10%)	Rs. 35.9 bil. (+21%)	Rs. 62.6 bil. (+37%)
Net Farm Income	Rs. 9.3 bil. (+10%)	Rs. 24.9 bil. (+28%)	Rs. 42.8 bil. (+48%)
Foreign Exchange (net earnings)	Rs. 14.0 bil. (+83%)	Rs. 31.0 bil. (+187%)	Rs. 42.8 bil. (+258%)

a/ Based on Trend A for cotton where virus control allows continuation of past trends in yields and input use.

The "worst" case would occur where all crops are produced under the Trend Scenario and there is no control of the cotton virus. In the "worst" case, by Year 5, net foreign exchange earnings from five major crops would be nearly Rs. 21 billion less than occurred during the Base Year. The "best" case would occur when the cotton virus is controlled, an Effective Crop Improvement program is implemented and approximately half the gap between the present farm level price and the appropriate parity price is closed for all five major crops. This wide range of estimated net foreign exchange earnings at the end of Year 5 indicates the range of possible outcomes for Pakistan's agriculture in the immediate future.



Four impact indicators for each scenario — production, Gross Farm Income (GFI), Net Farm Income (NFI) and net Foreign Exchange earnings (FX) — were estimated using the Economic Wing Farm Income Model and Commodity Balance Sheets. The expected changes in yields for each scenario are very conservative estimates based on information provided by Pakistani farmers and agricultural scientists.

The Scenario impacts can be summarized by comparing the outcome in Year 5 with the Base Year. Under the Trend Scenario, production, GFI and NFI show modest increases. However, FX will be Rs. 9 billion less than for the base year: primarily because population will grow more rapidly than production. If nothing is changed, this downward drift in FX would continue. Under the Effective Fertilizer and Crop Improvement programs, estimated production, GFI and NFI show significant increase. There are also sharp increases in FX. Under the Farm Level Price Scenario, there would be further gains in estimated production, GFI, NFI and FX. The value of FX would increase from Rs. 25 billion in the Base Year to Rs. 59 billion in Year 5. There would also be a shift in favor of crops where Pakistan has a comparative advantage because of the increase in the farm level prices for wheat, cotton and Basmati rice coupled with a slight decrease in the farm level prices for coarse rice and sugar cane.

## DISCUSSION

The seminar presentation was in the form of a twenty two minute video which summarized estimated impact of expanded crop production in Pakistan that was developed by an Economic Wing/MINFA - EPA study. The video was preceded by a brief introduction based on handouts about the methods used to estimate the impacts. A draft of the Research Monograph generated from the study was made available to all participants. The empirical findings presented stressed the potentials for significant impacts from expanded crop production in Pakistan. The material shown in the video complimented the ideas and material presented earlier by Drs. Qureshi and Mellor. Even though the video presented fairly technical material, participants watched the video with interest and seemed to understand the basic nature of the results presented.

The same video was also shown at Islamabad. The empirical findings presented stressed the potential for significant impact from expanded crop production in Pakistan. The presentation was followed by a discussion of the technical assumptions used in the analysis. 1) The analysis assumed that increased Pakistani Cotton production would not influence the international price of Cotton. It was suggested that this assumption may not be correct and as a result, the estimated benefits from expanded Cotton production may be too high. 2) The question of inclusion of cross elasticities of production with respect to price was raised and the fact that the magnitude of the production increases seemed very large. Such cross elasticities were included in the analysis, but the available empirical estimates of such elasticities have rather low. The aggregate impacts do appear large, but the per hectare increase in yields were very conservative. 3) A question about the assumption on performance of the irrigation systems was raised. The analysis assumed that the irrigation system continued to perform through year 5 as it had earlier.

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# **PRIORITY INSTITUTIONAL REFORMS IN IRRIGATION SECTOR TO IMPROVE PRODUCTIVITY OF IRRIGATED AGRICULTURE**

*by*

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## **A. THE PROBLEM AND NEED FOR CHANGE**

### **1. Pakistan's Irrigation System - A Perspective**

Pakistan's irrigation system was designed to allocate the scarce water resource over a large geographic area on a basis deemed to be equitable, namely, in approximate proportion to the amount of arable land. With design cropping intensities well below 100% in both the *kharif* and *rabi* seasons, water scarcity was thus to be imposed on all farmers, creating strong economic incentives for them to make efficient use of the water received.

The desired pattern of water allocation was to be achieved through the design of the system's structures coupled with its operations according to a few fundamental rules relating primarily to supply conditions. The operating agency was responsible to administer the system in accordance with these rather simple rules, instead of managing the system on the basis of judgment made in response to complex considerations about changing supply and demand conditions. The system was thus built with a minimum of adjustable control structures, limiting the possibility for the operating agency to modify the designed pattern of water allocation through day-to-day management interventions.

### **2. Inequity in Water Distribution**

Over the years, four interacting factors have combined to drastically alter the nature of

the system: unsatisfactory maintenance of the channels, failure of the Provincial Irrigation Department (PIDs) to follow operational rules, modification of the system's design by both farmers and the PIDs, and widespread exploitation of ground water supplies, particularly by shallow, privately-owned tubewells. The first three factors all related to the operation of the canal systems, have led to a pronounced shift in the pattern of canal water allocation: a much higher proportion is delivered to the head reaches of the system, at the expense of the tails. These are described below in some detail:

*a. Unsatisfactory maintenance*

The major maintenance problem leading to a head-end bias in the distribution of water is the failure to desilt the channels adequately. As silt builds up in the bed of a channel it becomes increasingly difficult for the channels to carry water at its design capacity. Furthermore, by raising the bed of the channels, the silt raises the elevation of water relative to that of turnouts resulting in an increase in flow through the turnouts at the head-end and a reduction in water in the tail reaches.

This maintenance failure is often attributed to inadequate funding of the PIDs, coupled with the high cost of operating and maintaining the SCARP tubewells. These observations give an overly simplistic diagnosis of the problem. There are two reasons for suggesting that the problem is more complex:

*First*, an analysis of the data on O&M funding for Punjab and Sindh PIDs reveals that over the period 1981/82 to 1988/89 O&M expenditures showed significant positive annual growth rates in real terms: 3.0 % in Punjab and 7.5 % in Sindh. However the amount spent on "canal works" has declined in real terms (5.5 % in Punjab, and 0.1 % in Sindh) indicating that the PIDs assigned a relatively lower priority to canal maintenance during the 1980s relative to the competing claims for example, on "establishment" which were growing in real terms at average annual rates of 6.0 % in Punjab and 13.2 % in Sindh mostly due to increase in salaries and so forth, and partly due to addition of new staff.

*The second* reason is that O&M expenditures on canal works are often not used in a cost effective fashion due to poor quality control and fraud associated with contract work and wastage on "cosmetic" works. Besides, O&M activities are often not targeted to key sections of channel where they would bring about the greatest changes in the hydraulic conditions.

The above considerations suggest that there are important institutional problems

(accountability, incentives, motivation) associated with poor O&M of canals that go well beyond the question of amount of funds provided. Unless these problems and constraints are addressed effectively, it is unlikely that major improvements in the maintenance of the irrigation system will result from increased funding alone.

**b. *Failure of the PIDs to follow operational rule:***

The channels of Pakistan's irrigation system were designed to be operated at or near full supply capacity. Operation at flows significantly below the design capacity leads both to inequities in the geographic distribution of water (because of the design of outlets), and to problems of excessive deposits of silt in canal beds. As a result, a key operational rule is that whenever the overall water supply is too small to allow all channels to operate at a minimum of 70 % of their full supply capacity, a rotational system must be established that will close enough channels at any one time so that those that remain open can operate at the required discharges. This rule is often compromised due to "power influence" ignoring the "*warabandi*-based equity" system. As the PIDs attempt to satisfy various individuals and groups of farmers who are using their power to influence distribution of water in their favor, it is likely to become increasingly difficult to follow the canal closure rule.

**c. *Modification of the system's design***

Because of water scarcity, the "power influence system" of water distribution resorts to deliberate modification in the original design often involving illegal tampering with the *mogha*. Another approach is to install a pipe or some other type of outlet illegally or quasi-legally through influence in a channel where no outlet originally existed, which results in reduced flow of water at the tail-ends even if the channels are properly maintained. Unless the PIDs can regain control of withdrawal of water from canals according to system's design, it will not be able to deliver water in accordance with the design criteria. As in the cases of the two problems discussed previously, it is clear that this problem is primarily behavioral and institutional and not a technical problem.

**3. Groundwater Supplies**

Widespread exploitation of groundwater supplies has greatly reduced overall water scarcity of the system, resulting in cropping intensities far in excess of the original design (for example 120-130% as compared to original design of 50-75% in one distributary of LCC system), also simultaneously increasing secondary salinity with concomitant

reductions in yields even when water is abundant. Because this lower quality groundwater acquired by means of private tubewells is expensive (Rs 30-50 per acre inch), individual farmers face strong economic incentives to increase their access to canal water through modification in the system design, such as enlargements of the *moghas* and installation of new outlets from the distributaries, or even through outright theft.

Widespread use of groundwater from private tubewells has created an overall conjunctive-use irrigation system that is much more demand-driven than the canal system itself giving the overall irrigation system a flexibility that is desirable for the efficient use of water and reducing the need to try to operate the canal system on a demand basis.

Issues of the canal system are clearly of great importance to the future of agriculture in Pakistan; however, it is important to recognize the extensive role played by groundwater in Pakistan's irrigated agriculture, and the importance of complex interactions between the two sources of water in sharing the outcomes of Pakistan's irrigated agriculture sector. It is unrealistic to expect that reforms limited to the canal system alone will be able to solve the difficult problems of irrigation facing Pakistan as it moves into the 21st century.

#### **4. Equity, Productivity and Sustainability**

These changes in the irrigation system and increased availability of groundwater have profound and interacting productivity and equity implications. Increase in total production of the irrigated area, if sustainable, is a desirable response in the light of increased population pressure. But shift in the pattern of distribution of canal water, with its head-end bias, has negative implications both for productivity and equity. To reduce the salinity problem associated with poor quality groundwater, farmers often mix canal water with groundwater. With declining amounts of canal water in the tail reaches, the prospects are reduced for achieving a satisfactory quality of irrigation water by mixing. Farmers at the tail ends who receive less free canal water, must rely more heavily on costly groundwater which reduces yields due to increase in salinity.

#### **5. Drainage**

A related and equally important problem is that of drainage. Any man-made irrigation system is eventually doomed if it does not have a carefully planned and operated drainage system. Pakistan's drainage system is probably in worse condition than the irrigation system. For the satisfactory performance of irrigated agriculture, it is essential the

irrigation system be properly designed and operated efficiently to meet the crop water requirements, and affluent water and salts are also drained away from the system.

## **6. Cost Recovery**

An important issue associated with overall reform in irrigation system is the recovery of water charges from users. The present *abiana* is designed more as a mechanism to bolster government revenues rather than a charge meant exclusively to operate the irrigation system as a public service to farmers. The method by which PIDs are funded does not create any particular relationship between the revenues obtained from *abiana* and cost of providing irrigation services. A case has been made repeatedly in the past to increase water rates to offset the increasing costs of O&M of the irrigation system, but farmers have resisted this increase mainly on grounds that the amount of water supplied to them is not in accordance with the original design or indeed the requirements of different crops. Besides, with increasing problems of head-tail distribution, the tail-end farmers in most canal commands maintain that they hardly receive any canal water and thus should not be required to pay anything for a service which does not exist.

The present system of *abiana* is based on the cropped area and the crops sown, instead of the amount and quality of water delivered to the farmers. This needs to be changed. Farmers will be willing to pay higher and more realistic charges for irrigation water provided supply is assured and rates are fixed in light of the overall pricing structure for both the agricultural inputs and outputs and net profits to growers. Another pre-requisite for paying higher water charges would be an assurance that funds thus collected would be used exclusively to improve O&M of the irrigation system and not as a general government revenue.

## **B. PROPOSAL TO REFORM THE IRRIGATION SYSTEM**

If Pakistan's irrigation system is to operate productively in the next century, major institutional reform would seem to be a necessary condition. The proposed reforms are long-term in nature, and will require a long-term commitment if they are to succeed. What is outlined in the following paragraph is thus a vision of the institutional structure that might be eventually achieved for all of the canal systems of Pakistan. Initial efforts to undertake such reform would need to be limited to only one or two canal systems.

## 1. Objectives of the Reforms

Main objective of the reforms is to address the principal institutional constraints by:

- relieving the functionaries from the departmental routine and stifling administrative and financial controls by reforming PID into a para-statal body (Authority) endowed with administrative and financial autonomy on commercial lines.
- confining responsibilities of the Authority largely to "upstream activities" such as improved system operation planning, O&M of upstream (main canal) systems, preparation and implementation of new projects, and providing the interface between the upstream and downstream activities through water-related research and extension service.
- transferring responsibility for "downstream activities" relating to water distribution to participatory farmer organizations by undertaking an organized social mobilization program aimed at the systematic formation of sustainable farmers irrigation groups and their apex organizations.
- establishing an independent institution (Commission), designed to be immune against external influence and undue political intervention, with adjudicatory and regulatory powers, surveillance and information dissemination responsibilities relating to equitable distribution and efficient utilization of provincial water resources.

## 2. Framework

Responsibility for O&M of the primary portions of the canal systems, up to the headworks of the distributary canals, would be vested in financially autonomous Irrigation Authorities (IAs). At the tertiary or watercourse level, Farmers Irrigation Groups (FIGs) would be responsible for O&M activities, and for assessing and collecting fees from individual farmers to pay for the cost of the services provided by the IAs. Linking the individual FIGs and the IAs, and with contractual responsibility for O&M of the distributaries would be distributary level Federations of FIGs (FEDs). Services provided by the IA could be limited to provision of irrigation water to head of distributary, or could include technical support to the FEDs and their member FIGs. A FED would be responsible for the financial aspects of its contracts, and would assess each member FIG

for its share of contractual costs. In the case of a non-existent or non-functioning FED, the IA would assume O&M responsibilities down to head of watercourse. Finally, an independent commission be established to monitor performance of the irrigation system, monitor and review IA's charges for irrigation water, and to review and resolve contractual disputes between IAs and FEDs. Either the commission or a similar body could be given an oversight responsibility for monitoring the financial procedures of the FEDs and FIGs.

### **3. Recommended Changes at the Federal Level**

With the conclusion of the inter-provincial Water Apportionment Accord and the policy of increased provincial autonomy, there is a growing demand from the province to enhancing the role of PIDs in planning and implementation of water sector projects, a function presently performed mainly by the zonal units of the Water Wing of WAPDA. With the identified need to consider a modified role and responsibilities of the Water Wing (with or without the proposed privatization of the Power Wing), it would be appropriate to decentralize WAPDA's Water Wing by transferring the zonal units to the ambit of the PIDs (or their successors).

The WAPDA Water Wing would then remain responsible mainly for water sector planning to assist the Federal Ministry of Water and Power and for coordination in implementation of inter-provincial water sector development projects.

As some of these functions are seen to overlap the functions of the Chief Engineering Advisor (CEA), it would seem logical to merge the residual entity of the Water Wing with the CEA. The status of the combined organization at the Federal level, which would include the Federal Planning Cell established in the Water Wing under the WSIPS, may be restored to that of the original "Central Engineering Authority", which in any case was designed as an inter-provincial coordination body. With headquarters at Islamabad, the new Authority would need institutional strengthening through a program of staff training to play a more effective role in water sector resource assessment, development planning and coordination in implementation of inter-provincial projects. In the event, it would also be opportune to relocate the headquarters of the Indus River System Authority, recently created to coordinate the implementation of the Water Apportionment Accord, from Lahore to Islamabad.

## **C. CREATION OF PROVINCIAL IRRIGATION AUTHORITIES**

### **1. Rationale**

A key reason for establishing IAs is to foster increased accountability to all water users on the part of those operating the irrigation system. This includes fiscal (proper use of funds), managerial (judicious use of resources) and program accountability (effective provision of services). Financially autonomous IAs with contractual obligations to groups of users (FEDs) would have a vested interest in providing a quality of services that will make farmers both willing and able to pay for the IAs costs of providing irrigation services.

Another reason to establish IAs is to attract high quality staff. While many of the staff of the IAs would come from PIDs, the IAs would have the necessary degree of autonomy in their personal decisions so that they could select only those who demonstrated both the required technical skills and the desired personal characteristics, such as motivation to perform well. The IA would also have the ability to establish, within its salary structure, a reward system that would encourage superior performance and would attract personnel with abilities and motivation to succeed under such a system.

The rationale to establish IAs also includes the need to create an "organizational culture" that generates pride and prestige associated with the effective operation and maintenance of a technically complex system that is of crucial importance to the nation's economy. Operating portions of one of the world's largest contiguous irrigation system in ways that make it successful and productive is a complex and difficult task, and should be seen as a source of great pride and prestige. The creation of autonomous IAs provides an opportunity to instill them, and their mission, with a level of prestige that the PIDs lack with respect to their operational activities. This would also enhance the ability of the IAs to attract high quality staff.

### **2. Functions**

The basic functions of an IA would be to operate, on a continuing basis, the primary portions of one or more of Pakistan's canal systems; and to perform the maintenance necessary for sustained operation of these same portions of the system(s). The IA would also be responsible for generating revenues to cover its costs. To the extent possible, the IA would contract with FEDs at the distributary level for the provision of irrigation services. This would leave the FEDs, and their member FIGs responsible for operation

of the system below the head of the distributary channel. In the absence of a functional FED for a given distributary, the IA would be responsible for the secondary system, including both the distribution of water to outlets of individual watercourses and maintenance of the distributary.

### **3. Technical Expertise**

In addition to the major need for staff with expertise in hydraulic and civil engineering, the IAs will also need expertise in areas of system management, irrigation agronomy, economics and sociology. Expertise in system management will be needed both to facilitate operation of the complex irrigation system, and to help ensure that the entire IA performs as an effective organization. Expertise in irrigation agronomy will be needed so that consideration of consequences of operating decisions for agriculture is integrated into the IAs decision-making process. Expertise in economics will be important to help the IAs evaluate questions relating to the charges to be levied on farmers and water use efficiency. Expertise in sociology will facilitate effective interaction of the IAs with individual farmers, FIGs and FEDs. It would also be important in the role of the IA to help to form FIGs and FEDs.

### **4. Financial Considerations**

IAs would be authorized to raise revenues by charging for the irrigation services provided and to retain these revenues for their own use. This would involve setting fees, assessing amounts to be charged, billing the FEDs, and collecting from them. In areas where FEDs or FIGs do not exist, the IAs would be authorized to assess, bill, and collect from the individual water users. IAs would also be authorized to receive external grants or funds from government for special development activities. Special grants from the government would be needed at the time of establishment of an IA to provide for the financial transition from the provincial budgets.

## **D. ORGANIZATIONAL STRUCTURE OF IAs**

The nature of planning and development activities in the public sector as well as the O&M of such large installations as storage dams, barrages, inter-river link canal and the main canal systems of the Indus plains do not lend themselves to being privatized or being administered as a public utility. It would therefore be appropriate to retain these functions in the public sector. However, in view of the intractability of existing PIDs to

assume these responsibilities at the required level of competence, there would seem to be no option but to reconstitute the PIDs into semi-autonomous authorities.

IA would comprise a Chairman and three Members, responsible for the three main Wings of the Authority, each being assisted by two directors. The organizational structure of IA's is given in table 1.

Transition from Departmental to the Authority structure would be preceded by the preparation of a comprehensive restructuring plan. Assumption of new responsibilities by the existing staff will require a large scale technical training and re-orientation program to adopt modern management practices.

An organization chart for the Authority is shown in Figure 1.

#### **E. PROVINCIAL WATER COMMISSION**

The institutional arrangement outlined above would require a strong legal cover to enable protection small farmer's rights against traditional misappropriation of water by the local powerful entities, resolution of mutual disputes and recovery of dues from free riders and so forth. The required services are proposed to be provided by establishing an independent

Provincial Water Commission (PWC), preferably headed by a High Court Judge. The PWC would be endowed with requisite judicial authority and immunity from administrative and political intervention with the following responsibilities:

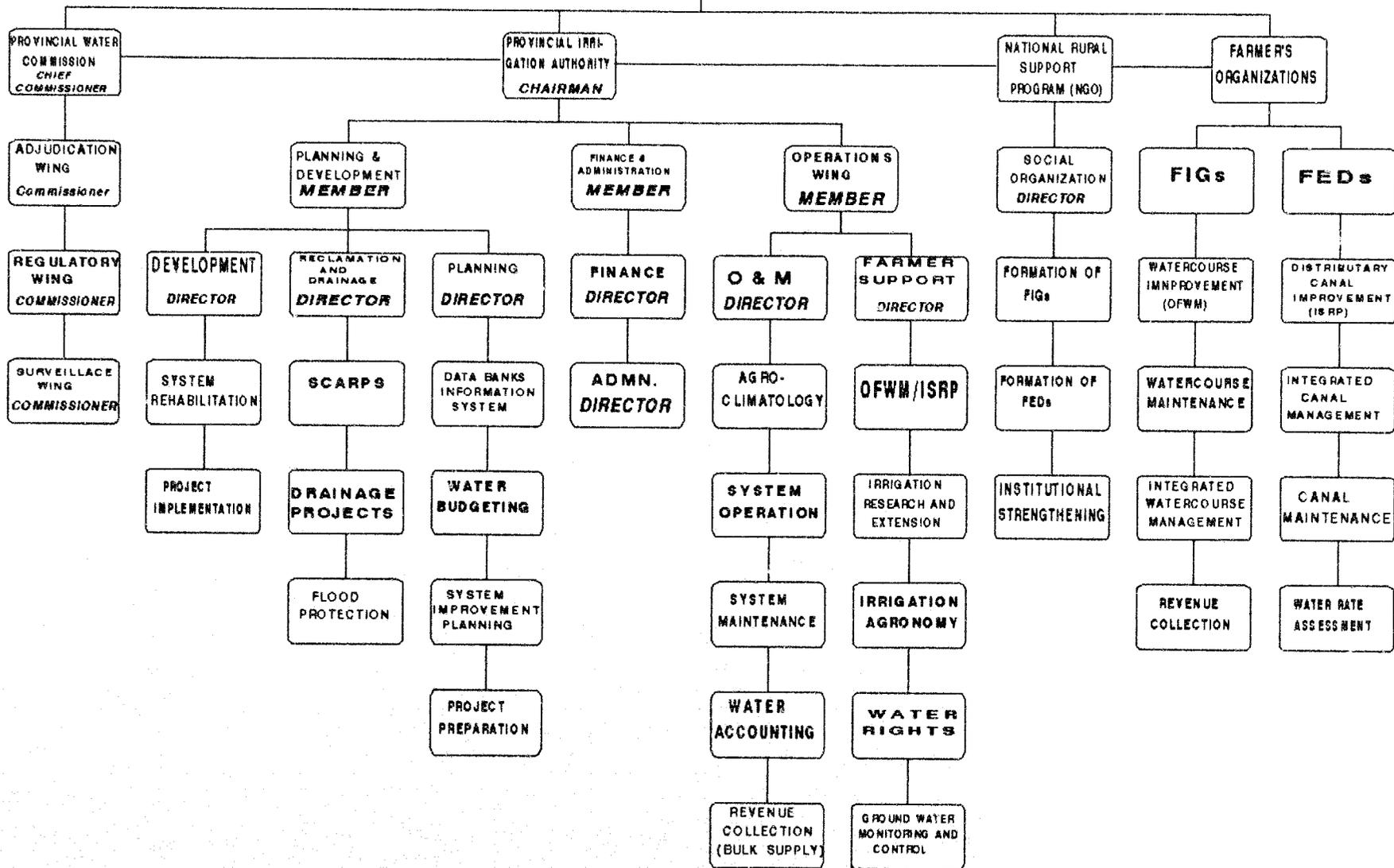
- Adjudication of disputes relating to water distribution.
- Regulatory functions relating to water charges, pollution and groundwater exploitation control.
- Water Audit and publication of IAs Water Accounts, based on data independently collected by the Commission.
- Surveillance of equity in water distribution and initiating corrective action, *suo moto*, when necessary.

**Table 1: Organizational Structure of IA's**

	<b>Position</b>	<b>Responsibility</b>
i.	<b>Chairman IA</b>	Chief Executive
ii.	<b>Member, Planning and Development Wing</b>	
a.	Director, Planning	Data Bank and Information System Water Budgeting System Improvement Planning Project preparation
b.	Director, Reclamation & Drainage	SCARPs, Drainage Projects Flood Protection
c.	Director, Development	System Rehabilitation Project Implementation (new projects)
iii.	<b>Member, Operation Wing</b>	
a.	Director, O&M	Agro-climatology System Operation, System Maintenance Water Accounting Revenue Collection (bulk supply)
b.	Director, Farmer Support	OFWM/ISRP Irrigation Research and Extension Irrigation Agronomy T.A in determining Water Rights Groundwater Utilization
iv.	<b>Member, Finance and Administration Wing</b>	
a.	Director, Finance	Financial Affairs
b.	Director, Administration	Administrative Affairs

Figure 1

# PROVINCIAL IRRIGATION AUTHORITY



## **F. COST RECOVERY FROM FARMERS**

### **1. Magnitude of the Water Charges**

Estimated costs for O&M of the total system for 1996/97 for Punjab are Rs 24.1 per acre foot of water compared to abiana of Rs 10-11 per acre foot in recent years. Thus, a financially autonomous IA would need to charge roughly 2.5 times the current charges, provided they have no additional liability to maintain and operate the SCARP tubewells.

Water charges are usually fixed in nominal monetary terms. Subsequent general inflation erodes the real value of the charges, making them increasingly inadequate to cover the cost of the services being provided. Efforts to return the charges to their previous real levels requires the visible and often politically difficult decision to raise their nominal monetary amount. One alternative is to establish water charge in terms of the value of a specified amount of a key commodity produced in the irrigated area, and so forth wheat. As the price of this commodity increases the amount of funds generated for water charges also increases. It should be emphasized that setting the fee in terms of the value of a physical quantity of a commodity does not mean that it is actually collected in kind.

### **2. Tubewell Water Cost as a Proxy to Fix Water Charges**

One way to obtain an estimate of the ability of farmers to pay for canal irrigation water is to consider what they pay for private tubewell water especially in areas where all the irrigation water comes from tubewells. One might even argue that because canal water is generally of higher quality than tubewell water, farmers could afford to pay more for it than for tubewell water. On the other hand, because the farmer has greater control over the timing of tubewell water, it might have somewhat greater value. Considerable selling of tubewell water occurs in Punjab. As a rough approximation, one could use the figure of Rs 30 to 40 per acre-inch as an estimate of what farmers can afford to pay for tubewell water. Assuming that canal water has only half the productivity of tubewell water, farmers could afford to pay a minimum of Rs 15 per acre-inch for canal water.

## **G. CONCLUDING REMARKS**

The proposal presented in this paper to bring about a major institutional change in the irrigation set-up has been developed as a result of discussions with several eminent

national and international experts and in the light of experience of several other countries. The operation and maintenance of the irrigation system in Pakistan has deteriorated to such an extent that mere addition of resources will not solve the problem; the situation calls for a bold institutional change that will tackle the major ills of the system. Implementation of the proposed institutional changes will require committed leadership and a determined effort. We believe that the expected pay-off from implementation of the proposed institutional changes justifies the effort and expense involved. The proposal gives only a broad sketch of the institutional changes; details will have to be worked out by experts once the proposal is approved in principle.

## DISCUSSION

There was a lively discussion on the main proposal for reforming PIDs in all the sessions including the last session in Islamabad. Besides senior irrigation officials which included Chief Engineers of Irrigation and Chiefs of irrigation sections in the provincial P&Ds, senior officials of agriculture departments and farmers representatives also participated in the discussions. Chief(Water) in the Planning and Development Division, GOP and Joint secretary (Water) Federal Ministry of water and Power participated in the discussions in Islamabad.

There was general agreement that the irrigation system in the country had deteriorated to such an extent that major institutional changes are warranted. All participants agreed about inequity in water distribution, strong "power influence" distorting the irrigation operations and unsatisfactory maintenance of the system.

The farmers, agriculture experts and officials, planners and representatives of the donor agencies fully endorsed the proposal to transform PIDs into autonomous agencies and transfer responsibility for O&M of distributary canals and water courses, distribution of water and collection of water charges from users to farmers organizations. The idea of Water Commission was strongly endorsed. It was also proposed that farmers representatives should be included in the Governing Body of the proposed autonomous authorities so that these organizations feel responsible to the end users.

The senior irrigation officials agreed with the poor state of O&M of the system and inequity due to "power influence" but generally disagreed with the proposal to convert PIDs into autonomous authorities. They argued that if the PIDs were provided sufficient funds for O&M and the irrigation officials given protection against "power influence" in enforcing the prescribed regulations and punishing the defaulters, the PIDs could bring the system back to high levels of efficiency and restore equitable distribution of water within a short period. They maintained that the autonomous organizations proposed are liable to be more prone to corruption and inefficiency and "power influence" than the government departments.

Judging from the experience of O&M of *karezes* and other farmer-operated small irrigation schemes which seemed to perform well, maintain equity and ensure that no water theft is allowed, it was concluded that properly constituted farmers organizations

as proposed, will be able to operate the system more efficiently and equitably than at present.

While generally endorsing the proposal to convert PIDs into autonomous authorities and transfer operation at the secondary and tertiary level to the users, the participants recommended that several alternatives should be developed for implementation to suit the special requirements of different provinces and irrigation sub-systems. The bottom-up approach of first organizing the users into FIGs and FEDs and establishing Provincial Water Commissions while retaining the PIDs was also recommended for consideration, as a pre-requisite to major institutional changes in irrigation management.

Regarding water charges, it was generally agreed that if water availability and equitable distribution was ensured, and water charges were used exclusively for improvement and upgradation of the irrigation system, then farmers would not seriously object to increase in abiana to make the charges more realistic to run the system.

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# **INSTITUTIONAL REFORMS IN AGRICULTURAL TECHNOLOGY DEVELOPMENT AND DISSEMINATION TO BOOST IRRIGATED AGRICULTURE**

*by*

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*Islamabad*

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## **A. NEED FOR INSTITUTIONAL REFORMS IN AGRICULTURE SUPPORT SYSTEMS**

Pakistan desperately needs to increase productivity of its agriculture sector to meet the growing needs of the burgeoning population and bolster the national economy. With deep alluvial soils and plenty of sunshine, it should be possible to achieve high yields of most crops in the irrigated Indus plain. In actual practice, average yields of most crops are only 20-40% of the demonstrated potential and far below those obtained in countries with similar resource endowment.

Major constraints to improving productivity have been well identified. Removal of these constraints, however, requires changes in agricultural policies and the basic institutional infra-structure supporting the complex production system. These changes are difficult to identify precisely and even more difficult to implement. Agricultural production is a highly complex process involving interaction of a large number of disciplines from biological, physical and social sciences. Having a sound policy framework, especially price policies for agricultural inputs and outputs is the key to development of a vigorous national agriculture sector.

The first two papers of this seminar have described the macro-economic framework and the commodity pricing policies and have made several important recommendations aimed at improving the overall efficiency of the agriculture sector and increasing its contribution to the national economy. However even with a perfect policy framework, the actual

productivity in farmers' fields is determined by two important sets of inputs viz: availability of improved farm-tested production technology and timely provision of inputs of proper quality at appropriate prices. The first of these is the product of the "technology system" consisting of education, research and extension sub-systems, while the second which includes supply of seed, fertilizer, pesticides, and credit and so forth, is organized by different public and private sector agencies.

There are serious deficiencies in the operation of both these sets of inputs resulting in reduced productivity in farmers fields as compared to the potential. This paper examines different components of the "technology system", especially research to identify weaknesses and suggest measures for improvement so that the farmer regularly gets improved, farm-tested technology which enables him to remain efficient and competitive in the domestic and international market. The supply of two major inputs viz. seed and fertilizer which are crucial to achieving high crop yields are examined in some detail.

The system generating improved agricultural technology for Pakistan is not up to the tasks required by it for accelerated growth, inspite the fact that investment in universities, agricultural research institutes and extension programs has provided a high rate of return. However that investment has been far short of the amount needed by an accelerating agricultural sector.

Pakistan's is a large and diverse agriculture and requires a matching technology generation system. In the past its technology output has drawn heavily on foreign sources. That facilitated by the domestic technology capacity, will continue to be important in the future. However, now that the easy borrowing from abroad has occurred the domestic component must rise in relative size.

Not only has the domestic system been grossly under financed relative to the task, but the available resources have been used relatively inefficiently. How valuable the returns are is evidenced by the high rate of return to those resources, despite their inefficient utilization.

The burden on technology generation system is growing rapidly, with widening demands for a diversifying agriculture, increasing complexity of the scientific problems, demand of the farmers for higher incomes, and expanding opportunities in foreign trade. Thus, while the demands made on the system have been growing rapidly, the already inadequate system has not. We, therefore, recommend a major expansion of the system and major institutional changes. These changes will affect farmers, technicians, bureaucrats and

politicians. They must all understand the urgency of the needs and the fact that there are no viable alternatives to expanding and improving the technology system.

## **B. MAJOR CONSTRAINTS**

The important constraints of the three major components of the technology system viz. education, research and extension are briefly described below:

### **1. Education-Human Resources Development**

The quality of agricultural education both at the undergraduate and post-graduate level, its relevance to the local conditions, emphasis on field-oriented training and basic understanding of the numerous disciplines which interact to produce successful and sustainable irrigated agriculture, is of fundamental importance in the strategy to improve agriculture. Graduates of the universities of agriculture and of engineering & technology who have to provide technological support for development of irrigated agriculture lack knowledge either of hydrological and water harnessing and distribution aspects (agronomists) or about biological and economic aspects of crop production and farming systems (engineers). The curricula of these universities need to be overhauled to produce competent graduates capable of substantially improving irrigated agriculture through input of improved technology.

Besides producing first degree graduates and M.Sc's, the agriculture universities are also required to produce Ph.Ds to provide leadership in the research system. Such manpower, at present, is mostly trained in foreign universities which has certain disadvantages as compared to training personnel, especially in applied sciences, within the country. Agriculture universities in Pakistan have become primarily teaching institutions with little emphasis on research by graduate students and faculty, and negligible budgetary provisions for this activity. This neglect of research and of updating the knowledge base has led to a deterioration in the quality of teaching particularly at the post-graduate level with adverse consequences for agricultural development in the country.

### **2. Research**

The vital role of research in increasing agricultural productivity through sustainable use of natural resources is universally recognized. It is impossible for any country, let alone a developing country like Pakistan, to cater to the technology needs of all commodities

and all the farming systems. Therefore the limited manpower and financial resources available for research have to be utilized judiciously according to pre-determined criteria of efficiency, sustainability and equity in order to optimize returns on research investment. This requires expertise in planning, monitoring and evaluation of the research programs.

Although the modest investment in agricultural research in the country has paid handsome dividends in the past, the research system needs some major improvements to enable it to meet the changing technological needs of developing and modernizing agriculture. Some major issues requiring immediate attention are:

- Proliferation of research institutes and wasteful duplication of research efforts.
- Re-organization of the NARS in light of constitutional provisions, with clear demarcation of responsibilities for federal and provincial research, and mechanisms for effective coordination.
- Inadequate overall financial resources for research, especially operational funds.
- Lack of effective planning, monitoring and evaluation of the research program.
- Almost total neglect of pre-technology or basic sciences research badly needed to support the applied research effort.
- Deficiency of trained manpower in the overall system with major deficiencies in some disciplines and regions.
- Lack of private sector involvement in research.
- Lack of coordination in agriculture and irrigation research to produce integrated technology packages for irrigated agriculture.

### **3. Extension-Transfer of Technology**

With limited land and water resources and mounting pressure to increase agricultural production to meet rising demands, Pakistan has to rely primarily on increasing use efficiency of available resources to increase productivity. This is possible only through judicious use of improved technology to increase yields and reduce cost of production.

Pakistan has an elaborate agricultural extension system. Provincial agriculture departments (PADs) which deal almost exclusively with **crops** (both field and horticultural) have separate extension wings with their operations extending to union council and village level. In addition, PADs also have sizable organizations which deal with all aspects relating to farm machinery including tubewells.

**Livestock, forestry and fisheries** departments in the provinces do not have similar elaborate arrangements for extension. Livestock departments primarily provide veterinary cover although recently some staff has been appointed to advise on other aspects of livestock production management. Forestry and fisheries departments do not have extension wings but do supply tree saplings and fish seed on request.

There is virtually no extension services for **water management**. PIDs do not have the necessary expertise in water management for crop production. OFWM wings in the PADs are concerned primarily with lining of water courses and provide some information to the farmers on proper use of irrigation water which is grossly inadequate compared to the overwhelming importance of water in crop production in the mainly arid areas of the Indus plains.

### *Issues*

- Major causes of the relative ineffectiveness of extension agencies in technology transfer are: Lack of resources for operation, poor linkages with research institutions, low morale and lack of motivation of staff due to inappropriate personnel policies.
- With a great diversity in farming systems and rapid development of knowledge, it is no longer possible for extension agents to keep abreast of latest developments in all commodities. Modern communication techniques for example use of audio-visual medium need to be emphasized in extension.
- Extension activities in livestock, forestry, aquaculture and irrigation management are virtually non-existent. It is also not possible to have parallel extension services in all these sub-sectors because it will be costly for the government and confusing and bothersome for small farmers.
- Research institutions, especially mono-crop institutes, play a minimal role in dissemination of technology as it does not form part of their mandates.

- There is no arrangement for inter-provincial coordination in extension programs and research in methods for transfer of technology for different commodities, ecologies and target groups.
- Public sector research and extension is not effectively linked with private sector. Neither the technology developed by public sector research is communicated to private sector nor is there a mechanism to ensure that technologies or products promoted by the private sector conform to the larger interests of the country.

#### **4. Availability of Inputs**

The quality and timely availability of inputs and services is a major bottleneck to higher productivity of irrigated agriculture. Main external inputs for crop production are seed, fertilizer, pesticides and agricultural machinery. Besides, availability of fuel and power for operating farm machinery; assured supply of irrigation water, and ready access to agricultural credit is also essential. While all the inputs are important, only two seed and fertilizer, are discussed here in some detail:

##### *a. Seed*

Seed is a relatively low cost input for crop production which has major impact on productivity. Use of improved seed can increase productivity by 20% as compared to the farmers' seed but its use has been restricted due to problems of availability, accessibility and quality. Overall seed availability for most crops except wheat and cotton is far below the requirement for the cropped area. Main constraints to the further development of public sector seed industry are limited processing and storage capacity, inadequate marketing facilities, non-availability of the required quantities of basic seed and inadequate facilities for monitoring quality of seed in the market.

Private sector could play a dominant role in supplying quality seed. However despite government policy to encourage private sector-both multi-national and national, to develop seed business, entrepreneurs are facing several major constraints such as non-availability of sufficient land and concessional loans, limits on foreign investment in land for seed production, non-existence of plant breeders' rights and lack of trade mark protection, and sale of nondescript seed due to absence of appropriate laws protecting seed quality.

Very little is being done to produce quality seed of fodder crops, pulses, oilseeds,

vegetables, fruits and flower crops. With current emphasis on production of these crops for local consumption and export, non-availability of quality seed is likely to become a major limiting factor in achieving the envisaged growth targets.

**b. Fertilizer**

Fertilizer is basic to technological advance particularly in a country with Pakistan's superb and responsive physical conditions. The chronic fertilizer shortage at critical times has masked the inadequacies of the research system and exacerbated the problems of a deteriorating irrigation situation. The continuing shortage of fertilizer can only be explained by lack of appreciation of the importance of fertilizer, since the solution to the problem is simple.

Fertilizer use efficiency is also quite low in Pakistan. Being a costly and a major input, this affects farmers' net income and overall national economy. To overcome this requires site-specific research on different commodities in various agro-ecological zones to determine most economic fertilizer application. However since this is already a responsibility entrusted to NFDC and PARC, no further institutional changes are warranted.

**C. PROPOSED INSTITUTIONAL CHANGES**

**1. Education**

Following institutional reforms are proposed to resolve some of the constraints in the educational system for irrigated agriculture.

**a. Revision of curricula**

Syllabi of both the agriculture and engineering universities need to be reviewed to ensure that the students get a basic understanding of the deficiency subjects. Following measures are suggested for this purpose:

- add basic courses on rural sociology, agricultural economics and irrigated agronomy (consumptive use of water) to syllabi of B.Sc. Engg. (Irrigation).

- add basic courses on irrigation system design and operation, water distribution and hydraulics aspects of gravity flow irrigation to the compulsory course work for all agriculture graduates.
- include compulsory field assignment to work with the farmers and field staff of PIDs and PADs for agriculture and engineering students.
- curricula of B.Sc agr.engg (Irrigation & drainage) should be reviewed and modified jointly by PIDs and PADs, to enable these graduates to get jobs in irrigated agriculture for which they are trained.
- In-service short courses should be organized for the technical staff of PIDs and PADs in deficient areas to make them more effective in developing irrigated agriculture.

Agricultural University, Wageningen, would be a good model to develop an integrated course in irrigated agriculture with an appropriate mix of relevant disciplines to prepare graduates for service in agricultural development of irrigated areas.

#### ***b. Research in agriculture universities***

Training for Ph.D degree, requires qualified faculty who are competent to teach courses and guide thesis research. Universities should develop manpower and physical facilities in a few selected areas in which they specialize and produce Ph.Ds. to provide leadership in research within the NARS. Agriculture and engineering universities should develop a 10 year master plan to produce adequate numbers of Ph.D's with specializations required to meet national needs. To change the character of the universities from predominantly teaching institutions to research universities, they should be brought within the national research network under the PARC umbrella and fully supported financially, to undertake research in subjects where they have a comparative advantage.

## **2. Research**

Pakistan NARS has been successful in effectively utilizing relatively low levels of skills (as compared to developed countries). It now faces the challenge of achieving both expansion and upgrading which will compete for scarce skills and financial resources. Overall efficiency of the system will also have to be substantially improved by more systematic planning, monitoring and evaluation. Following measures are proposed to bring about these changes:

*a. Scientific manpower*

Expand the scientific manpower by 40% from about 5,000 scientists in 1993 to 7000 by the end of the decade. Number of M.Sc's should also be expanded from the present 3,000 to 5,000 by the year 2000, almost all of whom can be trained in Pakistan. Number of Ph.D's should be increased from 450 to 1200. Ideally most should be trained in Pakistan, but limited capacity will require that one-third are trained abroad. Selection of subjects for training of Ph.D scientists should be carefully done, so as to develop balanced manpower to meet the national research needs.

Recruitment of research scientists should be done on merit alone with minimum consideration for domicile. Efforts should be made to increase intake of scientists with basic sciences background to reduce inbreeding and increase orientation of teaching and research programs towards basic sciences aspects of the subject.

*b. Expenditures and research support*

The research system, in Pakistan, is grossly underfunded even when compared to other developing countries in the region. The proposed expansion in staffing will require a doubling of real expenditure, over the next decade: 20-25 % to augment the meager operational support to researchers, 20-25 % for upgrading posts and provision of better salary incentives to scientists and the remaining 40% for expansion in staffing.

*c. Planning the expansion: priority setting*

Decisions regarding hiring of new research staff and training are critical parts of the planning and priority setting exercise. It is, therefore, important to have continued and improved priority-setting and project monitoring system, as part of medium range planning. But once staffing and specialization decisions are made some flexibility is lost; hence the urgency for a careful long-range planning exercise.

Among the critical decisions to be made in this expansion period are i) changes in research sites & centers, ii) changes in commodity focus, iii) development of pre-technology science capacity and iv) development of biotechnology capacity. Following suggestions are made on each of these issues based on experience in other systems which are comparable to the situation in Pakistan:

**First**, on sites and centers: There may be a need for some new locations, but experience suggests that scale economies to research units become more important as systems go through the kind of quality upgrading envisaged here. Many systems have consolidated small stations with poor contacts with larger units to achieve more effective scientific interaction. We urge caution in establishing new stations and close concern for the issue of scale in research units.

**Second**, on commodities: Pakistan has some 130 different crop commodities but the 15 most important account for 98 percent or so of crop value. Research expenditure on different commodities should be roughly in proportion to their value unless a special case can be made that the research potential for the less important commodity is much greater and/or that the market potential for the commodity is sufficiently high. As new commodity programs are considered, the two tests for invention potential and market potential should be applied to decide whether to maintain major research programs for a minor commodity. Extension systems can probably do something with these commodities; and in some cases the private sector may do so (for example, cut flowers).

At present, a large proportion of the scientific manpower is assigned to crops sector, with comparatively much smaller numbers in animal research and negligible in forestry and fisheries. There is also a similar imbalance in emphasis with respect to assignment of manpower to different disciplines in commodity research. These imbalances in emphasis on sub-sectors and disciplines need to be realistically rectified.

**Third**, on pre-technology science: Pakistan NARS has a very small component of "basic" or "pre-technology" science. The research problems that Pakistan has successfully addressed, over the past two decades, were likely to have been "easier" than the next generation of problems will be, and in the face of this, very applied research programs may not be able to make large gains. Pakistan will have to invest in more basic sciences training to tap into the research potentials that it will face in the future.

**Fourth**, on bio-technology: The fields of bio-technology, while not always of "higher science" content are tool-building fields and they constitute research and technology infrastructure. Pakistan has made some investment in this; more is called for in the future. While field gains from crop bio-technology are a few years away, there is little question but that these tools will become more and more important in the future. Pakistan should be building more capacity in its research as well as training system.

*d. Organizational issues*

There is considerable duplication in agricultural research effort in the country. The organization of NARS is also not in conformity with the constitutional provisions governing scientific research. The total effort can be made much more cost-effective if all research programs are centrally planned, funded and monitored even if they are administered by different organizations and institutions at the provincial and federal level.

A perspective national agricultural research plan consisting of discrete research projects with defined objectives based on agreed priorities, should be prepared for the period upto the end of the century. This plan should discourage unnecessary duplication in research, and help develop maximum coordination between research institutions.

NARS should be reorganized to make the program cost effective, efficient and client-oriented through maximum decentralization of operations by locating adaptive research stations in different parts of the country. These stations should be backed by research institutes at appropriate central locations and a system of close interaction from planners to the field staff, with active association of the client groups.

*e. Role of PARC and NARC*

NARC needs to be a real lead scientific center. Project coordination is important but the more important role for NARC is to be the conduit to international science both in the IARCs and in other institutions. Bio-technology is a natural area to stress which requires advanced training and scientific skills.

PARC must have leadership role in national planning and priority setting for agricultural research and coordination. It has to handle reviews and training decisions which will continue to be important. Priority setting and research planning is important not only for project and program design, but for training as well. The key strengths of the system in the future decade or two will be human, not physical (buildings, etc.). The limited number of really excellent scientists, who can lead scientific projects and provide for leadership in experiment design should be spared administrative demands to the extent possible.

As priority setting exercises are instituted they should stress the supply side of research. How is incentive potential being created? Are Pakistani scientists on the "frontier" in terms of contacts and knowledge of international pools of science and technology? Are

scientists being asked to produce carefully documented study reports and to communicate with others? Are publications furthering the fields of technology?

*f. Research grants mechanisms*

There is merit in a combination of funding mechanisms. Some formula funding is necessary to maintain and build research centers with assured program support but bulk of research support should be on the basis of competitive grants which tend to provide incentives and rewards to aggressive young scientists and encourage closer attention to the "frontier."

Present system of permanent budgets of research institutes and almost guaranteed service structure to research scientists inevitably leads to poor incentive for creative research and leads to inefficiency. Most of the research should be projectized and scientists should compete to get resources for their research projects. Maintenance research which has to be carried out routinely may be exempted from this mechanism. All research should however be subjected to periodic external review.

If it is not possible to create formal research universities, grants to university faculty, especially where graduate student research is involved, is particularly important. It can achieve some of the objectives of the research university even in a bureaucratic setting not conducive to it.

*g. Returns on research investment*

In order to bring about efficiency in the utilization of public sector funds for agricultural research, studies on returns to investment in research and extension should be refined to determine common features of successful research projects in order to incorporate these into rest of the research programs. The study should be extended to determine returns on investment in extension programs with a similar objective.

*h. Private sector research*

There are a number of private sector firms in the seed and input industries that do contribute technology and could contribute more to Pakistani agriculture. The policy environment should be changed to encourage as much private sector technological sourcing as possible. At the same time, the public sector must recognize that expanded private sector R&D will not supplant the traditional agriculture research system. Not only

is it unlikely that major R&D activities will be forthcoming in the private sector, but it is also important that farmers not be vulnerable to having only one source of technology.

### **3. Extension- Transfer of Technology**

#### ***a. Institutional set-up***

Extension services suffer from problems which largely stem from an outdated institutional set-up that is not in tune with the contemporary farming realities. What is needed is a hard look at the total set-up and not merely more funds and facilities for the staff as has been the approach in the past. The extension services seem to be under-utilized because of several major constraints including lack of mobility and weak linkages with research. Therefore, any solution to the problem of relative ineffectiveness of extension services should not embark on addition of more staff but instead should emphasize on improving the knowledge base, motivation and morale of extension agents and provision of adequate resources for their operation. A greater reliance should be placed on the audio-visual techniques for transfer of technology.

#### ***b. Extension in livestock, forestry and aquaculture***

With increased emphasis on livestock development, social forestry, and aquaculture development, it is important to organize transfer of technology in these areas. This could be done by integrating the improved technology in all aspects of agriculture (broadly defined) in a farming systems mode in one organization. This will require appropriate training of extension agents and a properly conceived role for SMSs and researchers, but will obviate the necessity of having separate extension organizations in different departments. Besides, small farmers who operate integrated farming systems will prefer dealing with one extension agent who, with proper backstopping by the SMSs, can provide information on all aspects of their operation.

All provinces have established bureaus of agricultural information. The scope of these organizations should be broadened to include, besides crop production, activities related to departments livestock, forestry, fisheries and irrigation management. The bureaus should have the capability to backstop the efforts of the union council level officials with audio-visual material, including mobile vans and SMSs, on all aspects of farm production activities.

*c. Extension in water management*

There are several dimensions to efficient use of irrigation water at farm level. These include delivery of water to the fields with minimum losses, application of proper amount of water to crops according to physiological requirements and adoption of improved methods to increase irrigation efficiency. These aspects require well organized research to generate easy -to-use, location-specific information, in addition to studies on economic returns to water application. The dissemination of information on irrigation issues could be done through an integrated extension system, where front line extension workers with support from SMSs and research scientists provide information about efficient on-farm water application

*d. Transfer of technology by research institutions*

Most farmers in the irrigated areas specialize in one or two crops which occupy a central place in their farming systems. Commonly research institutes located within the main production areas, should be entrusted the "transfer of technology" function for the specific crops by establishing Transfer of Technology (TT) sections at the institutes. The TT units should work closely with specialists in other sections (who will act as SMSs) and the FSR group, and prepare audio-visual packages and field demonstration programs to disseminate the latest information to farmers and train extension field staff in essential components of the technology.

*e. Federal government role in extension*

The federal government can play a role in agricultural extension in the following areas:

- Acquisition of improved agricultural technology from abroad and its dissemination to the provinces.
- Transfer of new information between the provinces and facilitating inter-provincial visits of experts.
- Research in techniques for packaging and transfer of information to different target groups and for special crops and ecologies.
- Technology development and dissemination to provinces for new commodities (for example tea, coconut, saffron etc.) and their farming systems.

- Periodic joint assessment, with the participation of provinces, of extension methodology and approaches.

Initially this function can be assigned to PARC who, in any case, have the responsibility to coordinate national efforts in generation of new agricultural technology.

## DISCUSSION

Constraints in the agricultural education, research and extension systems identified in the paper were generally agreed upon. It was pointed out that the lack of coordination between agriculture and irrigation departments in the provinces and between agriculture, livestock, fisheries and forestry departments was an important factor constraining the balanced development of irrigated agriculture.

Need for substantial increase in operational funds for research and allocation of research funds through competitive grants was fully endorsed. It was also agreed that the research effort in the country should be prioritized on objective criteria and research projects regularly monitored and research institutions reviewed at suitable intervals.

There was considerable discussion on organization of NARS. It was agreed that all the adaptive research should be exclusively administered by the provincial governments and be closely associated with extension services. Rest of the research which involves development of new technology and solution of complex problems should be planned and financed centrally while its operation should be decentralized by giving the research institutions maximum operational autonomy.

Agricultural universities should acquire the character of "research universities" and be fully involved in the national research effort. University staff should compete for research grants from national and international sources and achievements in research should be the major criterion for career improvement in the universities.

The proposal to emphasize audio-visual media in extension programs was accepted. It was also agreed that research institutions devoted to specific commodities should also assume major responsibility for dissemination of technology about the target commodity in the major production area for which the institutions should establish separate sections on transfer of technology.

The need to assure adequate supplies of agricultural inputs especially fertilizer was expressed by all participants. Problems of adulteration in agricultural inputs and non-availability at proper time were highlighted. It was pointed out that fertilizer use efficiency was quite low and need to be improved through research. Similarly the proposal to involve private sector in seed production was strongly endorsed. It was recommended that the constraints in development of private sector seed industry should

be resolved expeditiously so that farmers are able to get quality seed of through a vigorous competition between private entrepreneurs.

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## **RECOMMENDATIONS**

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### **A. MACRO POLICY NEEDS FOR ACCELERATING AGRICULTURAL GROWTH**

1. Manage exchange rate policy to avoid any substantial over-valuation of the rupee as overvaluation was the major source of macro policy bias against agriculture till early 1980.
2. Allocate substantial development expenditure for rural roads and primary and secondary schools to address the existing deficiencies in rural areas.
3. Spend the allocated money cost-effectively in line with gradual improvement in the absorption capacity for rural road and education sub-sectors. The additional cost of road expansion is Rs. 204 billion and for rural education will 121 billion.
4. At least double the expenditure on research and extension to reduce the cost of production for crops and other sub-sectors in agriculture.
5. Increase the information flow to facilitate greater market integration and development for agricultural inputs and outputs. Also reduce regulatory and other distortions that discourage the development of competitive markets.
6. Infrastructure and other rural development expenditures to be incurred by the government should be linked to generation of revenue through taxes from the areas where these are allocated.

### **B. COMMODITY PRICE POLICY- PRIORITY FOR CHANGE**

1. Remove duty on cotton exports. The expectation is approximately a corresponding 20 percent increase in cotton prices.

2. Increase sugar imports in order to reduce the sugar price, designed to stabilize sugar production at around present level.
3. Institute a wheat production program intended to achieve self-sufficiency in wheat production through increased fertilizer use and a crop improvement program.
4. Associated with the wheat production program announce an intention to gradually increase wheat price over a five year period to the import parity price.
5. Appoint a person or small committee, reporting to the Prime Minister, charged with ensuring policies on imports, foreign exchange and credit availability and other actions to ensure competitive markets for fertilizer and adequate and timely supplies of fertilizer to farmers.
6. Expand support for the Agricultural Prices Commission to regularize its primary data collection activities, regularize its status as a semi-autonomous body, and bring close oversight and policy contact through a high level Governing Board with government, farmer, consumer and academic representation.

**C. PRIORITY INSTITUTIONAL REFORMS IN IRRIGATION SECTOR TO IMPROVE PRODUCTIVITY OF IRRIGATED AGRICULTURE**

1. Reform PIDS gradually into autonomous Irrigation Authorities (IAs) with administrative and financial autonomy on commercial lines, and in-house expertise in irrigation engineering, systems management and planning, and socio-economic and agronomic aspects of irrigated agriculture.
2. Confine the responsibilities of the IAs largely to "upstream activities" such as improved system operation planning, O&M of main canal systems, preparation and implementation of new projects, and providing interface between upstream and downstream activities through water-related research and extension service.
3. Transfer responsibility for "downstream activities" relating to water distribution to participatory farmer organizations by undertaking an organized social mobilization program aimed at the systematic formation of sustainable Farmers Irrigation Groups for operation and maintenance of the watercourses and their

federations (FEDs) responsible for operation and maintenance of distributory canals.

4. Develop contractual arrangements between the IAs and FEDs under which the IA would provide specified irrigation services in terms of delivery of water to the FED against specified payments.
5. Set water charges from FEDs at a flat rate per day of acceptable water delivery performance at the head of distributory, to be reduced according to a fixed schedule, whenever delivery performance ratio fell below minimum acceptable value. Authorize the FEDs to establish charges for individual FIGs for their share of cost of water and O&M expenditure, and the FIGs to establish charges from individual farmers.
6. Establish an independent Commission in each province, immune against external influence and undue political intervention, to monitor the performance of the irrigation system with adjudicatory and regulatory powers, surveillance and information dissemination responsibilities relating to equitable distribution and efficient utilization of provincial water resources. The Commission should also have the responsibility to resolve contractual disputes between IAs and FEDs.
7. Undertake extensive and careful investigation of the legal and administrative ramifications of the proposed institutional changes prior to any implementation efforts, and take appropriate actions so that the changes will not be undermined by ambiguities and possible adverse judicial decisions.

**D. INSTITUTIONAL REFORMS IN AGRICULTURAL TECHNOLOGY DEVELOPMENT AND DISSEMINATION TO BOOST IRRIGATED AGRICULTURE**

**1. Education-Human Resources Development**

- i.\* Appropriately mesh training in agriculture and irrigation in both the agriculture and engineering universities to produce professionals with competence to guide development of irrigated agriculture. Revise the curriculum to meet training needs of newly constituted Irrigation Authorities.

- ii.\* Assign universities a key role to train manpower to modernize agriculture, and conduct research on medium-term pre-technology science. Prepare a 10-year master plan to domestically train adequate numbers of higher quality Ph.D's in agriculture and irrigation management.
- iii. Treat University research as an explicit part of the decentralized research system, competing freely for the enlarged competitive grants and bring it under the purview of PARC's oversight and strategic planning roles.

## **2. Research**

- i.\* Double the financial allocation (in real terms) to the agricultural research system by the year 2000, especially to increase the average operating expenditure per scientist. Provide financial support to all the pre-technology research and bulk of applied research through competitive research grants.
- ii. Gradually expand research manpower by 40 % (from 5000 to 7000 scientists) by 2000 simultaneously raising the quality standards.
- iii.\* Reorganize NARS to make the program cost-effective, efficient and client-oriented. Centralize planning, funding and monitoring of all research while simultaneously decentralizing operations by giving maximum operational autonomy to research institutions.
- iv.\* Prepare a perspective National Agricultural Research Plan (1994-2000) based on agreed priorities, consisting of clearly spelled out research projects with defined objectives, identified resource requirements, assigned responsibilities to various institutions to avoid unnecessary duplication, and measures to promote coordination between research institutions.
- v.\* Make future investment in agricultural research preferably in strengthening the existing institutions to enable them to perform optimally instead of utilizing the meager development resources to create new structures.
- vi.\* Institutionalize regular and more implicit improved priority setting and project monitoring as part of the medium term planning, to include changes in research locations and commodity focus, emphasis on pre-technology science, and biotechnology. Critically review all research programs and priorities through a system of periodic external reviews.

- vii. Refine studies on returns to investment in research to determine common features of successful research projects and incorporate these into rest of the research programs. Extend the study to determine returns on investment in extension programs with a similar objective.
- viii. Encourage public sector research institutions to develop joint projects with the private sector and have public R&D funding "open" with the objective of protecting farmers from unreasonable pricing by providing them economical alternatives.

### **3. Extension**

- i.\* Broaden the scope of the provincial Bureaux of Agricultural Information to include all aspects of farm production (livestock, aquaculture, farm forestry) in addition to crop production. Have the extension system rely more on audio-visual means, extensive on-farm demonstrations, and farm fairs.
- ii.\* Make transfer of technology (TT) an integral part of the mandates of research institutions by establishing TT section within the institute. Entrust mono-commodity institutes direct responsibility for TT in the region where the target commodity is a predominant component of the farming system.
- iii. Assign the federal government (initially PARC) a role in selected aspects of extension, especially TT from international sources, inter-provincial coordination in TT and research in extension techniques.
- iv. Encourage extension by private sector ensuring its full association with the public sector research programs for flow of technical information. Coordinate activities of the private sector organizations to ensure that no technologies are promoted which are not in the interest of the country.

### **4. Inputs**

- i.\* Establish a target for growth in fertilizer use (initially 15 % per year), monitor the growth rate and rectify immediately any deficiencies that show in the system. Establish a small, high level fertilizer commission to ensure adequate supplies of appropriate quality on time.

- ii.\* Establish self-sustaining, fully equipped and staffed pre-basic seed units at the research institutes and organize independent cells in the seed corporations, for production of basic seed.
- iii.\* Encourage private sector to establish small seed processing units in the main growing areas for producing certified seed and pay higher premium to contract farmers to attract them to produce quality seed.
- iv. Build adequate storage through the public sector agencies at the seed processing plants and at their sale outlets; provide appropriate cold storage for oilseeds and other crops which lose germination under hot and humid conditions.
- v. Start degree level study programs in seed technology in the agricultural universities and arrange short term (4-8 weeks) training courses for the seed sector professionals.

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\* *Recommendations having priority*

## **ANNEXURES**

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## **PROGRAM**

### **Seminar on**

### **Policy Issues for Enhancing Agricultural Productivity in Pakistan**

*Holiday Inn, Islamabad  
September 19, 1993 - Sunday*

- 0830-0900 Registration of Participants
- 0900-0915 Opening Remarks and Introduction to the Seminar by  
Dr. John Mellor

### **Morning Session**

- Chairperson:** Mr. Saeed Ahmad Qureshi
- 0915-9035 Priority Institutional Reforms in Irrigation Sector  
to Improve Productivity of Irrigated Agriculture  
(**Dr. Amir Muhammed**)
- 0935-1030 Discussion
- Panelists: Mr. Hafeez Qaiser  
Mr. F.A. Zaidi
- 1030-1045 *Tea Break*
- 1045-1110 Pakistan's Opportunities for Expanding Crop Production:  
Economic and Foreign Exchange Impacts  
(**Dr. Dick McConnen**).

1110-1145 Discussion

**Panelists:** Dr. A.H. Maan

1145-1210 Institutional Reforms in Agricultural Technology Development and Dissemination to Boost Irrigated Agriculture  
**(Dr. Amir Muhammed)**

1210-1300 Discussion

**Panelists:** Dr. Salauddin Solaiman

1300-1400 Lunch and Prayer Break

### **Afternoon Session**

**Chairpersons:** Mr. Salman Farooqi  
Syed Nawab Haider Naqvi

1400-1430 Major Macro Policy Needs for Accelerated Agricultural Growth  
**(Dr. Sarfraz Qureshi)**

1430-1500 Commodity Price Policy - Priority for Change  
**(Dr. John Mellor)**

1500-1600 Discussion

**Panelists:** Dr. M. Ghaffar Chaudhry  
Dr. Z.A. Vaince  
Dr. Abdul Salam

1600-1615 *Tea Break*

# PROGRAM

## Seminar on

### **Policy Issues for Enhancing Agricultural Productivity in Pakistan**

*Pearl Continental Hotel, Peshawar  
September 9, 1993 - Thursday*

- 0830-0900 Registration of Participants
- 0900-0905 Opening Remarks by Mr. Javed Iqbal Khan,  
Additional Secretary, P & D Department,  
Govt. of NWFP
- 0910-0915 Introduction to the Seminar by  
Dr. Amir Muhammed

### **Morning Session**

- Chairperson:** Dr. G.M. Khattak
- 0915-0930 Major Macro Policy Needs for Accelerated Agricultural Growth  
**(Dr. Sarfraz Qureshi)**
- Panelists:** M. Nawab Khan  
Mr. Javed Iqbal Khan
- 0930-1015 Discussion
- 1015-1030 Tea Break*
- 1030-1045 Commodity Price Policy - Priority for Change  
**(Dr. John Mellor)**

- 1045-1130 Discussion
- 1130-1145 Pakistan's Opportunities for Expanding Crop Production:  
Economic and Foreign Exchange Impacts  
**(Dr. Dick McConnen)**
- 1145-1230 Discussion
- 1230-1400 Lunch and Prayer Break

### **Afternoon Session**

- Panelists: Dr. G.M. Khattak  
Dr. M. Saeed  
Mr. Amir Haider
- 1400-1415 Priority Institutional Reforms in Irrigation Sector to improve  
Productivity of Irrigated Agriculture  
**(Dr. Amir Muhammed)**
- 1415-1500 Discussion
- 1500-1515 Institutional Reforms in Agricultural Technology Development and  
Dissemination to Boost Irrigated Agriculture  
**(Dr. Amir Muhammed)**
- 1515-1600 Discussion
- 1600-1615 Tea Break

**Seminar on**  
**Policy Issues for Enhancing Agricultural**  
**Productivity in Pakistan**

*Avari Hotel, Lahore*  
*September 12, 1993 - Sunday*

**Chairperson:**  
**Panelists:**

Chaudhry Sultan Ali  
Dr. Bashir Ahmad  
Malik Khuda Bukhsh Bucha  
Dr. M. Jamil Khan  
Mrs. Shaheen Khan  
Mr. Gaylord V. Skogerboe  
Mr. Mushtaq Ahmad Gill  
Malik Dost Mohammad  
Mr. Ghulam Abbas Jalvi  
Dr. S.H. Mujtaba Naqvi

*Avari Hotel, Karachi*  
*September 13, 1993 - Monday*

**Chairperson:**  
**Panelists:**

Dr. Nabi Bux Paloch  
Syed Aziz-ud-Din  
Dr. Rajab Ali Memon  
Dr. Badaruddin Soomro  
Dr. I.M. Bhatti

*Serena Hotel, Quetta*  
*September 15, 1993 - Wednesday*

**Chairperson:**  
**Panelists:**

Mr. Nasir-ud-Din  
Haji Abdul Rashid  
Mr. Ahmad Khan Khajjak  
Chaudhry Zulfiqar Ali Khan  
Dr. A.H. Bajoi  
Mr. Abdus Salam Khan  
Mr. Bashir Ahmad

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This publication incorporates five papers presented at seminars on "Enhancing Agricultural Productivity in Pakistan". These seminars were held at provincial capitals and Islamabad from September 9 to 19, 1993.

Four eminent scientists, Drs. John W. Mellor, Amir Muhammed, Richard J. McConnen and Sarfraz K. Qureshi were the main contributors in these seminars.

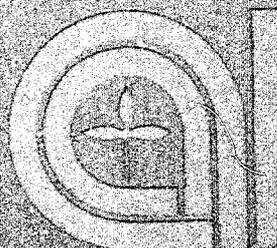
A group of distinguished persons including, policy makers, politicians, academicians, senior officials, donor agencies and farmers met to critically review the current status of Pakistan's agriculture and discuss strategies for its reforms in the future. A set of useful recommendations have been put forth to make agriculture sector more productive and efficient. We hope that readers find this publication helpful in re-thinking issues on Pakistan's irrigated agriculture.



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