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COMPARATIVE ADVANTAGE OF COTTON PRODUCTION IN PAKISTAN

By

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"This study was set to measure the competitiveness of seed cotton production and to determine whether the current set of policies are consistent with the existing comparative advantage. The analysis reflects strong national competitiveness in seed cotton production during the study period, 1998-2002. The study further reveals that Sindh has regained its historical dominance over Punjab in seed cotton production by making quantum jump in yield improvement. Though the crop shows strong national profitability, current policies discourage its production. The study indicates strong prospects for international competitiveness of seed cotton production if proper attention is given to develop hybrid seed, improve quality of output and contain increasing costs of pesticides. The welfare gains can be maximized by making policies consistent with the existing pattern of our international competitiveness".

1. Introduction

Cotton is the major cash crop of Pakistan and accounts for 11.7 percent of the value added and 2.9 percent of GDP. It is the main source of raw material for textile and other agro-based industries that provide almost

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40 per cent employment in the country. It earns about 60% of the country's foreign exchange [Economic Survey (2001)]. However, cotton production has been subject to instability mainly due to inconsistent government polices, high volatility in year to year prices, greater vulnerability of the crop to diseases and insects' attack, ever rising production cost, soaring input prices particularly of insecticides & pesticides and water logging and salinity. [Ahmad and Battese (1997)]. These problems have adversely affected welfare of the cotton growers and viability of the dependent sectors. Also, the current move towards liberalizing and globalizing the trading patterns pose challenge to international competitiveness of Pakistani cotton. To integrate into global economy, there is an urgent need to improve the crop in terms of both quantity and quality to maintain competitive edge over our competitors- and market share in international market. We can meet this challenge by making judicious use of available resources and following an appropriate combination of government policies and market forces. Comparative advantage and policy analysis is of major importance to know whether the current set of policies are consistent with existing pattern of comparative advantage and strengthen that pattern by using proper policy incentives in future [Byerlee (1989); Nelson and Panggabean (1994) and Khan (2001)]. This study is designed to (i) determine international competitiveness of Pakistani cotton, (ii) assess consistency of the current set of policies with existing pattern of comparative advantage and (iii) suggest appropriate policy measures for the cotton crop.

2. Scope of the study

The analysis covers two major cotton producing regions, namely Punjab and Sindh provinces of Pakistan, for five harvesting years i.e., 1997-1998 to 2001-2002. The two provinces are selected due to their major contribution to total cotton production i.e., the province of Punjab accounts for 78 percent of the area and 76 percent of the production and that of Sindh 21 per cent in area and 23 per cent in production.. Production cost estimates are based on the data of the Agricultural Prices Commission (APCom).

However, these were supplemented by domestic and international prices of inputs and outputs to get representative budgets for seed cotton. The average per acre costs are calculated for each province by taking average over five harvesting years while the country level data is obtained by taking weighted average of provinces based on their respective shares in production.

3. Analytical Framework

Applied economists have used different methods to measure comparative advantage and policy effects. Trade economists use Domestic Resource Cost (DRC) and Nominal and Effective Protection Coefficients (NPC and EPC), while project-appraisal economists use Social Benefit-Cost (SBC) Ratio. Recently, several studies have used Policy Analysis Matrix (PAM) that relates the above parameters of comparative advantage and policy effects [Panggabean (1989); Masters (1991); Masters and Winter-Nelson (1995) and Khan (1997, 2001)].

This study uses the PAM approach to determine international competitiveness of Pakistani seed cotton and policy effects. The PAM is a matrix of costs and revenue structures and consists of two accounting identities (Table 1). The first identity depicted by second and third column of the matrix shows that profit is equal to revenue minus costs measured in either private or social opportunity cost terms. The second identity shown by last column measures the policy effects i.e., the difference between observed values and efficiency values.

Table-1: The Structure of the Policy Analysis Matrix (PAM)

Budget Items	Private budget at market prices	National budget at national opportunity costs	Policy effects (transfers)
(1)	(2)	(3)	(4)
1. Revenue	A	F	K^c
2. Labor costs	B	G	L^d
3. Capital costs	C	H	M^e
4. Tradable input costs	D	I	N^f
5. Net profitability (1-2-3-4)	E^a	J^b	O^g

Source: Adopted from Comparative advantage of US Agriculture and Effects of Policies on Agricultural Development and Trade: the unpublished Ph.D. Thesis of Noor P. Khan, 1997.

Notes:

a) Net private profitability (NPP) or competitiveness, E = (A-B-C-D).

b) Net national profitability (NNP) or comparative advantage, J= (F-G-H-I)

c) Output Transfers, K = (A-F)
d) Labor transfers, L = (B-G)
e) Capital transfers, M = (C-H)
f) Tradable inputs transfers, N = (D-I)
g) Total policy effects, O = (E-J) = (K-L-M-N) = (NPP – NNP).

4. Results of PAM Analysis

4.1 DRC analysis: the measure of comparative advantage

The DRC analysis is a great achievement toward the development of more practical measures of comparative advantage. This ratio can be used to compare different economic activities in terms of social costs of domestic resources employed in earning or saving a unit of foreign exchange.

The smaller the social cost of transforming domestic resources to yield a unit of foreign exchange, the more efficiently the country uses its scarce resources. In the PAM context, DRC = (G + H)/(F - I). In this ratio, G and H are costs of domestic factors (i.e., land, labor and capital) while F is revenue and I the cost of the tradable inputs of the activity. The difference (F - I) is value added of the activity when everything is valued at social costs. The relationship between DRC and comparative advantage is straightforward: A country has a comparative advantage in an activity if DRC ratio is less than unity. Conversely, a DRC ratio greater than unity indicates inefficiency of the country in producing that particular commodity.

Table-2 summarizes the results of DRC analysis of seed cotton production in the study area during 1998-2002. The DRC coefficients for Pakistan vary between 0.31 and 0.41 that confirm the results of earlier studies about Pakistan's overwhelming competitiveness in seed cotton production. The average DRC coefficient of 0.36 reflects that we earn/save one rupee of foreign exchange by employing our domestic resources of Rs. 0.36 in seed cotton production. The comparative analysis of the two major cotton-producing regions depicts that in terms of comparative advantage Sindh has edge over Punjab. Historically, Sindh has been the leading province in cotton production due to its natural and geographic comparative advantage i.e., its proximity to Karachi port, the international trade outlet. This trend was reversed in 1983-84 when Punjab achieved breakthrough in high yield varieties and timely information to the cotton growers about plant

protection through the Pest Scouting and Early Warning Service. However, this study shows that Sindh has regained its historical dominance over Punjab by making a quantum jump in yield from 1997 onward.

Table-2: Domestic Resource Costs (DRC) Coefficients of Seed Cotton

Years	Punjab	Sindh	Pakistan
1997-98	0.39	0.27	0.36
1998-99	0.43	0.35	0.41
1999-00	0.31	0.30	0.31
2000-01	0.37	0.29	0.35
2001-02	0.41	0.32	0.39
Average	0.38	0.31	0.36

4.2 SBC analysis: the measure of comparative advantage:

As the name suggests, Social Benefit-Costs (SBC) ratio is the ratio of the net social benefits to the national opportunity costs of resources that may accrue to the use of these resources in the production activity. The Social Benefit-Cost (SBC) ratio is the most effective technique to prioritize alternative activities when the shadow exchange rate is well estimated. The numerator is the social benefits, while the denominator is the social costs of economic resources employed in creating the value added. This makes SBC a simple measure of comparative advantage. In the PAM context, SBC = F/ (G + H + I), where F is the revenue and G, H, I are the costs of tradable and non-tradable inputs, all valued at social prices. The relationship between SBC ratio and the measure of comparative advantage is straightforward: A country is an efficient producer of a commodity if SBC ratio is greater than unity, but less than one suggests that production of that commodity is not profitable for the country.

The SBC analysis in Table-3, reinforces the results of DRC analysis about the international competitiveness of Pakistan in seed cotton production. The average SBC ratio of 1.95 for Pakistan means that we can earn/save foreign exchange 1.95 times more as compared to its costs by investing in seed cotton production. The average SBC ratio of 2.25 for Sindh and 1.85 for Punjab clearly shows an edge of the former over the latter in seed cotton production. The explanations of the results of the SBC analysis are same as those for DRC analysis.

Table-3: Social Benefit Costs (SBC) Ratios of Seed Cotton Production

Years	Punjab	Sindh	Pakistan
1997-98	1.79	2.45	1.95
1998-99	1.70	2.01	1.77
1999-00	2.16	2.25	2.18
2000-01	1.88	2.35	2.00
2001-02	1.72	2.17	1.83
Average	1.85	2.25	1.95

4.3 Nominal protection coefficient (NPC): the indicator of policy effects

The Nominal Protection Coefficient (NPC) is simplest indicator of policy effects. It comes directly from the assumption that the border price is the shadow price of a commodity. The NPC is defined as the ratio of domestic price of commodity to its border price. In the PAM context, NPC = A/ F, where A and F are revenues per acre evaluated at domestic and border prices of the commodity. As an indicator of policy effects, an NPC lower than one means that production of a particular commodity is taxed either because of market failure or government intervention. Conversely, an NPC

greater than unity suggests inefficiency of a country in producing that particular commodity and that the price is heavily affected by government policies or other factors.

Table-4: Nominal Protection Coefficients (NPC) of Seed Cotton

Years	Punjab	Sindh	Pakistan
1997-98	0.60	0.60	0.60
1998-99	0.65	0.66	0.65
1999-00	0.45	0.45	0.45
2000-01	0.65	0.65	0.65
2001-02	0.65	0.65	0.65
Average	0.50	0.50	0.50

Table 4 shows that the value of the NPC ranges between 0.45 and 0.65 for both the cotton producing regions and thus for the entire Pakistan. The analysis suggests that farmers of seed cotton are receiving prices less than world reference prices and seed cotton production and exports are heavily taxed. The average NPCs of 0.50 for Punjab and Sindh, however, shows that farmers are equally taxed in the two provinces.

4.4 Effective protection coefficient (EPC): indicator of policy effects

Government policies affect not only agricultural production possibilities at the farm level but also value added through processing and marketing. Barber (1955) developed the Effective Protection Coefficient (EPC), an alternative indicator to NPC that captures the net effects of all policies on value added of agricultural production systems and not on just input or output prices. The EPC can be defined as the ratio of distorted tradable value added at market prices to its un-distorted value at border

prices. Using PAM elements, EPC = (A-D)/(F-I). The EPC quickly became and still remains a dominant indicator of policy effects in empirical studies. As such, the EPC is the summary measure of the incentives or disincentives caused by government policies in both input and output markets. Using the border price as the reference price, an EPC greater than unity implies price protection and positive incentives to the domestic producer of that commodity while the opposite is true when the EPC is positive but less than unity.

The coefficients of effective protection given in Table-5 indicate inputs as well as output (seed cotton) remained heavily taxed in both regions throughout the study period (more specifically during 1999-00). This quantitative analysis corroborates with the earlier empirical studies and the practice of government of Pakistan to production and export of the most bonanza cash crop of the country.

Table-5: Effective Protection Coefficients (EPC) of Seed Cotton

Years	Punjab	Sindh	Pakistan
1997-98	0.51	0.54	0.52
1998-99	0.58	0.60	0.59
1999-00	0.33	0.35	0.34
2000-01	0.58	0.60	0.59
2001-02	0.56	0.60	0.57
Average	0.51	0.54	0.52

5. Conclusions and Policy Implications

This paper uses Policy Analysis Matrix (PAM) approach to measure international competitiveness of seed cotton production in Pakistan and determine whether the current set of government policies are consistent with the existing pattern of comparative advantage. The analysis reflects strong

national comparative advantage in seed cotton production. The study further reveals that Sindh has regained its historical dominance over Punjab in the crop by making quantum jump in yield from 1997 onward. The results of NPCs indicate that seed cotton production in Pakistan is heavily taxed and therefore, its cultivation is being discouraged. This is further confirmed by EPCs analysis which depicts that both input and product markets discriminate against cotton production in Pakistan.

The findings of the paper suggest to exploit available potential in cotton cultivation to cater to local needs and earn foreign exchange. Concerted efforts need to be made to improve performance of the production and processing sectors. In the face of emerging WTO challenges macroeconomic policies conducive to cotton production in the country also seem important.

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Annex-I

PAM BUDGETS OF SEED COTTON PRODUCTION FOR 1997-98

Item	Punjab				Sindh			
	Values	Market cost/value	Opp. Cost/ value	Transfers	Values	Market cost/ value	Opp. Cost/ value	Transfers
Value of product & by-products (Rs/acre)	10431	10430	17400	-6970	14011	14011	23318	-9307
Labor cost (Rs/acre)	2666	2623	2623	0	2677	2677	2677	0
Capital cost (Rs/acre)	2622	2622	2367	255	2095	2095	2345	-250
Tradable cost (Rs/acre)	5088	3989	4707	-718	4625	3798	4481	-683
Yield (40 kgs/acre)	12.4				16.6			
Average market price (Rs/40 kgs)	833				833			
Gross value of seed cotton (Rs/acre)	10288				13786			
Value of sticks (Rs/acre)	143				225			
Total product value at market prices (Rs/acre)	10431				14011			
Export parity (Rs/40 kgs: Average 1997-01)	1194				1194			
Total value at export parity price (Rs/acre)	14746				19761			
Shadow price (Rs/40 kgs)	1404				1404			
Total value at shadow price (Rs/acre)	17400				23318			
Domestic Resource Cost Ratio (DRC)	0.39				0.27			
Social Cost-Benefit Ratio (SCB)	1.79				2.45			
Nominal Protection Coefficient (NPC)	0.60				0.60			
Effective Protection Coefficient (EPC)	0.51				0.54			

Note: Export parity price is calculated back from average fob price of Pakistani cotton yarn (Support Price Policies of Seed Cotton for the years, 1996-97 to 2000-01, Agricultural Prices Commission, Government of Pakistan, Islamabad.

Source: Support Price Policy for Seed Cotton for various years, Agricultural Prices Commission, Government of Pakistan, Islamabad.

Annex-II

PAM BUDGETS OF SEED COTTON PRODUCTION FOR 1998-99

Item	Punjab				Sindh			
	Values	Market cost/value	Opp. Cost/ value	Transfers	Values	Market cost/ value	Opp. Cost/ value	Transfers
Value of product & by-products (Rs/acre)	11364	11364	17400	-6036	13318	13318	20288	-6970
Labor cost (Rs/acre)	2903	2903	2903	0	3069	3069	3069	0
Capital cost (Rs/acre)	2848	2848	2426	422	1769	1769	2381	-612
Tradable cost (Rs/acre)	5281	4168	4918	-750	4884	3944	4654	-710
Yield (40 kgs/acre)	12.4				14.4			
Average market price (Rs/40 kgs)	907				907			
Gross value of seed cotton (Rs/acre)	11201				13061			
Value of sticks (Rs/acre)	163				257			
Total product value at market prices (Rs/acre)	11364				13318			
Export parity (Rs/40 kgs: Average 1997-01)	1194				1194			
Total value at export parity price (Rs/acre)	14746				17194			
Shadow price (Rs/40 kgs)	1404				1409			
Total value at shadow price (Rs/acre)	17400				20288			
Domestic Resource Cost Ratio (DRC)	0.43				0.35			
Social Cost-Benefit Ratio (SCB)	1.70				2.01			
Nominal Protection Coefficient (NPC)	0.65				0.66			
Effective Protection Coefficient (EPC)	0.58				0.60			

Note: Export parity price is calculated back from average fob price of Pakistani cotton yarn (Support Price Policies of Seed Cotton for the years, 1996-97 to 2000-01, Agricultural Prices Commission, Government of Pakistan, Islamabad.

Source: Support Price Policy for Seed Cotton for various years, Agricultural Prices Commission, Government of Pakistan, Islamabad.

Annex-III

PAM BUDGETS OF SEED COTTON PRODUCTION FOR 1999-00

Item	Punjab				Sindh			
	Values	Market cost/value	Opp. Cost/ value	Transfers	Values	Market cost/ value	Opp. Cost/ value	Transfers
Value of product & by-products (Rs/acre)	10129	10129	22648	-12519	10146	10146	22472	-12326
Labor cost (Rs/acre)	3089	3089	3089	0	2820	2820	2820	0
Capital cost (Rs/acre)	2886	2886	2313	573	1791	2052	2464	-412
Tradable cost (Rs/acre)	5483	4291	5063	-772	4871	3988	4706	-718
Yield (40 kgs/acre)	16.1				16.0			
Average market price (Rs/40 kgs)	620				620			
Gross value of seed cotton (Rs/acre)	9966				9889			
Value of sticks (Rs/acre)	163				257			
Total product value at market prices (Rs/acre)	10129				10146			
Export parity (Rs/40 kgs: Average 1997-01)	1194				1194			
Total value at export parity price (Rs/acre)	19194				19044			
Shadow price (Rs/40 kgs)	1407				1404			
Total value at shadow price (Rs/acre)	22648				22472			
Domestic Resource Cost Ratio (DRC)	0.31				0.30			
Social Cost-Benefit Ratio (SCB)	2.16				2.25			
Nominal Protection Coefficient (NPC)	0.45				0.45			
Effective Protection Coefficient (EPC)	0.33				0.35			

Note: Export parity price is calculated back from average fob price of Pakistani cotton yarn (Support Price Policies of Seed Cotton for the years, 1996-97 to 2000-01, Agricultural Prices Commission, Government of Pakistan, Islamabad.

Source: Support Price Policy for Seed Cotton for various years, Agricultural Prices Commission, Government of Pakistan, Islamabad.

Annex-IV

PAM BUDGETS OF SEED COTTON PRODUCTION FOR 2000-01

Item	Punjab				Sindh			
	Values	Market cost/value	Opp. Cost/ value	Transfers	Values	Market cost/ value	Opp. Cost/ value	Transfers
Value of product & by-products (Rs/acre)	13518	13518	20922	-7404	15909	15909	24515	-8606
Labor cost (Rs/acre)	3332	3332	3332	0	3323	3323	3323	0
Capital cost (Rs/acre)	3423	3423	2501	922	2009	2009	2464	-455
Tradable cost (Rs/acre)	5782	4500	5310	-810	4833	3945	4655	-710
Yield (40 kgs/acre)	14.9				17.4			
Average market price (Rs/40 kgs)	899				899			
Gross value of seed cotton (Rs/acre)	13345				15637			
Value of sticks (Rs/acre)	173				272			
Total product value at market prices (Rs/acre)	13518				15909			
Export parity (Rs/40 kgs: Average 1997-01)	1194				1194			
Total value at export parity price (Rs/acre)	17731				20776			
Shadow price (Rs/40 kgs)	1404				1409			
Total value at shadow price (Rs/acre)	20922				24515			
Domestic Resource Cost Ratio (DRC)	0.37				0.29			
Social Cost-Benefit Ratio (SCB)	1.88				2.35			
Nominal Protection Coefficient (NPC)	0.65				0.65			
Effective Protection Coefficient (EPC)	0.58				0.60			

Note: Export parity price is calculated back from average fob price of Pakistani cotton yarn (Support Price Policies of Seed Cotton for the years, 1996-97 to 2000-01, Agricultural Prices Commission, Government of Pakistan, Islamabad.

Source: Support Price Policy for Seed Cotton for various years, Agricultural Prices Commission, Government of Pakistan, Islamabad.

Annex-V

PAM BUDGETS OF SEED COTTON PRODUCTION FOR 2001-02

Item	Punjab				Sindh			
	Values	Market cost/value	Opp. Cost/ value	Transfers	Values	Market cost/ value	Opp. Cost/ value	Transfers
Value of product & by-products (Rs/acre)	13518	13518	20922	-7404	15909	15909	24515	-8606
Labor cost (Rs/acre)	3541	3541	3541	0	3552	3552	3552	0
Capital cost (Rs/acre)	3845	3845	2595	1250	3804	3845	2595	1250
Tradable cost (Rs/acre)	6622	5126	6049	-923	5341	4368	5154	-786
Yield (40 kgs/acre)	14.9				17.4			
Average market price (Rs/40 kgs)	898				899			
Gross value of seed cotton (Rs/acre)	13345				15637			
Value of sticks (Rs/acre)	173				272			
Total product value at market prices (Rs/acre)	13518				15909			
Export parity (Rs/40 kgs: Average 1997-01)	1194				1194			
Total value at export parity price (Rs/acre)	11731				20776			
Shadow price (Rs/40 kgs)	1404				1409			
Total value at shadow price (Rs/acre)	20922				24515			
Domestic Resource Cost Ratio (DRC)	0.41				0.32			
Social Cost-Benefit Ratio (SCB)	1.72				2.17			
Nominal Protection Coefficient (NPC)	0.65				0.65			
Effective Protection Coefficient (EPC)	0.56				0.60			

Note: Export parity price is calculated back from average fob price of Pakistani cotton yarn (Support Price Policies of Seed Cotton for the years, 1996-97 to 2000-01, Agricultural Prices Commission, Government of Pakistan, Islamabad.

Source: Support Price Policy for Seed Cotton for various years, Agricultural Prices Commission, Government of Pakistan, Islamabad.

AGRICULTURAL MARKETING SYSTEM AND TRADE ENHANCEMENT – ISSUES AND POLICIES

By
Mian Muhammad Mukhtar*

"Agriculture sector plays a vital role in the national economy and contributes about 24% to the total national GDP. Its components are crops, livestock, fishery and forestry. Crop sub-sector is the major one which provides 58% contribution to the agriculture GDP and has around 64 million tonnes of marketable surplus. An efficient marketing system provides the mechanism that allocates the resources more efficiently, ensures better returns to producers, greater satisfaction to the consumers and encourages investment in developing new technologies. The marketing of agricultural products in Pakistan has multifarious channels. There are 203 regulated markets functioning in the country and most of the domestic agricultural marketing and exports are in the hands of private sector. The Government has been taking strict regulatory measures to save the farmers from the exploitation of market intermediaries and also supported them by procuring their produce at minimum guaranteed prices of certain commodities through various public sector agencies. But imperfections/deficiencies in the functioning of agricultural marketing system are still there. These need to be removed by introducing new harvesting and marketing technologies and by improving the market infrastructure, transportation, storage, grading, packaging and processing facilities. Moreover, opportunities for enhancement of mutual trade with SAARC, ECO and other countries need to be explored out vigorously for mutually benefiting from each others experiences and resources".

1. Introduction

The agriculture sector -- contributing about 24 per cent to the total GDP -- is the mainstay of Pakistan's economy. The main components of the sector are crops, livestock, fishery and forestry accounting for 58, 37, 4 and 1

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per cent respectively. The fishery and forestry products have their own marketing channels and peculiar problems. The marketing of livestock and agricultural crops including horticultural products passing through multifarious channels involves many stages and problems as their production is organized by multitudes of farmers spread over a wide area. These growers have usually small marketable surpluses which are to be collected from far-flung areas (often lacking marketing infrastructure) and supplied to the domestic consumers as well as export markets.

Trading of a large number of agricultural and livestock commodities is freely allowed and is in the hands of private sector. Coarse grains, spices and condiments, fruits and vegetables, gram and pulses, meat, milk and eggs are the commodities which fall under this category. The internal movement of these products is practically free and their market prices follow the course generally determined by the inter-action of supply and demand forces. There are 132 regulated markets in the Punjab, 68 in Sindh, 2 in Balochistan and one in the NWFP which are functioning under the Agricultural Produce Market (General) Rules, 1979 and being administered by the Provincial Agricultural Departments.

The Government has allowed the marketing and exports of most of the agricultural commodities in the private sector. However, it is not oblivious to its responsibilities towards well being of the tillers of the soil and domestic consumers on the one hand and development requirements of the economy on the other hand. At the harvest time, the markets are generally glutted with produce resulting in depressed market prices. In the years of good harvest, the market prices of the farm commodities may be too low to cover their production and marketing costs. The state of affairs is responsible for lower returns to the farmers, particularly the small ones who because of their weak staying power are compelled to dispose of the produce immediately after harvest. To safeguard the growers against such a situation and other market imperfections, e.g. the strong cartels of the buyers, the Government in the past had been fixing and implementing the support prices of important agricultural commodities i.e. wheat, seed cotton, cotton lint,

sugarcane, rice (paddy), cleaned rice, gram, potatoes, onions, oilseeds and tobacco. The support prices are designed to provide a floor to the market which do not replace the open market mechanism/functioning.

In true spirit, the procurement agencies are obliged to purchase all the quantities of the produce offered for sale at support price till the market price rises above the level of support price. However, this function is not truly being performed under the today's regime of trade liberalization and due to financial constraints. The Government marginally intervenes only in worst situation. However, the public intervention at least plays a role of showing up the existence of a second buyer in hard situation which smoothens the market forces to some extent. Recently the coverage of support price programme has been curtailed to wheat, rice, cotton and sugarcane.

Specialized agencies and organizations are working in the public sector to look after various aspects of marketing and procurement of these commodities. For wheat and rice (paddy), Pakistan Agricultural Storage and Services Corporation (PASSCO) is responsible to implement their support prices. The Provincial Food Departments (PFDs) also procure wheat from the growers. In case of cotton, the Trading Corporation of Pakistan (TCP) has been assigned the task of its procurement. However, the Government does not buy the sugarcane but it is mandatory for the sugar mills to purchase sugarcane from the growers at the price announced by the Government. Similarly, Pakistan Tobacco Board has been entrusted with the fixation of grade prices as well as making necessary arrangements with tobacco companies in the private sector for marketing of tobacco.

The private sector as well as the public sector agencies handle millions of tonnes of marketable surplus of various farm products. The extent of marketable surplus can be seen from the following table which depicts the estimated quantities alongwith per cent of total production in case of a few important crops.

Table-1: Production and Estimated Marketable Surplus of Agricultural Commodities

S.No.	Commodity	Production	Estimated marketable surplus	Marketable surplus as % of total production
		000 tonnes	000 tonnes	Per cent
1.	Wheat	19522	9761	50
2.	Cotton	1844	1752	95
3.	Sugarcane	46346	37077	80
4.	Rice	4584	3438	75
5.	Gram and pulses	1345	1143	85
6.	Oilseeds	455	409	90
7.	Potatoes	1740	1392	80
8.	Onions	1587	1270	80
9.	Vegetables excluding potatoes	2906	2325	80
10.	Fruits	6027	5424	90
11.	Total	-	63991	-

Sources:

1. Agricultural Statistics of Pakistan, 2000-01.
2. Economic Survey 2001-02.
3. APCom support price policy reports.
4. FCA: Minutes of 76th meeting dated 21-3-2002.

It is evident from the above table that by handling around 64 million tonnes of marketable surplus of these commodities, the private as well as public sector enterprises perform a gigantic task. Besides it, the produce of many other minor crops and semi processed farm products also enter the markets before reaching into the hands of end consumers and the exporters.

2. Marketing Policy and Role of Public Sector

On the whole, the domestic marketing of agricultural products has been in the hands of private sector. However, the government has intervened the markets through its support price system including procurement and export of a few major crops. Different regulatory measures have also been taken for directing the smooth functioning of agricultural markets. The Seventies were characterized by the increasing role of public sector and its intervention in the input and commodity markets. A number of procurement/export organizations, such as, RECP, CEC, AM&SL and GCP were established but in Nineties all these institutions were disbanded, mostly in response to changing global economic environment and the pressure of donors. Accordingly, the public sector is on the retreat. For example, in mid-Eighties, the procurement of coarse and basmati rice by the public sector was sometimes as high as 40 to 48 per cent of total production which dropped to only 3 to 6 per cent in 1995-96. Similarly, the procurement of cotton by CEC in 1985-86 was recorded at more than 60 per cent of the yearly production (as well as of total exports), but in recent years the procurement by TCP has not been more than 5 per cent.

However, in case of wheat market the Government intervention remains quite substantial as more than 4 million tonnes of wheat per annum has been procured at support price by the Government agencies. Nevertheless, wheat being the staple food crop is a special case. The Government has drastically curtailed the role of public sector marketing organizations to provide more room to the private sector in domestic and export markets.

The Government is also providing support to the private sector's economic activities through its various organizations working for market promotion. In this respect, the Export Promotion Bureau, Pakistan Standards Institute, Federal Bureau of Statistics, Pakistan Cotton Standards Institute, and the Department of Agricultural & Livestock Products Marketing &

Grading (DALPMG) are making valuable contribution towards the fixation of quality standards, grading, market intelligence, export promotion and maintaining liaison with international organizations, such as, FAO, UNDP, WTO etc. The DALPMG collects and disseminates the wholesale prices of about 190 commodities prevailing in 35 important markets for the benefit of the producers, consumers, traders and policy makers. Moreover, there are provincial Directorates of Agricultural Marketing which regulate the functioning of more than 200 markets and supply wholesale prices of various farm products alongwith information on other allied aspects to the official users as well as the general public.

3. Role of Private Sector

At present, the marketing of agricultural commodities is largely performed by the private sector based on age-old customs and practices of assembly, distribution, transportation, selling and buying. Unregulated markets still exist, particularly in the provinces of NWFP and Balochistan. However, in the Punjab and Sindh, there are about 200 regulated markets which facilitate the growers to dispose of their produce. The marketing system has developed through the decades and a number of improvements have been brought in it by enforcement of various rules and regulations. Moreover a large number of processing units, such as, flourmills, cotton gins, rice husking mills, oil extracting factories and sugar mills have been established overtime which purchase the produce directly from growers. Due to this development, not only an alternate source of marketing has become available to producers but the pressure on existing agricultural markets has declined considerably.

4. Marketing Problems

Inspite of all these developments, the marketing of agricultural produce is still engulfed in various problems. A long chain of market intermediaries exists comprising of pre-harvest contractors, itinerant merchants (village beoparies), commission agents, wholesalers, retailers and

hawkers. Poor infrastructure of markets/roads, insufficient storage/processing facilities, inefficient means of transportation, illiteracy and weak holding capacity of the farmers etc. are resulting in:

- Various malpractices in marketing of agricultural produce.
- High incidentals and marketing margins.
- Excessive wastage of produce and deterioration in its quality.
- Distress sales at harvest by farmers, resulting in low prices and low incomes for them.
- Overall huge financial losses to the national economy.

5. Searching for the Solution

An efficient marketing is as important as the expansion of agricultural output is itself. The farmers need a favourable and sustainable output-input price relationship in order to produce more. A constant vigorous campaign for expanding the exports could be helpful in fully exploring and utilizing our comparative advantage prevalent in the production of certain agricultural and livestock products, such as, cotton, food grains, fruits & vegetables, wool and leather. In this connection, the following three areas need to be concentrated upon:

i) To remove the deficiencies and in-efficiencies in the existing marketing system, new harvesting and marketing technologies need to be introduced. Heavy investments should be made to improve the physical infrastructure of markets, transportation, storage, grading, packaging and intelligence dissemination facilities alongwith educating the growers about proper time and methods of marketing their produce. Strict regulatory measures should be undertaken to save them from the illegal practices of the intermediaries. Moreover, new export markets need to be explored and our share needs to be enhanced in the existing ones.

ii) The socio-economic problems faced by the farming community, particularly the small and marginal growers, may not be addressed by simply regulating the markets. The agriculture sector throughout the developing as well as developed world is being supported by the Governments in one or the other form. In an environment of trade liberalization, the role of public sector in the marketing of agricultural products may not be abandoned altogether. As long as the domestic support price measures are within the de-minimus limit of 10 per ent of Agricultural GDP, we should continue the remaining part of this programme to assure the growers that the market prices will not be allowed to fall below a certain level i.e. the minimum guaranteed level, at least for the main four crops presently being covered under this programme. It is essential for the well-being of farmers as well as the national economy, to provide them some safeguard against the imperfections of markets, their shortcomings and failures, and the strong monopolies and cartels of buyers/processors.

As every nation has its own experiences on the road to development, we can benefit from our regional partners in the SAARC and ECO, particularly in the field of agricultural marketing. As these nations have different background of development process, therefore, we can share with them our experience of successes as well as failures and learn a lot from each others experiences. Opportunities for enhancement of mutual trade with SAARC, ECO and other countries also need to be explored vigorously.

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AGRICULTURAL CREDIT IN PAKISTAN: ITS AVAILABILITY, CONSTRAINTS AND REMEDIES

By

Rauf A. Sheikh

"Pakistan's economy is agrarian and rural based and continues to be so despite massive efforts at industrialization. Agricultural credit will continue to have an important role to play in augmenting agricultural production, improving rural productivity and increasing private investment in agriculture. In recognition of the fact that development revolves on availability of credit, commercial banks were inducted in agriculture and rural financing in 1972 to achieve national socio-economic objectives. The expectation was that commercial banks with their vast resources and branch network should be gainfully used for development of rural areas. But the commercial banks' modest efforts in this direction have not brought about substantial change. However, Zarai Taraqiati Bank Limited (ZTBL formerly ADBP) as a specialized institution through its elaborate credit delivery system has played significant role in sustained development of Agriculture in Pakistan. In this paper the overall agri credit position in the country and the role of commercial banks, Federal bank for Cooperatives and ZTBL has been discussed in detail. Further the article analyses the constraints in expansion of micro finance in Pakistan and suggests remedial measures."

1. Introduction

With adoption of innovative farm production techniques by the farmers and the changes in the pattern of inputs use, credit has assumed a significant importance. The farmers especially the resource deficient subsistence land holders who constitute about 90% of the farming community need cash to purchase agricultural inputs and the latest farm machinery/equipment required to modernize their farming operations. Credit

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to the farmers was initially available as taccavi loans provided by the Provincial Governments through revenue departments which have been stopped since 1986. Presently formal credit is available through ZTBL with network of 351 branches, 1400 Mobile Credit Officers; Federal Bank for Cooperatives which operates through Provincial Cooperative Banks having 234 branches and around 60,000 affiliated societies and Commercial Banks having 2500 branches operating in the rural areas (9th Five Year Plan).

Pakistan's economy is agrarian and rural based and continues to be so despite massive efforts at industrialization. Agricultural credit will continue to have an important role to play in augmenting agricultural production, improving rural productivity and increasing private investment in agriculture. In recognition of the fact that development revolves on availability of credit, commercial banks were inducted in agriculture financing in 1972 to achieve national socio-economic objectives. The expectation was that commercial banks with their vast resources and branch network should be gainfully used for development of Agriculture sector. In quantitative terms, commercial banks have been initially instrumental in expansion of agricultural credit. However, the induction of commercial banks has been a marriage of unwilling partners' and resulted in compelling urban oriented institutions to go to rural areas with all the attendant consequences. Disbursement of agricultural credit by commercial banks has either declined or almost remained constant from 1987 to 1994 and farm credit has deteriorated in quantitative terms as well.

Despite considerable efforts made towards institutional development and expansion of the source base, the agricultural credit delivery system continues to suffer from financial and managerial in-efficiencies. The measures taken in the past could not produce desirable results except some marginal improvement in credit delivery system. Agricultural production increases particularly of food crops have not corresponded with growing population threatening food security. The dependence on foreign sources to feed its people is a vulnerability against external pressures which can pose threats to core national interest. Taking stock of the situation, the Economic

Advisory Board has recommended to increase allocation of credit for agricultural sector to the tune of Rs 100 billion per annum envisaging to achieve import substitution in edible oils, wheat and other products with a net saving of US$ 1.5 billion per annum.

2. Institutional Agricultural Credit System

State Bank of Pakistan occupies a unique position in the development of credit delivery system in the field of Agricultural Credit. Agricultural credit estimates are prepared by the Agricultural Credit Advisory Committee (ACAD) in consultation with Governor State Bank of Pakistan (SBP). The annual credit plan along-with sectoral and institutional credit ceilings are approved by the National Credit Consultative Council (NCCC) headed by the Governor, State Bank. Moreover, there is a full-fledged Agricultural Credit Department responsible to plan Agricultural Credit requirements of the country and to study all problems on Agricultural Credit, provide consultations to major agricultural credit disbursing agencies with a view to organize and ensure sufficient and efficient agricultural credit operations in the country.

There are three main sources of formal credit supply in the country i.e., Zarai Taraqiati Bank Limited (ZTBL), Federal Bank for Cooperatives (FBC) and the Commercial Banks (CBs). Keeping in view the tremendous resources at their command and large number of branches spread over the country with large geographical coverage, it was decided in 1972 that the commercial banks should also be required to provide agricultural credit. Presently ZTBL as evident from the data given in Table 1 below is the largest provider of Agricultural Credit followed by Commercial Banks and Federal Bank for Cooperatives. Moreover, its share has also increased over time (55% in 1991 to 62 % in 2000) while that of the other two has declined (19% to 15% and 26% to 23% respectively).

Table-1: Agricultural Credit Disbursed by Source of Institution

(Rs in million)

Years	ZTBL	Cooper-ative	Commer-cial Banks	Total	ZTBL's Share in %age	Cooper-ative's share in %age	Commercial Banks' Share in %age
FY' 91	8324	2967	3866	15157	55	19	26
FY' 92	6996	3247	4180	14423	49	22	29
FY' 93	8643	2978	5275	16896	51	18	31
FY' 94	8989	2622	4632	16243	55	16	29
FY' 95	14576	3757	4608	22941	64	16	20
FY' 96	10254	2909	4662	17825	58	16	26
FY' 97	11654	3431	4969	20054	58	17	25
FY' 98	22353	4929	6110	33392	67	15	18
FY' 99	30171	5440	8068	43679	69	12	19
FY' 00	24424	5951	9313	39688	62	15	23

Source: "Agricultural Credit Indicators 2000", ADBP, Islamabad.

3. Requirement of Credit and its Availability from the Formal Sources

Credit allocations for agricultural sector have never matched with the requirements. Share of agricultural credit in credit plan of the country has been dismally low compared to its contribution to the economy in terms of employment generation, export earning and supply of a variety of raw materials to industry which is largely agro based. Review of last four, 5-year plans commencing from 1978 to 1998 reveals that disbursement of agriculture credit against annual targets given by National Credit Consultative Council (NCCC) to three credit advancing agencies (ADBP, FBC and CBs) lagged behind. The allocation of funds for investment in agriculture is based on availability of resources and not on actual credit requirements of the farming community. Comparison of actual disbursement

of credit against the requirement estimated in annual plans is even more frustrating as is evident from the data in the Table-2 given below:

Table-2: AGRI Credit Requirement, Allocation & Achievement

(Rs in million)

Year	Agri Credit Requirement	Allocation	Achievement
1978-83	90538	N.A	20687
1983-88	148355	61566	63815
1988-93	298708	97010	75762
1993-98	622881	149970	112447
1998-2003	713159	271495	N.A

Source: 9th Five Year Plan.

Main factors ascribing to low achievements of disbursement targets include liquidity constraints, reluctance of commercial banks to make investment in agriculture and low recovery rate. Among three credit advancing agencies, ZTBL and Federal Bank for Cooperative have, by and large, achieved their disbursement targets despite liquidity constraints stemmed from stoppage of rupee re-finance by SBP and foreign assistance from international donors and low rate of recovery as shown in the Table-3 below.

Table-3: Allocation of Funds Made by NCCC to ZTBL, NCBs and FBC and their Achievements

(Rs in million)

Year	ZTBL		NCB		FBC	
	Allocation	Achievement	Allocation	Achievement	Allocation	Achievement
91-92	11870	6996 (59%)	6872	4663 (68%)	4110	3247 (79%)
92-93	10946	8643 (79%)	7737	5275 (68%)	3837	2928 (76%)
93-94	13005	8989 (69%)	8722	4632 (53%)	3571	2631 (74%)
94-95	15440	14576 (94%)	9768	4608 (47%)	4000	3757 (94%)
95-96	12100	10339 (85.5%)	11176	5631 (50%)	3810	3803 (100%)
96-97	11900	11687 (98%)	10856	4969 (46%)	3435	3431 (100%)
97-98	26400	22363 (85%)	10856	6110 (56%)	4931	4929 (100%)
98-99	30513	30176 (99%)	10856	8068 (74%)	5440	5440 (100%)
99-00	35000	24424 (70%)	11942	9313 (78%)	5980	5951 (99.5%)
00-01	31250	25145 80%	11942	10135 85%	6072	4259 70%

Source: ADBP Annual Report 2000-01.

SBP warned ZTBL to generate its own funds for its lending programs and started reducing rupee re-finance to ZTBL in a phased manner by applying 10% cut in each year's allocation from 1987 onwards on cumulative basis. Rupee re-finance has accordingly been stopped to ZTBL from 1996-97. Taccavi loans provided by the Govt upto 1986-87 have already been stopped. All sources of foreign assistance have dried up due to closure of donor funded credit projects. Whereas commercial banks despite availability of resources exercised restraint on investment in agriculture sector. It is estimated that Commercial Banks are mobilizing saving to the

tune of 100 billion per annum from the rural areas against a meagre annual investment of Rs 4 to 9 billion over last 10 years (Table – 1)

Total financial requirement for agriculture sector during the 9th plan works out to Rs 1053 billion against which credit requirement would be Rs 713 billion. Detail of Estimated Financial and Credit requirement with break-up into development and production credit is given below in Tables-4 and 5 respectively.

Table-4: Estimated Financial (Cash) Requirements During 1998-99 to 2002-03

(Rs in million)

Year	Development	Production	Total
1997-98 (Bechmark)	46, 273	105, 121	151, 395
1998-99	51, 456	116, 895	168, 351
1999-2000	57, 219	129, 987	187, 206
2000-01	63, 628	144, 546	208, 173
2001-02	70, 754	160, 735	231, 489
2002-03	78, 678	178, 737	257, 415
Total	321,735	730,900	1,052,634

Source: 9th Five Years Plan.

Table-5: Estimated Credit Requirements During 1998-99 to 2002-03

(Rs in million)

Year	Development	Production	Total
1997-98 (Benchmark)	35, 466	67, 103	102,570
1998-99	39, 438	74, 619	114,058
1999-2000	43, 856	82, 976	126,832
2000-01	48, 767	92, 270	141,037
2001-02	54, 229	102, 604	156,833
2002-03	60, 303	114,096	174,399
Total	246,593	466,565	713,159

Source: 9th Five Year Plan.

4. Financing Strategy

In alignment with GOP's development strategies, lending institutions have been concentrating their investment in the priority areas to achieve sectoral growth rates. Banks' main financing has been for tractors, farm implements, harvesting machinery, minor irrigation (tube well, lift pumps) poultry farming, dairy/livestock farming and seasonal agri inputs. Total credit requirement during 8th five years plan was estimated at Rs 623 billion to agriculture against which allocation was Rs 150 billion of which Rs 112.5 billion could be advanced. Total disbursement during 7th plan period amounted to Rs 76 billion against allocation of Rs 97 billion (Table 2). ZTBL as a main arm of GOP for providing agricultural credit is making efforts to increase flow of credit to the farming community, especially the small farmers. Previously the beneficiaries of ZTBL loans were mostly medium and large farmers. Despite enormous contribution of small farmers (holding land upto 25 acres), landless/tenants and women to rural economy, have limited access to formal sources of credit.

Realizing the vital role of this socially less advantaged group, ZTBL has gradually shifted its focus from medium/large farmers to small farmers. Under its redirected strategy, share of small farmers in the total disbursement has increased from 55% in 1993-94 to 69% in 1998-99 (Annex-I). In order to enhance the access of small farmers to formal credit, Bank adopted innovative credit delivery approaches. Of them, most significant are supervised credit system (Description in Appendix-II) and credit to women through women. The study on "Rural Finance System" of Philippine revealed that access of small farmers to Rural Financial Institutions is not automatically guaranteed by a liberalized rural financial markets. The Philippine government promotes and encourages innovations in lending systems to improve such access (Gilberto M.L. 1991). Three innovative programmes in the study have been identified. One intends to demonstrate the capacity of small farmers in handling credit and building a financial track record that banks generally value. An other establishes a pool of funds from which participating rural banks would draw during periods of tight liquidity. The third envisions the building of a gross root level financial infra-structure by linking autonomous financial self help groups with government banks towards establishing a privately owned and directed apex bank for the self help groups.

5. Lending Operations

Commercial banks and Federal Bank for Cooperatives are providing 80 to 90% production loans out of their total agri credit disbursement of Rs 55,682 million and Rs 38,170 million respectively during last 10 years. Whereas, ZTBL provides development loans as well as production loans as detailed in Table-6 below:

Table-6: Agricultural Credit Disbursement By Major Purposes

(Rs in million)

Purposes	1999-00	1998-99	1997-98	1996-97	1995-96
Development Loans	8347	8161	8250	5697	4110
Tractors	5744	4510	4286	3196	3262
Farm Equipment	361	526	610	185	74
Dairy Farming	743	743	1591	1329	425
Livestock	185	219	284	291	43
Tube wells	831	1436	858	386	173
Orchards	78	226	160	97	18
Poultry Farming	27	35	41	26	18
Land Development	40	55	36	18	7
Farm Transportation	0.1	0.689	29	34	17
Fisheries	13	58	31	19	7
Draught Animals	-	-	-	-	-
Others	330	352	323	116	66
Production Loans	16082	22010	14104	5958	6144
Fertilizer	8454	11220	6980	2946	3161
Pesticides	3445	5446	3269	1539	1445
Seeds	3387	4218	2661	954	1045
W/C for Poultry Farming	58	61	52	41	18
W/C for Dairy Farming	103	103	104	36	42
W/C for Livestock	11	17	67	13	4
W/C for Fisheries	-	-	-	-	-
Others	633	945	971	427	429
Total	24424	30171	22354	11655	10254

Source: "Agricultural Credit Indicators 2000", ADBP, Islamabad.

The share of ZTBL in formal credit ranged from 55% to 69% as given in Annex-I. The lending operations of ZTBL as the largest provider of agri credit are discussed here in detail. It has made impressive improvements in providing credit to agriculturists and landless rural poor to help increase their farm productivity and income levels. ZTBL, has today become a single largest institution in the country for supply of agricultural credit and transfer of agricultural technologies to the farmers through its credit delivery mechanism. Measures were taken, policies were streamlined and reinforced which changed the dimensions of agricultural credit, leaving far reaching effects on Pakistan's agriculture. Mechanization of farm operations is also an important area where the contribution of ZTBL is conspicuous. Since inception, ZTBL has disbursed Rs 61,294 million to finance 404,656 tractors as on June 30, 2000 which is about 90% of total number of tractors purchased through institutional credit in the country. Similarly, it extended loan of Rs 8,245 million for installation of 107,673 tube wells out of total number of 283,350 tubewells in the country. Early sixties witnessed the introduction of chemical fertilizer technology with the active support of credit mechanism. During late sixties the Bank played a major role in financing the introduction of biological technology i.e. Maxi-Pak wheat seed which was mainly responsible in obtaining maximum output per acre. Again during seventies wheat thresher technology triggered-off with the ZTBL's credit support. Malik et.al (1991) analyzed the role of agricultural credit in development of Agriculture. The study identified several areas that deserve immediate attention. There seem to be five major problems regarding access to the institutional credit: (1) The actual flow of credit to the small farmers. (2) The limited flow to small farmers is concentrated in the Punjab and NWFP and to the Owner farm Category. (3) There are complex procedures for advancing agri-loans by the commercial banks. (4) Delay in disbursement of credit due to un-necessary documentation. (5) The Interest rates on agricultural loans need to be rationalized.

Gill (1993) studied the role of Development Financial Institutions (DFIs) in rural industrialization. Analysis of data on loans provided for various rural agro-industries by 13 DFIs revealed that ZTBL played major role in rural industrialization. ZTBL provides loans for carrying out farming activities as well as for agro-processing and agri input/service industries.

6. Constraints in Expansion of agricultural Credit

Formal credit institutions are reluctant to diversify and extend their lending operations to new rural poor/small farmers. They look to only walk in clients who in most cases are ex-borrowers. They are hesitant to extend small loans due to the following reasons:

i) Micro loans are not cost affective. Proportionate administration costs on small loans are considerably higher as compared with big loans. The poor are often seen as unreliable clients due to their unstable and small incomes and irregular saving and borrowing. Moreover, achieving predetermined loan targets is much easier through lending to big borrowers. Credit rating of micro-finance is also not established.

ii) Collated credit is as such more secured than non-collated credit. As small agricultural loans are mostly non-collated, thus there is greater tendency for avoiding such loans.

iii) Attaining the national objective of increased food production is more easily possible through big producers.

iv) There is a perceptible cultural gap between the formal lenders, mostly originating in the urban environment and the rural borrowers who are accustomed to a different way of borrowing money. They also find it difficult to comply with several loan formalities like filling of loan applications,

obtaining' guarantors, etc. Moreover, information related to various credit schemes, formalities, obligations, etc., do not reach them particularly to the illiterates.

v) Various terms and procedures of institutionalised lending are in-appropriate to the needs and cash flows of small producers. The flexibilities needed by them for repaying the loan are not built into formal loans. This makes them fearful of the consequences of non-repayment to a formal lender.

vi) Credit from formal lenders is tied to pre-identified production activities, whereas for a small borrower his immediate consumption needs are more pressing than productive investment. Formal lenders, however, view consumption credit as unproductive.

vii) For a small borrower, credit from a money lender although at a high interest rate, is often readily available round the corner in a system to which he has been accustomed for generations.

7. Conclusions and Recommendations

There exists a vast potential for resource mobilization in the rural areas. Commercial banks through their network of rural branches are reportedly mobilising deposits of over Rs 100 billion per annum but the contributors of these resources are not being benefited. They apparently shy away micro-entrepreneurs/small farmers for fear of default and divert lending to larger industries and commercial/trading activities despite the fact greater proportion of such loan portfolio has become infected. As a result CBs are now afraid of further investments in the above said areas. They have liquidity and are in search of safer investments. Commercial bank's perception of low rate of recovery of loans obtained by the land-less rural poor and small farmers is not correct. Contrarily about 90% of total loans of the country are stuck-up in industrial sector where beneficiaries were larger

borrowers/elite class. Establishment of Micro-Finance Bank is though a commendable step in this direction but it alone may not be able to cater the credit needs of large population of the impoverished. Commercial banks and DFIs having more than 9,000 branches throughout Pakistan, many of which located in the rural areas, may be more actively involved in small loans by allocating them mandatory annual credit targets for this purpose.

Treating saving equally important to lending, formal credit institutions may prescribe a certain amount of saving in their bank accounts to qualify for availing credit facilities. Entrepreneurial ability, credit-worthiness and saving may be mandated as essential ingredients for enrolment of the persons as participants of the micro-credit program. For assessment of above attributes, the persons willing to become part of the program should first be enrolled as participants and then borrowers. The participants should be motivated and fully briefed about the program objective and the steps to be taken for its realization, - a way to emerge out of their poverty. The participants may not be advanced any type of loan before 3 months of opening their saving accounts.

To improve and make micro credit programme successful more specific recommendations are made in the following:

i) It should be made compulsory for credit institutions to impart training to the micro entrepreneurs. Till such time credit institutions develop their own training facilities, assistance of the existing training institutions and organizations like Poly Trade Institutes, SMEDA, ABAD etc., may be sought.

ii) To keep administration cost low, the formal lenders including Micro-Finance Bank have to adopt quick and simple lending procedures such as decentralized loan approvals, minimum documentation, and use of social collaterals (individual/group guarantees) in place of tangible collaterals on the lines of Bank Rakyat of Indonesia and Grameen Bank of Bangladesh.

iii) To ensure high repayment rate, the lenders have to develop a range of techniques including peer pressure, contact intensification, investment counselling and frequent follow-up for recovery specially during the periods when incomes are received.

iv) Prudential regulations of the State Bank of Pakistan applicable to normal lending procedures/policies may be relaxed so that Micro-Finance could be operated with limited regulatory cover.

v) Micro-Finance Bank and the main steam credit institutions may have to re-design their products suited to peculiar requirements of the low income groups in terms of size of loans, assets owned income consumption requirements, flexibility in repayment period etc.

vi) Diversification in lending will have to be achieved in order to minimize lender's risk as well as increase income of the micro-entrepreneurs.

vii) To ensure substantial contribution to GDP, separate lending targets for economic opportunities envisaging value addition and for the traditional ones may be given.

viii) Responsibility to ensure the recovery of credit should be put jointly on all the creditors and mark-up on loans linked to timely repayment of loan instalments from the creditors of the area.

ix) NGOs seeking linkage of their clients with the formal lenders may be formally involved in credit operations by asking them to furnish personal guarantees to secure loans/advances to their recommendees. This would ensure people's participation in credit delivery system and recovery of loans.

Annex-I

Agricultural Credit Disbursed by Source of Institution

Years	ZTBL	TACC AVI	Cooper-ative	Commer-cial Banks	Total	ZTBL's Shares in % age	Cooperat ive 's Shares in %age	Commerc ial Bank Shares in % age
FY' 79	416.937	11.960	413.780	1381.110	2223.787	19	19	62
FY' 80	711.550	8.200	708.640	1587.400	3015.790	23	24	53
FY' 81	1066.619	8.300	1126.250	1826.770	4027.939	26	28	45
FY' 82	1557.386	10.340	1100.300	2436.100	5104.626	30	22	48
FY' 83	2310.435	2.690	1320.930	2680.890	6314.945	36	21	42
FY' 84	3131.676	9.300	1449.890	4088.700	8679.566	36	17	47
FY' 85	4167.908	0.000	1567.600	4953.100	10688.608	39	15	46
FY' 86	5307.867	0.000	2048.580	5790.800	13149.087	40	16	44
FY' 87	6031.152	0.000	2494.750	7313.400	15839.302	38	16	46
FY' 88	7716.078	0.000	3020.280	5564.000	16300.358	47	19	34
FY' 89	8667.523	0.000	2730.710	3423.600	14821.833	58	18	23
FY' 90	9389.861	-	640.070	3950.367	13980.298	67	5	28
FY' 91	8323.947	-	2967.450	3865.657	15157.054	55	19	26
FY' 92	6996.426	-	3247.010	4179.56	14422.996	49	22	29
FY' 93	8643.405	-	2978.003	5274.970	16896.378	51	18	31
FY' 94	8989.252	-	2621.490	4632.306	16243.048	55	16	29
FY' 95	14575.735	-	3756.740	4608.353	22940.828	64	16	20
FY' 96	10253.873	-	2908.490	4662.471	17824.834	58	16	26
FY' 97	11654.501	-	3431.130	4968.775	20054.406	58	17	25
FY' 98	22353.632	-	4928.930	6109.766	33392.328	67	15	18
FY' 99	30171.330	-	5439.970	8067.723	43679.023	69	12	19
FY' 00	24423.889	-	5951.230	9312.518	39687.637	62	15	23

Source: "Agricultural Credit Indicators 2000", ADBP, Islamabad.

Annex-II

LOANS DISBURSED TO SMALL FARMERS BY ZTBL

(Rs in million)

Years	Small Farmers (Upto 25.0 Acres)	Large Farmers	Total Agricultural Credit	Small Farmers share %age	Large farmers Share %age
FY' 1986	3235	1488	4723	69	31
FY' 1987	3873	1477	5351	72	28
FY' 1988	5004	1951	6955	72	28
FY' 1989	5733	2342	8074	71	29
FY' 1990	5861	2780	8642	68	32
FY' 1991	5106	2630	7736	66	34
FY' 1992	3992	2498	6490	62	38
FY' 1993	3879	4106	7985	49	51
FY' 1994	4772	3930	8702	55	45
FY' 1995	10979	3160	14138	78	22
FY' 1996	8096	2158	10254	79	21
FY' 1997	8746	2908	11655	75	25
FY' 1998	17169	5184	22354	77	23
FY' 1999	23181	6991	30171	77	23
FY' 2000	19602	4822	24424	80	20

Source: "Agricultural Credit Indicators 2000", ADBP, Islamabad.

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RESOURCE ALLOCATION EFFICIENCY IN WHEAT FARMING IN PESHAWAR VALLEY

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"Resource use efficiency in wheat farming on irrigated and rainfed farms in Peshawar valley of North West Frontier Province (NWFP), Pakistan was examined. The farms were found to be operating at decreasing returns to scale on irrigated farms. Rainfed farms are operating at constant returns to scale. The marginal value product of the resources indicated that most of the inputs are either under or over utilized, leading to inefficiency in resource allocation and reduction in yields. This study suggests that farmers should increase the seed rate and use of farm yard manure and decrease the traction hours (except for tubewell irrigated farms), and application of nitrogen and phosphorus nutrients for achieving higher incomes. Farmers are generally efficient in the use of labor and irrigation water".

1. Introduction

Efficient allocation of resources plays a vital role in the running of any agricultural enterprise. The process involves not only the right level of input use but also its application at the right time. However, the changing nature of entrepreneurship required for the present agriculture makes it

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difficult for the farmers to reach this level. For example, the development of new varieties and its adoption at farmers' field demand higher level of inputs along with the changes in the production practices [Huang, (1971)]. In this regard Hooper (1961), claimed that farmers in India were generally efficient in the context of the prevailing technology. However, the availability of multiple technologies like seed of eight wheat varieties in the markets of NWFP for achieving self-sufficiency, makes it difficult particularly for the illiterate farmers of the province to coop-up with the allocation of resources. This research effort is carried out to investigate the present level of resource allocation in wheat farming in Peshawar valley of the province. For this purpose micro level data have been used. As irrigation plays a vital role in the decision making, the phenomena of inputs utilization has been studied on canal and tubewell irrigated and rainfed farms. Similar analysis has been carried-out by previous researchers such as Chaudhry et. al. (1987), who studied the resource efficiency in wheat production on upstream and down stream farms in the Indus basin.

2. Methodology:

2.1 The sampling and model:

The study is based on the primary data collected from 171 farmers of district Peshawar (Table 1). Using proportionate sampling technique, a representative sample of farmers was drawn. The sample included 64 per cent canal irrigated, 23 per cent tubewell irrigated and 13 per cent rainfed farms respectively.

A Cobb-Douglas production function was fitted to the data, in-order to get the production elasticities. The function is widely used due to its ease in application and interpretation [Fuss et al, (1978), Heady and Dillion (1969)]. The estimated model is as under:

$$\ln Y = \ln\beta_0 + \beta_1 \ln TRH + \beta_2 \ln SD + \beta_3 \ln NIT + \beta_4 \ln PHO + \beta_5 \ln IRI + \beta_6 \ln FYM + \beta_7 \ln LAB + e_i \quad \ldots (1)$$

where

ln = Natural Logarithm
Y = Yield per acre
TRH = Tractor Ploughing Hours per acre
SD = Seed in Maunds (50 Kgs) per Acre
NIT = Nitrogen Nutrients in Kgs per Acre
PHO = Phosphorus Nutrients in Kgs per Acre
IRI = Number of Irrigation per Acre
FYM = Farm Yard Manure in Trolleys
LAB = Labor in man days per Acre
e = Disturbance term

$\beta_1 \ldots \beta_6$ are the coefficient of the explanatory variables. The ordinary least square method (OLS) was used to estimate the model. The model was replicated for canal and tubewell irrigated and rainfed farms. Model of the same kind was used by a number of researchers in the past including Chaudhry et al., (1987), Hussain (1998), Thakur et. al., (1990), Azhar and Ghafoor (1988), Sabur and Haque (1992), Patel (1982), Bhatia (1992) for the same purpose. The strength of the model lies in the fact that both the dependent and independent variables are measured in physical units, making this independent of the price variations.

2.2 Estimation of resource efficiency

The ratio of marginal value product (MVP) estimated from equation-1 to the opportunity cost of the input exhibits the level of allocation efficiency (E). If E for input is greater than unity, more of the input should be used and vice versa. However if it is equal to one, then the input will be optimally utilized. Opportunity cost of the input will be taken as the market

price plus interest @ 14 per cent. In-order to estimate MVP of tractor hours for example, we know that

$$MPP_{TRH} = (dY/dTRH * TRH/Y) * (Y/TRH)$$

where

MPP_{TRH} means marginal physical product of tractor hours per acre and

Y stands for yield per acre.

but

$dY/dTRH * TRH/Y = \beta_1$ in model-1, therefore,

$MPP_{TRH} = \beta_1 * (Y/TRH)$

and $MVP_{TRH} = MPP_{TRH} * PY$

where PY = Price per maund of wheat grain

Using this procedure, MVP of all the resources indicated in model-1 is calculated.

3. Results and Discussion

In NWFP, about 2.2 million acres of land is annually used for wheat cultivation which produces approximately 1.3 million tones of wheat. About 40 percent of the wheat area is irrigated and the rest is rainfed. The rainfed area contributes 42.4 percent to the provincial wheat output. However, the average yields of even irrigated farms (table-1) are blow the national average yield (GoP, 98). The phenomenon needs to be addressed to increase the productivity levels at farmers' fields. The differences among the means of

canal and tubewell irrigated farms, canal and rainfed farms and tubewell irrigated and rainfed farms are significant at 1 percent level of significance.

Table 1: Wheat Area and Productivity on the Selected Irrigation Systems

Irrigation source	Number of farms	Average wheat area per farm (acres)	Yield (maunds*/acre)
Canal	109	2.36	20.94**
Tubewell	39	2.05	18.49**
Rainfed	23	2.42	10.52**
All	171	2.30	18.98

* One maund = 50 kgs

** All means differ significantly between irrigation system at 1 per cent α for t-values.

The OLS estimators of the parameters of Cobb-Douglas production function with respect to various irrigation systems and all farms, the sum of coefficients of the input variables and coefficient of multiple determination (R^2) are given in Table-2. The high and significant values of F-statistics and R^2 indicate that the model used, explained the data very well. Furthermore, most of the estimated coefficients are significant with the exception of few for rainfed farms. Tripathi (1993), using the same variable found similar results, however he used bullock labor as against tractor hours used in this research. The signs of seed and FYM and labor on tubewell irrigated farms are unexpectedly negative but insignificant. The appearance of such unexpected signs are common in the published literature and reported by

Hussain and Young (1985), Lau and Yotopolus (1971) and Chaudhry et al. (1987).

Table-2: Regression Results of the Model-1 on Selected Irrigation Sources

Regression Coefficient	All Farms (N = 171)	Canal (N = 109)	Tubewell (N = 39)	Rainfed (N = 23)
Constant	0.797 (18.85)**	0.891 (10.9)***	0.856 (9.07)***	0.685 (3.06)***
Tractor hours	0.030 (1.35)*	0.009 (0.34)	0.164 (2.88)***	0.070 (0.43)
Seed (maunds)	0.189 (2.45)***	0.167 (1.54)**	-0.135 (1.20)	0.378 (0.93)
Nitrogen (kgs)	0.027 (1.57)**	0.010 (0.48)	0.030 (0.54)	0.004 (0.07)
Phosphorus (kgs)	0.021 (2.03)**	0.031 (2.47)***	0.037 (2.42)***	-0.0071 (0.03)
Irrigation (number)	0.425 (15.25)***	0.384 (6.98)***	0.442 (5.36)***	NA
Farm yard manure (trolleys)	0.057 (1.62)**	0.048 (1.09)	-0.069 (1.30)	0.456 (1.90)**
Labor (mandays)	0.176 (4.64)***	0.143 (2.72)***	-0.0026 (0.04)	0.313 (1.60)**
Sum of coefficients	0.926	0.794	0.467	1.224
R^2	0.78	0.56	0.73	0.51
Other statistics	$F_{7,163}$=82.9 DW = 2.01	$F_{7,101}$=18.7 DW = 2.21	$F_{7,31}$=12.0 DW = 1.62	$F_{6,16}$=2.81 DW = 2.20

* Significant at 10 percent
** Significant at 5 percent
*** Significant at 1 percent

The sum of estimated coefficients indicates that all except rainfed farms are subject to decreasing return to scale. The rainfed farms exhibit increasing return to scale which may be mainly due to under utilization of resources. Most of the DW statistics falls in the neutral range of auto-correlation and does not seem to be a problem in the selected models. Tests for heteroskadasticity detection were made and the results are compiled in Annex-I. In this annex all the calculated v^2 values are higher than the tabulated values of 0.00039, 0.675 and 0.989 at 1, 6 and 7 degrees of freedom at 99 percent level of significance, indicating the absence of heteroskadasticity in the estimated models.

4. Efficiency in Resource Allocation

As indicated in methodology section, resource allocation efficiency is measured as the ratio of MVP to opportunity cost of resource. If the ratio is greater (less) than 1, more (less) of the resource should be used. However the level of unity, exhibits the optimum resource utilization level.

The results concerning resource allocation are presented in Annex-II. These results suggest that tractor is over-utilized for ploughing on all the farms, except the tubewell irrigated farms where its MVP is high, implying its under utilization. The level of use of both the fertilizers and irrigation can be decreased for achieving higher level of efficiency. However, on overall basis, the use of irrigation is close to the optimum level. It is interesting to note that FYM is under utilized for wheat crop on all the farms. Thus a comparison of the point estimates of MVP of all inputs with their respective factor costs indicates that these inputs are not used efficiently by the farmers. Only irrigation number for all farms and labor for canal irrigated farms are close to optimum levels. Therefore there is a scope for augmenting yields (profits) through optimal allocation of resources.

5. Conclusions and Recommendations

It is concluded that the farmers of Peshawar valley are not optimally allocating their resources in wheat farming. Therefore, it is recommended that in order to increase their incomes and productivity, they will have to reallocate their resources by increasing the level of seed and farm yard manure and decreasing the application of tractor hours (except for tubewell irrigated farms), nitrogen and phosphorus nutrients. Farmers are generally efficient in the use of labour and irrigation water, hence their present level of application is optimal.

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Annex-I

HETEROSKADASTICITY TESTS V^2 OF THE MODEL USED

Test	All Farms	Canal irrigated farms	Tubewell irrigated farms	Rainfed farms
$e^2 = f(y\hat{})$	13.97 with 1 D.F	6.25 with 1 D.F	0.341 with 1 D.F	2.367 with 1 D.F
$e^2 = f(y\hat{}^2)$	11.69 with 1 D.F	6.22 with 1 D.F	0.402 with 1 D.F	2.500 with 1 D.F
$e^2 = f(\ln y\hat{}^2)$	16.44 with 1 D.F	6.28 with 1 D.F	0.281 with 1 D.F	2.172 with 1 D.F
$e^2 = f(X_i)$ P-B-G Test.	29.46 with 7 D.F	21.96 with 7 D.F	3.585 with 7 D.F	10.919 with 6 D.F
$e = f(X_i)$ Glejser Test	31.12 with 7 D.F	30.37 with 7 D.F	5.320 with 7 D.F	10.009 with 6 D.F

Annex-II

RESOURCE EFFICIENCY OF INPUTS USED IN WHEAT FARMING ON THE SELECTED IRRIGATION SYSTEMS

	Tractor (Hours)	Seed (Maunds)	Nitrogen (Kgs)	Phosphorus (Kgs)	Irrigation (Number)	FYM (Trolleys)	Labor (Person Days)
All farms							
Elasticity of Production	0.03	0.19	0.03	0.02	0.06	0.43	0.18
Mean	6.48	0.92	38.32	12.74	3.11	0.51	14.89
Resource price (Rs)	106.59	539.82	15.36	24.95	126.52	417.79	80.00
Resource opportunity cost (Rs)	114.05	577.61	16.44	26.70	135.38	447.04	85.60
MPP	0.09	3.91	0.01	0.03	0.35	15.94	0.22
MVP	37.20	1656.97	5.66	13.24	147.25	6748.03	94.96
MVP/ Opportunity cost	0.33	2.87	0.34	0.50	1.09	15.10	1.11
Canal Irrigated Farms							
Elasticity of production	0.01	0.17	0.01	0.03	0.05	0.38	0.14
Mean	7.55	0.93	44.65	16.64	3.75	0.57	16.09
Resource price (Rs)	106.85	534.07	15.39	24.50	149.72	422.30	80.00
Resource opportunity cost (Rs)	114.33	571.46	16.47	26.22	160.20	451.86	85.60
MPP	0.03	3.78	0.01	0.04	0.27	14.01	0.19
MVP	10.94	1603.35	2.19	16.54	113.61	5941.19	78.94
MVP/ Opportunity cost	0.10	2.81	0.13	0.63	0.71	13.15	0.92
TW Irrigated Farms							
Elasticity of production	0.16	-0.14	0.03	0.04	-0.07	0.44	-0.26
Mean	5.16	0.87	28.00	9.03	3.15	0.58	14.66
Resource price (Rs)	106.92	541.00	15.30	26.03	99.60	398.21	80.00
Resource opportunity cost (Rs)	114.41	578.87	16.37	27.85	106.57	426.08	85.60
MPP	0.59	-2.90	0.02	0.08	-0.41	14.09	-0.32
MVP	248.63	-1227.10	8.38	32.05	-173.62	5961.47	-137.11
MVP/ Opportunity cost	2.17	-2.12	0.51	1.15	-1.63	13.99	-1.60
Rainfed Farms							
Elasticity of production	0.07	0.38	0.00	0.00	0.00	0.46	0.31
Mean	3.68	0.96	25.85	0.84	0.00	0.06	9.59
Resource price (Rs)	104.50	565.91	15.33	24.95	0.00	525.00	80.00
Resource opportunity cost (Rs)	111.82	605.52	16.40	26.70	0.00	561.75	85.60
MPP	0.20	4.15	0.00	0.05	0.00	82.71	0.34
MVP	82.78	1741.56	0.63	21.49	0.00	34737.77	144.18
MVP/ Opportunity cost	0.74	2.88	0.04	0.80	0.00	61.84	1.68

COST COMPARISON OF WATER SUPPLIED BY ELECTRIC AND DIESEL TUBE WELLS IN IRRIGATED PUNJAB

By
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Mohammad Nauman[***] and Abdul Shakoor[****]

"The agricultural tariff and hence cost of irrigation water from electric tubewells kept on increasing over the years in the past. This trend compelled the growers to shift from electric to diesel tubewells as diesel tubewells had turned out to be much cheaper source of irrigation than those run by electricity. WAPDA took a notice of this shift and in order to reverse this trend, it asked National Electric Power Regulatory Authority (NEPRA) to provisionally announce agricultural tariff reduction effective from July 1, 1999 to give relief to farmers. The impact of this reduction has been studied through a survey and it has been estimated that the cost of irrigation water supplied by an electric tube well per acre per season for the three crops under study declined considerably due to this relief. It was more favourable in short duration crops like rice and wheat and less favourable for long duration crops like sugarcane. For example, per acre cost of irrigation water declined by Rs 971 in case of rice and by Rs 204 for wheat. In case of sugarcane it declined by Rs 1450 but it was still higher than diesel tube wells by Rs 577 on per acre per season basis. However, for all the three crops the decline in the cost of electric water almost ranged between 36 to 40 per cent of cost incurred before July 1, 1999.

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1. Introduction

Pakistan's irrigated agriculture depends on both surface and ground water sources including electric and diesel operated tube wells and artesian wells [Mahmood and Forreest (1990)]. According to Agricultural Statistics of Pakistan, 1999-00, about 16 per cent tube wells are being operated through electricity in the Punjab. Supplementary irrigation through these tube wells play an important role in crop production in the province. Expenditure on tube well irrigation contributes about 5 to 25 per cent to total cost of production depending upon the crops grown. Thus, cost of production and hence economics of various crops is significantly affected by the changes in irrigation water charges and electricity tariffs. The electricity tariff charged for agricultural sector had been increasing over the years in the past. The increasing cost led to shift from electric to diesel tube wells by the farmers and the diesel tube wells turned out to be much cheaper source of irrigation as compared to electric tube wells. In order to attract agricultural customers, WAPDA requested National Electric Power Regulatory Authority (NEPRA) to reduce agricultural tariff. The provisional reduction in agricultural tariff in July 1999 was viewed by authorities as having a positive effect on the use of electricity as a cheaper source of energy than diesel. This study was initiated and aimed at comparing the cost of electric and diesel operated tube wells and also to see whether the tariff reduction already effected is sufficient to check the shift from electric to diesel tubewells.

2. Materials and Methods

The study was conducted in the six districts* of Gujranwala Division of the Punjab during August 1999 to October 1999. WAPDA tariff tables were collected from Gujranwala Electric Power Company (GEPCO) and WAPDA's other field offices. As per requirements of NEPRA purposive

* These are Sialkot, Narowal. Gujrat, Mandi Bahaudin, Gujranwala and Hafizabad.

(quota) sampling procedure was adopted during the survey. A total number of one hundred and fifty respondents were interviewed (25 from each district) from within both electric and diesel operated tube well owners.

The cost of water from both electric and diesel operated tube wells was estimated on the actual usage basis for three main crops, i.e., rice, wheat and sugarcane and its comparison was carried out by taking into account the change in the prices of electricity and diesel before and after July 1, 1999. For this purpose following formulae were used:

- Cost of water from electric tube wells = cost of electricity per hour x time to irrigate one acre x total number of irrigations required for the crop per season.

- Cost of water from diesel operated tube wells = (cost of diesel per hour + cost of lubricants per hour) x time to irrigate one acre x total number of irrigations required for the crop per season.

In addition, to estimate the cost of irrigation water, overall cost of production and the share of irrigation water in it was also estimated.

3. Results

Comparing the cost of irrigation water through electric and diesel tube wells during the period prior to July 1, 1999, table 1 indicates that it was higher by about Rs 392, Rs 137 and Rs 2,027 per acre per season for rice, wheat and sugarcane crops respectively, for electric tube wells than diesel tube wells. However, after the reduction in agricultural tariff on July 1, 1999 the cost of irrigation water for sugarcane crop remained still higher in case of electric tube wells as compared with diesel tube wells, but the difference declined from Rs 2,027 to about Rs 577 per acre per season, a fall of Rs 1,450 per acre per season. In case of wheat and rice crops, use of electric

tube wells became economical as compared to diesel tube wells. Cost of water supplied through electric tube wells became cheaper by Rs 67 per acre per season in case of wheat and Rs 579 in case of rice as compared with diesel tube wells after the reduction in agricultural tariff on July 1, 1999. Previously cost of diesel tube wells was cheaper for these crop by Rs 137 and 392 respectively.

Table-1: Cost of Irrigation by Electric and Diesel Operated Tube Wells Used for Rice, Wheat and Sugarcane Crops in Gujranwala Division

Crop	Cost of irrigation water before July 1999			Cost of irrigation water after July 1999		
	Electric tube wells	Diesel tube wells	Difference of diesel from electric tube wells	Electric tube wells	Diesel tube wells	Difference of diesel from electric tube wells
	---------- Rupees per acre ----------					
Rice	2435	2043	392	1464	2043	-579
Wheat	545	408	137	341	408	-67
Sugarcane	3969	1942	2027	2519	1942	577

After the reduction in agricultural tariff on July 1, 1999, the electricity became cheaper as compared to diesel for agricultural purposes for short duration crops like wheat and rice. For long duration crops like sugarcane, the cost of electric tube wells was still higher than the cost of diesel tube well. However, cost of electric tube wells declined by about 37 per cent for sugarcane crop after July, 1999 than before July, 1999. The main reason for the higher cost of electricity as compared to diesel in annual crop like sugarcane was the fixed cost of electricity that is charged on the basis of per kilowatt hour per month.

Table-2 shows that on electric operated tube wells share of irrigation water in per acre cost of production before July, 1999 was about 48, 14 and

52 per cent for rice, wheat and sugarcane crops respectively. In other words, more than half of the total cost was spent on irrigation water for sugarcane. Similarly, a little less than half of the total cost was spent on water for rice. Share of water for wheat was less. After reduction in tariff on July 1, 1999 the share of water declined for all the three crops. It declined to about 35, 10 and 41 per cent for rice, wheat and sugarcane respectively. The reduction in tariff has lessen the financial burden on farmers to a greater degree.

Table-2: Contribution of Irrigation Water in the Cost of Production of Rice, Wheat and Sugarcane on Electric Operated Tubewells

Crop	Before July 1999			After July 1999		
	Cost of production	Cost of irrigation water	Share of irrigation water in cost of production	Cost of production	Cost of irrigation water	Share of irrigation water in cost of production
	-- Rupees per acre --		Per cent	-- Rupees per acre --		Per cent
Rice	5115	2435	48	4144	1464	35
Wheat	3805	545	14	3602	341	10
Sugarcane	7619	3969	52	6168	2519	41

4. Conclusions

During the past decade the increasing agricultural tariff discouraged farmers in using electric tube wells. Farmers shifted from electric tube wells to diesel tube wells for irrigation purpose. Agricultural tariff was reduced in July 1999. The policy of government in reducing the tariff has positively effected the farmers and cost of water has declined. The farmers will switch back to electric tube wells in due course of time.

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REPLACEMENT OF POPPY CULTIVATION WITH ONION CROP IN DISTRICT DIR: ANALYZING POLICY OPTIONS THROUGH LP MODEL

By
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Anwar F. Chishti**

"A comparison of the revenues and costs of onion and poppy crops, grown in district Dir, revealed that there were large and significant differences between net revenues and costs of these crops. Poppy was found very numerative crop, yielding net revenue 2.10 times higher than that of onion. This edge of high net revenues was due mainly to high market price of poppy and its low cost of production. To fully eradicate poppy, two options were considered and analyzed; the options considered were (i) imposition of tax on cultivation of poppy or (ii) provision of incentives to onion growers. The former option was found economically more feasible as it would not only make poppy cultivation uneconomical, but would also bring money to the government treasury compared to the latter one wherein the government exchequer or taxpayers would have to bear the cost for provision of such incentives".

Introduction

The climatic condition of Dir district is favourable for many crops including onion and poppy. Onion was cultivated on 0.650 thousand hectares with production of 6.715 thousand tons in district Dir during 1998-99 (Government of Pakistan, 1999). The climatic conditions of district Dir also favours the cultivation of poppy, and according to some estimates, one third of the total output of poppy is produced in this district (Mian, 1992). Poppy has become the primary source of income to the farmers in district. During

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1998, average wet poppy yield ranged between 9 and 21 kgs/acre (wet to dry ratio of poppy is 1:0.69) with production 1.5 times higher for irrigated land (Harrod, 1999).

The cultivation of poppy is legally prohibited, and is not acceptable morally. However, the poppy production has been so economical and profitable that its cultivation could not be stopped altogether inspite of the best efforts by the administration. The main purpose of this paper is to compare onion and poppy crops on the basis of their cost of production and revenue estimates and analyze the economic options that help onion crop to replace poppy cultivation.

2. Methodological and Analytical Framework

- Data collection

This research study has been based on primary data collected through a survey of people involved in cultivation of onion and poppy in district Dir. Two growers were randomly selected from each of twenty seven poppy growing villages listed with the Dir District Development Project (DDDP)-a project working for the same purpose in the area.

- Data analysis

The data collected on onion and poppy crops were further used to arrive at the following estimates of costs and revenues, mandays of labour involved and quantity of fertilizers applied on per acre basis.

	Onion	Poppy
Net revenue (Rs per acre)	18,203	38,253
Cost/acre (Rs per acre)	21,353	15,934
Labour (man days per acre)	197	193
Fertilizers applied (kgs per acre)	158	164

The above stated estimates of revenues and costs provide the base to further arrive at the optimal solution using the Linear Programming (LP) model framework (Fredrick and Gerald, 1995) as provided below.

$$\text{Maximize } Z = C\,X$$
$$\text{Subject to } AX \leq B \qquad (1)$$
$$Z = \text{Net revenue from both crops}$$

where C = profit on both crops.
A = technology coefficient.
B = constraints.

More specifically, the following LP model was used.

$$\text{Maximize } Z = 18203\,X_1 + 38253\,X_2$$
Subject to

$$197\,X_1 + 193\,X_2 \leq 393 \quad \text{(Labour Constraint)}$$
$$X_1 + X_2 \leq 2.39 \quad \text{(Land Constraint)}$$
$$158\,X_1 + 164\,X_2 \leq 322 \quad \text{(Fertilizer Constraint)}$$
$$21353\,X_1 + 15934\,X_2 \leq 37287 \quad \text{(Funds Availability Constraint)}$$

$$X_1, X_2 \geq 0 \qquad (2)$$

In the above model, the net revenue estimates from the two crops have been taken as income coefficients in the objective function with X_1 and X_2 as land allocated to onion and poppy cultivation, respectively. Since the average grower allocated 2.39 acres to the two crops, hence, it was assumed that the total land available for the two crops was 2.39 acres. Similarly, number of labour employed and quantity of fertilizer applied for the two crops were considered as maximum available resources of the two inputs. The fourth constraint represents the availability of funds; the actual amounts

of funds spent by growers for raising of the two crops; were assumed as the total funds available with an average growers for these two crops.

3. Empirical Results

The estimation of LP model specified in equation (2) yielded the following results.

$$
\begin{aligned}
X^* &= (X_1, X_2) = (0, 1.96) \\
Z^* &= \text{Rs } 75106.5 \\
S &= (s_1, s_2, s_3, s_4) = (14, 0.43, 0, 6001.95) \\
Y &= (y_1, y_2, y_3, y_4) = (0, 0, 233.25, 0) \qquad (3)
\end{aligned}
$$

Where

X_1 = Area allocated to onion.
X_2 = Area allocated to poppy.
Z^* = Maximized objective function.
S = Slack variables representing the unused quantity of labour s_1, land s_2, quantity of fertilizers s_3, and total expenditure s_4.

As expected, the results suggest that if an area of 1.96 acres is sown to poppy, that will yield optimal net revenue of Rs 75106.50. This optimal allocation will also save 14 man-days of labourers, 0.43 acres of land and Rs 6001.95 from the expenditure made.

The estimation of LP model (equation 2) also provided the results of sensitivity analysis of the objective function coefficients, as follows:

Current Values (Objective Function Coefficients)	Allowable Range (to Stay Optimal) Minimum	Maximum
18203	$-\alpha$	36853.5
38253	18894.3	$+\alpha$ (4)

The above results indicate that onion crop (X_1) will not enter in the optimal solution and poppy (X_2) will remain in the basic solution as far as the values of coefficient of X_1 and X_2 range between - α (18203) and 36,853.50 and 18,894.3 and + α (38253). This further suggests that if the net revenue of poppy drops below the minimum level, its cultivation will drop, and X_1 (onion crop) will enter into the optimal solution. Or alternatively, net revenues of onion will have to be increased beyond its present maximum level of Rs 36,853.50 to achieve the same objectives.

4. Options Tried

- Reducing incentives for poppy

The above analysis suggests that some measures are needed to be adopted to decrease the net revenue of poppy below the minimum level. To do so, net revenue of Rs 18,893/- were tried as the coefficient of X_2 and re-estimated the model originally specified in equation 2. The results of the specified model are provided, as follows.

$X = (X_1, X_2) = (1, 1)$
$Z^* = 37096$ Rs

Current Values (Objective Function Coefficients)	Allowable Range (to Stay Optimal)		
	Minimum	Maximum	
18203	- α	36853.5	
18893	17565.9	18894.3	(5)

The above results indicate that X_1 representing onion crop has entered the basic optimal solution. However, poppy is still in the basic solution, though its area has decreased from 1.96 to 1 acre.

For full eradication of poppy, the sensitivity analysis were further used and several levels of reduced net revenues as coefficient of X_2 were

tried and ultimately reached the conclusion that net revenues less than Rs.13583.40 would fully eradicate the poppy. Hence, the results of final estimation are, as follows.

$X = (X_1, X_2) = (1.75, 0)$
$Z^* = 31786.4$ Rs.

Current Values (of Objective Function Coefficients)	Allowable Range (to Stay Optimal) Minimum	Maximum	
18203	18201.1	$+\alpha$	
13582	$-\alpha$	13583.4	(6)

The results indicate that an area of 1.75 acre sown under onion will fully eradicate poppy, and will yield net revenues of Rs 31,786.40 to the growers. The results further suggest that, to do so, we will have to increase the social cost of cultivation of poppy by Rs 24,671 (Rs 38,253 – Rs 13,582). This objective may be achieved by imposing tax valuing Rs 24,671/- per acre on cultivation of poppy.

- **Enhancing incentives for onion**

Alternatively, a second option to provide some incentives to growers for onion cultivation, was also tried. Original sensitivity analysis results given in equation 4 suggests that if we enhance the value of coefficients of X_1 (representing onion) beyond the maximum level of Rs 36,853.50, this will help onion to enter into the basic optimal solution. A value of Rs 36,854/- was tried as the coefficients of X_1 and got the following results.

$X = (X_1, X_2) = (1, 1)$
$Z^* = 75107$ Rs

Current Values (Objective Function Coefficients)	Allowable Range (to Stay Optimal) Minimum	Maximum	
36854	36853.5	39640.4	
38253	35564.1	38253.5	(7)

As expected, onion has entered the basic optimal solution for cultivation of one acre, reducing the poppy from 1.96 to 1 acre land. The results further suggest that we need to further increase the coefficient value beyond the maximum value of Rs 39,640.40. Some higher values were thus tried and reached the conclusion that a value of Rs 51,263 would fully eradicate the cultivation of poppy crop. The results of the model tried on the basis of this value yielded the following results.

$X = (X_1, X_2) = (1.75, 0)$
$Z^* = 89516.39$ Rs

Current Values (Objective Function Coefficients)	Allowable Range (to Stay Optimal) Minimum	Maximum	
51263	51262.5	$+\alpha$	
38253	$+\alpha$	38253.4	(8)

The above results indicate that poppy cultivation can be eliminated if revenues from onion are enhanced upto a level of Rs 51,263/- per acre; this includes Rs 18,203/- as profit from onion cultivation plus Rs 33,060/- as incentive to the growers. The grower will allocate 1.75 acres to onion with no land to poppy crop and will yield a total benefit of Rs 89,516.39.

5. Conclusion

In the aforementioned paras, two options were tried, namely imposition of tax worth Rs 24,671/- on cultivation of poppy versus provision of incentives worth Rs 33,060/- to the onion growers, on per acre basis. As far as the first option of imposing tax is concerned, that will exert no financial burden on government, and rather, will yield earnings to the government. In contrast, the second option will require huge funds from the treasury on spending on incentives to the growers. The second option, therefore, does not seem feasible for the implementation, especially in the present economic conditions prevailing in the country.

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WHEAT PRODUCTION FORECAST MODEL FOR PAKISTAN

By
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"In this paper five separate models were developed for Pakistan, Punjab, Sindh, NWFP and Balochistan for wheat area forecasting. One yield model was developed for Pakistan. Production was estimated by multiplying area and yield forecasts. The explanatory variables included in the area models are area under wheat lagged by one year and wheat procurement price. The explanatory variables used in the yield model are fertilizer consumption of wheat (kgs/ha) and total water availability at farm gate. The analysis shows that highly significant results for procurement price, lagged wheat area and water availability at farm gate during Rabi season. The model can be used to predict the production estimates well before the crop harvest time within reasonable tolerance limits.

1. Introduction

Agriculture sector is the backbone of the economy of Pakistan and plays a vital role in the economic development of Pakistan. It shares about 24 per cent in the GDP of the country and more than 44 per cent labour force is engaged in this sector.

Agriculture sector mainly depends upon the four major crops grown in Pakistan. One of these crops: cotton, wheat is a major foreign exchange earner. Wheat and rice crops are important to supplement the staple diet to

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the people of Pakistan. Wheat is grown in all the provinces of the country. It is cultivated on more than 8 million hectares and accounts for 36 per cent of the total cropped area. As wheat is the principal staple food, its magnitude and size, particularly during short falls in its production, deeply influences the economy of the country.

Government needs accurate and advance information about the status of wheat crop ahead of harvest and till the availability of final estimates. Therefore, accurate forecasting of wheat area and production may support the policy makers and planners for making policy decision regarding supply and demand of wheat in the country and its import/export. Many economists have accomplished substantial work on forecasting of area and yield of wheat crop. A number of forecasting models for projecting the crop have been formulated earlier. A few of them are by Azhar et al (1973), Malik (1983), Amir & Akhtar (1984) and Noor Muhammad (2001) for wheat crop and Khan and Khan (1988) for rice crop.

The most important criterion in forecasting agricultural production is the theoretical consistency of the model (Gujrati 1978, Granger, 1980). Ahmed et al. (1983) also provided log-run supply and demand estimates for crops. The explanatory variables used for what supply projection in the study were: lagged production, wholesale prices of agricultural commodities, fertilizer prices and overall water availability. The estimates are made for the country as a whole instead for different provinces.

2. Material and Methods

The major statistical tool used for production forecast is the regression analysis. Different explanatory variables were explored before setting down for the ones which could give best results in terms of economic logic and satisfy certain statistical criteria. Because of the complex production system of crop, different models were devised for different production zones (provinces). Production was estimated by multiplying area and yield forecasts. Five equations were estimated for wheat area for

Pakistan and all provinces and one for wheat yield for Pakistan. Time Series data for the period 1975-76 to 2000-2001 were collected from secondary sources. The main purpose of using secondary data was to save time and getting quick information about forecasting. Table 1&2 provide the description of the area and yield models used in this study.

Table-1: Specification of variables for wheat area forecast model

Province/ Pakistan	Dependent variable	Explanatory Variables	
		1	2
Punjab	A_t	A_{t-1}	PRP
Sindh	A_t	A_{t-1}	PRP
NWFP	A_t	A_{t-1}	PRP
Balochistan	A_t	A_{t-1}	PRP
Pakistan	A_t	A_{t-1}	PRP

A_t = Area under wheat ('000' hectares) in the year t.
A_{t-1} = Area under wheat ('000' hectares) in the year t-1.
PRP = Procurement price of wheat (Rs. Per 40 Kgs) in the year t.

The production of wheat depends upon a number of inputs/factors like fertilizer application, water availability, rainfall and temperature during growth and maturity periods and wheat support price. Before fitting the models, it is very important to carefully identify these variables which will be used in the model. For this purpose various explanatory variables were tried. Area and yield of wheat were considered as dependent variables in forecast models. For the selection of model variables, each independent variable was plotted against dependent variable and their behavior was studied. The variables which had linear relationship were kept while others were dropped. The multicollinearity problem in the explanatory variables was studied with the help of correlation matrix. After the statistical exercises and careful consideration of logical relationship of the variables a set of

variables was selected. The explanatory variables included in the wheat area models were area under wheat lagged by one year and wheat procurement price. The explanatory variables used in the yield model were wheat yield, fertilizer consumption for wheat (kgs/ha), total water availability at farm gate during the "Rabi" season. The data for these variables were collected from secondary sources for 26 years since 1975-76.

It is rational to consider procurement price of wheat crop as the major incentive which motivates the farmers to increase area under wheat. Timely announcement of this price by the government enhances the confidence of the farmers for the prospective profit from the crop.

Table-2: Specification of Variables for Wheat Yield Forecast Model

	Dependent Variable	Explanatory Variables	
		1	2
Pakistan	Y_t	FCW_t	WA_t

Y_t = Yield (kilograms per hectare) of wheat in the year $_t$.
FCW_t = Fertilizer consumption on wheat area (kilograms per hectare) in the year $_t$.
WA = Water available at farm gate in the rabi season (MAF) in the year $_t$.

The use of fertilizers for wheat has deep influences on the wheat yield. If the farmers use fertilizers for wheat as advised by the experts, it means they will attain high yield. Therefore, the fertilizer consumption in kgs per hectare for wheat crop has been taken to see the clear impact of fertilizer on wheat crop.

It is evident from the yield gap of barani and irrigated area that irrigation water affects the wheat yield to a great extent. Therefore, we have used the total irrigation water availability at the farm gate during rabi season in the yield forecast model.

Total rainfall during October-February and average maximum temperature during February and March were used as explanatory variables in models, because high temperature and humidity have very good influence on wheat plant and grain ripening. Good rainfall Oct-Feb means good wheat yield particularly in barani areas. Signs of coefficients for rainfall and temperature were not logical and consistent. These variables were dropped from the area and yield models.

After the selection of these variables different sets and sub-sets of these variables were made and applied in main models. Multiple Regression Analysis was used in the model building. Log form of explanatory variables was also used for area model and yield model. Results were not much different to linear form. These models fitted the time series data reasonably well. Five equations were estimated in the model separately for Pakistan, Punjab, Sindh, NWFP and Balochistan for wheat area forecasting. One equation was estimated for yield for Pakistan. Equations for area and yield for Pakistan are given below:

$$\text{Area} = bo + b_1 A_{t-1} + b_2 PRP.$$
$$\text{Yield} = bo + b_1 FCW + b_2 WA.$$

Wherein 'b' are regression coefficients and other variables as defined below:

A_{t-1} = Lagged area under wheat ('000' hectares) in the year t-1.
PRP_t = Procurement price of wheat (Rs. Per 40 Kgs) in the year $_t$.
FCW_t = Fertilizer consumption on wheat area (kilograms per hectare) in the year $_t$.
WA_t = Water available at farm gate in the rabi season (MAF) in the year $_t$.

The regression coefficients of the above equations have been estimated through Ordinary Least Squares (OLS) method. Estimated equations for Pakistan are given below:

$$\text{Area} = 5623.28 + 0.19 A_{t-1} + 4.73 PRP.$$
$$\text{Yield} = 150.97 + 0.84 FCW + 33.82 WA.$$

Two criteria were used to evaluate the forecast performance of each of the above mentioned models. The first criterion used could measure the actual forecast error but for the previous years for which data is available. The second criterion provided measurements of the model fit to the available data at a particular period of time. A brief description of the two criteria is as follows.

2.1 Type–I criterion

The type-1 criterion to measure the forecast is the "Absolute percent deviation of the forecast from the estimate at maturity given by $|(P-A)/A| \times 100$, where P is the predicted or forecasted value for the year t, and A is the actual value for the year t."

2.2 Type-II criterion

This criterion was used to provide a measure of model fit and its performance based on the following:

i) The absence of model assumption violation specifically the heteroscedasticity.

ii) The size of the residual mean square (RMS) from the multiple regression.

iii) The size of coefficient of determination (R^2).

iv) The Durbin-Watson statistic as a test for serial correlation.

v) The size of regression coefficients, their significance and standard errors.

vi) The vector of residuals for the time series used in formulating the wheat area and yield forecast models.

vii) Study of the correlation matrices for the examination of multi-colinearity.

3. Results and Discussion

The results of area and yield forecast models were studied considering their statistical properties and economic logic. The statistical properties are the coefficient of determination (R^2), statistical significance of coefficients, Durban Watson and F- Statistics. For a statistical model it was considered that economic logic prevails which means that the signs of coefficients are logical and consistent.

3.1 Wheat area forecast models

The model for Pakistan shows highly significant results for procurement price and lagged wheat area. The model is satisfactory with statistical properties i.e. high R^2, low value of Durbin Watson Statistic and high F-Statistic.

Wheat area model for the Punjab shows significant results for procurement price and lagged wheat area. The model has high R^2 value and a highly significant F-Statistic. Value of Durbin Watson Statistics lies within the range of tolerance.

Wheat area model for Sindh shows significant results for wheat lagged area at one percent level of significance whereas the coefficient of procurement price is non-significant. The model gives acceptable size of Durbin Watson Statistic and highly significant F-Statistic.

The model for NWFP province indicates significant results for lagged wheat area and procurement price. The model has a low R^2 and high F-Statistics. The size of Durbin Watson Statistic is problematic.

The model for Balochistan indicates highly significant results only for lagged area, whereas the coefficient of procurement price is non-significant. The model has a high R^2 and a highly significant F-Statistic. Durbin Watson Statistic does not create problem of serial correlation for explanatory variables.

Table-3: Results of Wheat Area Forecast Model for Pakistan and Provinces (Linear Form)

Provinces/ Pakistan	Constant	Coefficients		R^2	D.W.	F. Ratio
		A_{t-1}	PRP			
Punjab	4095.25	0.17** (3.87)	3.95** (6.21)	0.83	1.01	55.19**
Sindh	777.92	0.24** (3.41)	0.08 (0.45)	0.42	1.31	8.26**
NWFP	660.17	0.14* (2.32)	0.30* (2.45)	0.46	0.94	9.79**
Balochistan	110.97	0.51** (3.46)	0.24 (1.36)	0.66	2.50	21.80**
Pakistan	5623.34	0.19** (4.04)	4.73** (5.07)	0.80	1.06	43.69**

Note: Figures in parenthesis are "t" values
* Significant at 5 percent level
** Highly significant

3.2 Yield forecast model for Pakistan

The coefficient of water availability at farm gate during Rabi season (WA) is highly significant, but the coefficient of fertilizer consumption for wheat in kgs/ha (FCW) is 0.84 with a low "t" value, although the sign of the coefficient is consistent. A high R^2 as well as a highly significant F-Statistic show that the equation has a good explanatory power. Durbin Watson Statistic falls within the range of around 2, which is not problematic.

Table-4: Wheat Yield Forecast Model for Pakistan (Linear Form)

	Constant	Coefficient		R^2	DW	F.Ratio
		FCW	WA			
Pakistan	150.97	0.84 (0.40)	33.82** (2.96)	0.83	1.89	54.90**

Note: Figures in parenthesis are 't' values
** Highly significant

4. Conclusions

The performance of wheat area forecast model was tested by comparing official estimates with the forecasts for a period of three years from 2000-01 to 2002-03 and is given in Table-5.

Table-5: Performance of Wheat Area Forecast Model

Provinces/ Pakistan	2000-01			2001-02			2002-03		
	Official est.	Fore-cast est.	Differ-ence	Official est.	Fore-cast est.	Differ-ence	Official est.	Forecast est.	Differ-ence
	Million hect.		Percent	Million hect.		Per cent	Million hect.		Per cent
Punjab	6.25	6.29	(+) 0.64	6.10	6.33	(+) 3.77	6.19	6.32	(+) 2.10
Sindh	0.81	1.07	(+)31.10	0.87	1.08	(+)24.14	0.86	1.01	(+)17.44
NWFP	0.79	0.83	(+) 5.06	0.75	0.86	(+) 4.67	0.80	0.85	(+) 6.25
Baloch-Istan	0.32	0.34	(+) 6.25	0.33	0.35	(+) 6.06	0.30	0.35	(+)16.67
Pakistan	8.17	8.53	(+) 4.41	8.05	8.62	(+) 7.08	8.15	8.53	(+) 4.66

Source: For official estimates: Agricultural Statistics of Pakistan, Planning Unit, Ministry of Food, Agriculture and Livestock, Islamabad, 1999-00.

Table-5 shows that forecasted area for 2001-02 was only 3.77 and 24.14 percent higher than the official estimates of Punjab and Sindh respectively. In 2002-03 forecast was 2.10 percent higher for the Punjab province. However, the national wheat area forecast for 2001-02 was 7.08 percent higher than the official estimate. The forecasted wheat area of Pakistan for 2002-03 is 4.66 percent higher than the official target.

The performance of wheat yield forecast model is given in Table-6. When compared with official estimates of 2262 kgs per hectare yield in 2001-02; forecasted yield was only 1.99 percent lower than the official estimate and 6.13 percent lower (2295 kgs/ha) than the official estimate (2445 kgs/ha) of 2002-03.

Table-6: Performance of Wheat Yield Forecast Model

Year	Official estimate	Forecast estimate	Difference
	... Kgs per hectare ...		Per cent
2001-02	2262	2217	(-) 1.99
2002-03	2445	2295	(-) 6.13

Source: Agricultural Statistics of Pakistan, Planning Unit, Ministry of Food, Agriculture and Livestock, Islamabad, 1999-00.

Production of wheat was also forecasted by multiplying forecasted area with the forecasted yield of respected years. The performance was tested by comparing the forecasted production with the official estimates of the corresponding years. Comparing with the official estimate of 18.23 million tonnes for the year 2001-02 the forecasted estimate of 19.11 million tonnes is 4.83% higher (Table-7). While comparing the results of 2002-03, it is noticed that forecasted production is 0.86 % lower than the official estimate of 19.75 million tonnes.

Table-7: Comparison of Official Production Estimates and Forecasts

Year	Official estimate	Forecast estimate	Difference
	... Million tones...		Per cent
2001-02	18.23	19.11	(+) 4.83
2002-03	19.75	19.58	(-) 0.86

Source: Agricultural Statistics of Pakistan, Planning Unit, Ministry of Food, Agriculture and Livestock, Islamabad, 1999-00.

It reveals that the results of forecasted production are satisfactory indicating that the performance of area and yield forecast models is acceptable. This implies that National Wheat Yield Forecast Model is very efficient and can be used to predict future yield with reasonable level of accuracy.

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Appendix-I

COMPARISON BETWEEN OFFICIAL AND PREDICTED ESTIMATES OF WHEAT AREA IN PAKISTAN FROM 1975-76 to 2001-02

Year	Area (000 hectares)		Percent variation
	Official	Predicted	
1975-76	6110	5810	-4.91
1976-77	6390	6965	9.00
1977-78	6360	7018	10.35
1978-79	6687	7053	5.47
1979-80	6924	7161	3.42
1980-81	6984	7206	3.18
1981-82	7223	7217	-0.08
1982-83	7398	7291	-1.45
1983-84	7343	7324	-0.26
1984-85	7258	7342	1.16
1985-86	7403	7373	-0.41
1986-87	7706	7400	-3.97
1987-88	7308	7469	2.20
1988-89	7730	7406	-4.19
1989-90	7844	7538	-3.90
1990-91	7911	7635	-3.49
1991-92	7878	7704	-2.21
1992-93	8300	7726	-6.92
1993-94	8034	7948	-1.07
1994-95	8170	7898	-3.33
1995-96	8376	7985	-4.67
1996-97	8109	8340	2.85
1997-98	8355	8290	-0.78
1998-99	8230	8337	1.30
1999-00	8463	8342	-1.43
2000-01	8180	8536	4.35
2001-02	8410*	8623*	2.53

* Estimated area

Source: Agricultural Statistics of Pakistan (1999-00), Ministry of Food, Agriculture and Livestock, Islamabad.

Appendix-II

COMPARISON BETWEEN OFFICIAL AND PREDICTED ESTIMATES OF WHEAT YIELD IN PAKISTAN FROM 1975-76 TO 2001-02

Year	Yield (kgs/ha)		Percent variation
	Official	Predicted	
1975-76	1420	1321	-6.97
1976-77	1431	1422	-0.63
1977-78	1316	1441	9.50
1978-79	1488	1443	-3.02
1979-80	1568	1488	-5.10
1980-81	1643	1535	-6.57
1981-82	1567	1560	-0.45
1982-83	1678	1610	-4.05
1983-84	1482	1662	12.15
1984-85	1612	1646	2.11
1985-86	1881	1719	-8.61
1986-87	1559	1786	14.56
1987-88	1734	1824	5.19
1988-89	1865	1855	-0.54
1989-90	1825	1896	3.89
1990-91	1841	1926	4.62
1991-92	1991	1958	-1.66
1992-93	1947	2003	2.88
1993-94	1893	2070	9.35
1994-95	2081	2107	1.25
1995-96	2018	2126	5.35
1996-97	2053	2119	3.21
1997-98	2238	1988	-11.17
1998-99	2170	2185	0.69
1999-00	2491	1980	-20.51
2000-01	2325	2183	-6.11
2001-02	2378*	2217*	-6.77

* Estimated area

Source: Agricultural Statistics of Pakistan (1999-00), Ministry of Food, Agriculture and Livestock, Islamabad.

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STATISTICAL APPENDIX

Table-1: Growth Rates of Major Crops in Pakistan 1947-48 Through 2001-02

Period	Parameter	Crops				
		Wheat	Rice	Maize	Sugarcane	Cotton
		---------- Per cent per annum ----------				
1947-48 to 1959-60						
Area		1.53	2.74	2.10	7.61	1.79
Yield		-1.18	-0.19	0.66	-1.53	2.09
Production		0.33	2.54	2.62	6.12	3.86
1959-60 to 1969-70						
Area		2.85	3.22	3.41	4.24	3.39
Yield		3.37	4.44	0.98	3.67	3.23
Production		6.32	7.80	4.42	8.06	6.48
1969-70 to 1979-80						
Area		1.27	3.31	0.43	3.19	0.80
Yield		3.18	0.59	1.79	-0.46	-1.54
Production		4.49	3.92	2.24	2.72	-0.76
1979-80 to 1989-90						
Area		1.06	0.36	1.85	0.24	2.48
Yield		1.52	-0.52	1.01	0.79	6.96
Production		2.60	-0.16	2.88	1.03	9.61
1989-90 to 1999-00						
Area		0.77	1.82	0.41	2.04	1.34
Yield		2.01	3.11	0.82	1.84	-0.88
Production		2.80	4.98	1.25	3.92	0.31
1947-48 to 1999-00						
Area		1.57	2.07	1.90	3.17	1.99
Yield		2.36	1.81	0.88	0.93	2.46
Production		3.98	3.92	2.79	4.10	4.50
1989-90 to 2001-02						
Area		0.36	1.18	1.13	1.54	1.18
Yield		2.12	2.44	2.51	1.15	-1.75
Production		2.59	3.64	3.67	2.69	1.04
1947-48 to 2001-02						
Area		1.52	1.99	1.91	3.05	1.97
Yield		2.36	1.79	1.05	0.89	2.27
Production		3.93	3.81	2.98	3.97	4.46

Note: The above growth rates are trend growth rates and have been calculated through Ordinary Least Squares (OLS) Method.

Table-2: Farm Level Cost of Production of Important Crops*

Crop/ Year	Wheat		Seed Cotton		Rice Paddy			Sugarcane		
					Basmati	IRRI	IRRI			
	Punjab	Sindh	Punjab	Sindh	Punjab		Sindh	Punjab	Sindh	NWFP
	Rupees per 40 kgs									
1982-83	65	54	-	-	93	55	56	-	-	-
1983-84	73	64	166	-	85	56	37	-	-	-
1984-85	70	64	176	107	85	57	37	7.10	7.10	7.10
1985-86	72	66	182	112	88	59	40	7.17	7.17	7.17
1986-87	77	70	170	163	104	68	52	7.73	6.92	7.67
1987-88	77	77	175	167	109	69	53	7.60	7.15	7.86
1988-89	81	80	175	167	114	73	56	8.21	7.60	8.36
1989-90	81	79	185	175	114	73	56	9.14	8.34	9.31
1990-91	93	94	214	211	136	82	67	10.53	9.39	10.90
1991-92	109	108	248	247	165	101	75	12.55	10.86	12.18
1992-93	123	121	278	273	174	106	83	13.23	12.72	13.57
1993-94	133	136	294	288	189	114	88	14.75	13.88	15.23
1994-95	153	155	328	330	213	128	103	16.13	15.81	16.39
1995-96	167	170	364	373	228	139	114	16.94	16.80	17.40
1996-97	204	201	412	425	259	161	130	18.72	18.40	18.79
1997-98	244	241	544	519	297	182	144	22.21	22.22	22.18
1998-99	254	247	581	557	310	189	158	25.11	24.57	24.57
1999-00	269	261	606	582	329	204	167	26.25	25.48	25.58
2000-01	285	264	660	610	353	210	168	27.22	26.39	26.51
2001-02	307	283	734	666	382	227	176	32.40	30.39	32.29
2002-03	322	291	757	685	400	241	184	31.71	31.35	30.29
2003-04	344	313	815	718	439	258	195	34.59	33.33	31.71

Note:

* Covered under support price programme. The above costs are of the average growers of main producing areas.

Source: APCom, Support Price Policies – various issues.

Table-3: Farm Level Cost of Production of Selected Crops*

Crop/ Year	Non-traditional Oilseeds				Potatoes	Gram	Onions	
	Sunflower	Soyabean	Safflower	Canola			Punjab, Sindh & NWFP	Baloch-Istan
	---------- Rupees per 40 kgs ----------							
1982-83	127	111	112	-	38	141	23	23
1983-84	139	116	118	-	-	-	-	-
1984-85	139	118	114	-	41	138	-	-
1985-86	144	121	118	-	44	139	29	29
1986-87	146	121	119	-	43	149	29	29
1987-88	152	126	123	-	41	149	31	31
1988-89	165	133	128	-	47	157	34	34
1989-90	165	133	128	-	49	172	37	37
1990-91	186	164	140	-	49	173	43	43
1991-92	203	183	165	-	58	176	50	42
1992-93	218	195	175	-	61	192	55	48
1993-94	238	209	-	-	68	225	61	52
1994-95	282	247	204	-	73	263	67	59
1995-96	318	282	241	-	79	298	72	64
1996-97	377	336	280	371	98	313	82	73
1997-98	412	372	308	397	123	347	91	84
1998-99	434	388	328	421	125	323	102	93
1999-00	448	412	337	455	123	376	108	106
2000-01**	461	411	342	461	124	436	106	125

Notes:

* Covered under support price programme. The above costs are of the average growers of main producing areas.

** After 2000-01, above mentioned crops have been excluded from the support price programme.

Source: APCom, Support Price Policies – Various issues.

Table-4: Nominal and Real Support Prices* of Food Crops 1980-81 to 2003-04

Year	Wheat		Rice Paddy			
			Basmati		IRRI (FAQ)	
	Nominal	Real	Nominal	Real	Nominal	Real
1	2	3	4	5	6	7
	---------- Rupees per 40 kgs ----------					
1980-81	58	116	75	150	39	77
1981-82	58	104	85	153	45	81
1982-83	64	110	88	151	49	84
1983-84	64	102	90	144	51	82
1984-85	70	106	90	136	51	77
1985-86	80	116	93	135	53	77
1986-87	80	112	102	143	53	74
1987-88	83	109	130	171	55	72
1988-89	85	102	125	149	60	72
1989-90	96	108	144	162	66	74
1990-91	**112**	**112**	**144**	**144**	**73**	**73**
1991-92	124	112	155	140	78	71
1992-93	130	107	175	144	85	70
1993-94	160	118	185	137	90	67
1994-95	160	105	211	137	103	67
1995-96	173	102	222	131	112	66
1996-97	240	127	255	135	129	68
1997-98	240	118	310	152	153	75
1998-99	240	111	330	153	175	81
1999-00	300	134	350	157	185	83
2000-01	300	129	385	165	205	88
2001-02	300	124	385	159	205	85
2002-03	300	120	**	**	**	**

Notes:

* Deflated by CPI and expressed in 1990-91 rupees.

** Support price for 2002-03 crop year was not fixed by the Government.

Source: APCom, Support Price Policies – Various issues.

Table-5: Nominal and Real Support Prices* of Cash Crops: 1980-81 to 2002-03

Year	Seed Cotton		Sugarcane			
	MNH-93		Punjab		Sindh	
	Nominal	Real	Nominal	Real	Nominal	Real
1	2	3	4	5	6	7
	---------- Rupees per 40 kgs ----------					
1980-81	182	363	9.65	19.26	9.81	19.58
1981-82	192	345	9.65	17.35	9.81	17.62
1982-83	197	338	9.65	16.56	9.81	16.84
1983-84	200	320	9.65	15.44	9.81	15.70
1984-85	203	307	9.65	14.61	9.81	14.85
1985-86	207	300	9.65	14.00	9.81	14.23
1986-87	207	290	11.79	16.51	11.95	16.74
1987-88	207	273	11.79	15.53	11.95	15.74
1988-89	210	251	12.59	15.04	12.86	15.36
1989-90	225	253	13.75	15.49	14.00	15.77
1990-91	**245**	**245**	**15.25**	**15.25**	**15.75**	**15.75**
1991-92	280	253	16.75	15.15	17.00	15.37
1992-93	300	247	17.50	14.41	17.75	14.62
1993-94	315	233	18.00	13.32	18.25	13.50
1994-95	400	262	20.50	13.42	20.75	13.59
1995-96	400	236	21.50	12.71	21.75	12.85
1996-97	500	264	24.00	12.69	24.50	12.95
1997-98	500	245	35.00	17.16	36.00	17.65
1998-99	-	-	35.00	16.23	36.00	16.69
1999-00	-	-	35.00	15.67	36.00	16.12
2000-01	725	311	35.00	15.01	36.00	15.43
2001-02	780	323	40.00	16.56	43.00	17.81
2002-03	800**	321	40.00	15.95	43.00	17.15

Notes: For cotton from 2000-01 to 2002-03 the nominal and real prices of seed cotton are the prices of group of most commonly grown varieties like NIAB-78, NIAB-Krishma, CIM-240, NIAB-86, FH-87, CRIS-9, CIM-109,Gohar-87, F-682 and MNH-147 etc. instead of MNH-93.

* Deflated by CPI and expressed in 1990-91 rupees.

** At the start of picking season, Rs 825 per 40 kgs was fixed as a result of mutual understanding between the growers, spinners and the Government. But it could not be implemented.

Source: APCom, Support Price Policies – Various issues.

Table-6: Nominal and Real Support Prices* of Non-traditional Oilseeds 1980-81 to 1999-00

Year	Sunflower		Soybean		Safflower		Canola	
	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real
1	2	3	4	5	6	7	8	9
	---------- Rupees per 40 kgs ----------							
1980-81	118	235	107	214	96	193	-	-
1981-82	133	239	117	210	122	219	-	-
1982-83	140	240	122	209	120	206	-	-
1983-84	150	240	140	224	125	200	-	-
1984-85	170	257	160	242	140	212	-	-
1985-86	170	247	160	232	140	203	-	-
1986-87	170	238	160	224	140	196	-	-
1987-88	170	224	160	211	140	184	-	-
1988-89	177	211	165	197	143	171	-	-
1989-90	205	231	185	208	165	186	-	-
1990-91	225	225	200	200	180	180	-	-
1991-92	250	226	230	208	220	199	-	-
1992-93	280	231	250	206	220	181	-	-
1993-94	315	233	275	203	270	200	-	-
1994-95	315	206	275	180	270	177	-	-
1995-96	315	186	275	163	270	160	-	-
1996-97	450	238	345	182	300	159	450	238
1997-98	450	221	345	169	300	147	450	221
1998-99	500	232	410	190	350	162	500	232
1999-00**	500	224	410	184	350	157	-	-

Notes:

* Deflated by CPI and expressed in 1990-91 rupees.

** After 1999-00, above mentioned crops have been excluded from the support price programme.

(-) Not fixed.

Source: APCom, Support Price Policies – Various issues.

Table-7: Nominal and Real Support Prices* of Kitchen Crops: 1980-81 to 1999-00

Year	Potatoes		Gram		Onions	
	Nominal	Real	Nominal	Real	Nominal	Real
1	2	3	4	5	6	7
	---------- Rupees per 40 kgs ----------					
1980-81	27	53	-	-	19	39
1981-82	27	48	-	-	19	35
1982-83	41	70	-	-	25	43
1983-84	41	65	153	245	30	48
1984-85	42	64	153	232	30	45
1985-86	42	61	153	222	33	47
1986-87	45	62	161	225	35	48
1987-88	45	59	161	211	37	48
1988-89	50	60	180	215	40	48
1989-90	55	62	200	225	42	47
1990-91	55	55	210	210	52	52
1991-92	65	59	230	208	60	54
1992-93	67	55	235	193	65	54
1993-94	77	57	275	203	78	58
1994-95	84	55	315	206	78	51
1995-96	84	50	330	195	85	50
1996-97	115	61	400	211	100	53
1997-98	145	71	425	208	125	61
1998-99	145	67	425	197	140	65
1999-00**	145	62	450	192	-	-

Notes:

* Deflated by CPI and expressed in 1990-91 rupees.

** After 1999-00, above mentioned crops have been excluded from the support price programme.

(-) Not fixed.

Source: APCom, Support Price Policies – Various issues.

Table-8: International Prices of Major Agricultural Commodities: 1980-81 to 2002-03

Year	Cotton (cif North Europe)		Wheat	Rice	Sugar		Edible oils		
	Sindh/ Punjab Afzal 1-1/32"	Index-B Cottons	(Fob, pacific) US Western white	100% second grade (fob, Bangkok)	Raw sugar ISA price (fob & stowed caribbean) port in bulk	White sugar (fob & stowed London)	Soybean oil (fob Decature)	Palm oil (fob Malay-sia)	Sun-flower (fob NW Europ-ean ports)
	-- US cents/lb.--		---------- US $ per tonne ----------						
1980-81	-	-	N.A	N.A	-	-	519	588	N.A.
1981-82	64.96	63.96	N.A	N.A	203	284	464	571	N.A.
1982-83	65.95	67.25	165	272	174	243	405	445	N.A.
1983-84	74.13	79.68	145	267	139	190	520	502	N.A.
1984-85	54.00	57.55	140	217	139	146	681	742	N.A.
1985-86	36.13	39.25	134	188	133	185	572	498	N.A.
1986-87	59.84	59.59	108	186	139	187	343	283	N.A.
1987-88	63.94	64.97	119	220	206	246	349	344	N.A.
1988-89	61.42	63.50	168	284	263	351	519	443	476
1989-90	76.51	77.27	158	296	301	402	417	328	482
1990-91	76.32	77.22	117	292	203	303	458	317	480
1991-92	56.67	57.06	154	290	202	280	417	365	459
1992-93	53.99	53.25	150	253	211	274	471	379	492
1993-94	61.45	69.39	133	297	248	323	596	448	627
1994-95	75.89	75.44	163	282	302	397	605	647	691
1995-96	80.95	80.48	200	365	270	384	550	523	617
1996-97	76.23	75.27	163	342	245	319	504	525	545
1997-98	72.23	68.00	139	308	218	272	571	605	726
1998-99	51.28	68.00	115	290	174	233	439	487	560
1999-00	47.46	49.28	112	235	146	216	349	331	410
2001-02	56.78	53.70	113	185	206	250	N.A	N.A	N.A
2002-03	38.41	38.95	132	189	151	232	N.A	N.A	N.A

Note:

N.A Not available

Sources:

- For wheat: International Grain council – Various reports.
- For cotton: Cotton Outlook – Various issues.
- For rice: Food Outlook – Various issues.
- For sugar: International Sugar Organization (ISO), London – Various reports.
- For edible oils: Oil world – Various issues.

Table-9: Average Export Prices (fob Karachi) of Agricultural Commodities: 1980-81 to 2002-03

Year	Export prices (fob Karachi)					
	Cotton	Rice		Sugar	Onions	Potatoes
		Basmati	IRRI			
	Rs/bale*	---------- Rupees per tonne ----------				
1980-81	2,719	7,029	3,168	-	1,580	1,820
1981-82	2,158	7,599	3,061	2,887	1,830	1,800
1982-83	2,599	8,005	2,668	2,619	1,220	1,940
1983-84	3,067	8,090	2,697	3,341	1,240	1,850
1984-85	2,824	9,394	3,030	-	1,460	2,270
1985-86	2,206	10,813	2,582	-	1,290	1,640
1986-87	2,036	12,369	2,577	-	1,140	1,500
1987-88	3,643	12,672	3,520	-	1,260	1,800
1988-89	3,648	13,259	4,420	5,820	2,260	2,140
1989-90	5,512	14,583	3,860	9,699	1,850	1,380
1990-91	5,765	10,494	3,881	-	3,460	2,400
1991-92	4,834	10,261	4,825	-	2,080	1,980
1992-93	4,527	11,189	5,364	-	2,190	2,140
1993-94	5,409	12,427	5,166	9,912	4,170	2,580
1994-95	10,550	12,526	5,961	11,936	3,900	2,540
1995-96	9,525	13,830	7,923	12,015	3,840	1,770
1996-97	10,053	17,469	7,847	-	4,250	3,820
1997-98	10,514	19,827	8,676	13,757	5,930	5,420
1998-99	11,316	24,050	10,450	12,739	17,710	6,960
1999-00	7,707	26,390	9,587	16,524	7,995	5,290
2000-01	10,158	27,527	9,496	-	7,789	6,655
2001-02	7,305	28,830	10,273	6,605	6,234	6,654
2002-03	8,824	29,408	10,293	1,305	5,580	-

Notes:

* Per bale of 170 kgs.

(-) Not exported.

Source: Federal Bureau of Statistics, Karachi.

Table-10: Average Import Prices (cif Karachi) of Agricultural Commodities: 1980-81 to 2002-03

Year	Import Prices (cif Karachi)							
	Wheat	Gram	Sugar	Onions	Potatoes	Edible oils		
						Soyabean	Palm	Sun-flower
	---------- Rupees per tonne ----------							
1980-81	2,076	-	6,704	8,760	1,710	5,770	5,450	-
1981-82	2,224	-	5,873	5,530	1,640	5,450	5,370	-
1982-83	2,204	-	4,248	5,280	5,420	5,760	2,270	-
1983-84	2,952	-	4,265	3,900	2,170	8,620	5,270	-
1984-85	2,807	-	-	-	-	12,470	8,640	-
1985-86	2,472	-	3,601	-	-	9,830	9,480	-
1986-87	3,132	-	3,686	-	-	6,830	6,490	-
1987-88	3,079	-	3,815	-	1,220	8,060	4,910	-
1988-89	3,229	-	4,708	-	-	11,560	6,960	-
1989-90	4,197	10,580	9,102	-	-	10,410	6,890	-
1990-91	3,208	8,360	8,269	3,730	1,070	13,733	8,340	-
1991-92	4,205	11,960	7,832	-	4,410	12,599	9,098	-
1992-93	4,212	8,730	7,357	2,560	3,900	11,494	11,296	18,234
1993-94	3,804	8,870	9,335	1,100	1,110	15,848	12,549	19,816
1994-95	4,874	12,450	13,228	2,070	1,030	21,394	22,214	22,683
1995-96	7,718	13,430	15,606	1,170	2,900	24,599	25,170	23,100
1996-97	7,570	10,860	14,480	2,360	2,560	23,489	22,420	24,400
1997-98	7,413	11,370	15,189	5,990	2,620	33,964	28,244	32,793
1998-99	5,886	17,420	15,122	3,800	1,570	30,881	30,488	36,378
1999-00	7,316	16,700	15,850	3,178	1,822	43,360	19,850	N.A
2000-01	-	19,370	15,557	-	1,162	36,320	16,240	N.A
2001-02	-	19,790	17,185	-	1,258	36,980	19,990	N.A
2002-03	-	18,290	18,158	-	-	36,730	25,300	N.A

Notes:

(-) Not imported during the period
N.A Not available.

Sources:

- Ministry of Finance - Economic Survey – Various issues.
- Federal Bureau of Statistics, Karachi.

Table-11: Import Parity Prices of Agricultural Commodities 1980-81 to 2002-03

Years	Wheat based on fob (Pacific) price of US western white wheat		Sugarcane based on fob (London) price of white sugar		Onions	Potatoes	Edible oils		
					Based on actual import prices		Soyabean	Sunfl-ower	Canola
	If consumed at Karachi	If consumed at Lahore	Punjab & NWFP	Sindh			Based on their respective quoted price		
	Rupees per 40 kgs								
1980-81	-	-	-	-	-	-	-	-	-
1981-82	-	-	-	-	-	-	-	-	-
1982-83	-	-	-	-	-	-	-	-	-
1983-84	-	-	-	-	-	-	-	-	-
1984-85	-	-	-	-	-	-	-	-	-
1985-86	-	-	-	-	-	-	-	-	-
1986-87	-	-	7	7	-	-	-	-	-
1987-88	-	-	-	-	-	-	-	-	-
1988-89	-	-	19	19	-	-	-	-	-
1989-90	171	-	20	20	-	-	-	-	-
1990-91	-	-	19	19	-	70	-	-	-
1991-92	170	200	20	20	-	223	129	178	-
1992-93	190	240	24	25	-	-	138	207	-
1993-94	175	227	-	-	-	-	163	296	-
1994-95	236	293	-	-	-	-	342	391	-
1995-96	323	397	46	47	-	280	422	368	391
1996-97	280	368	-	-	115	256	430	368	417
1997-98	265	357	-	-	151	-	476	547	536
1998-99	280	357	-	-	-	-	379	420	427
1999-00	281	366	-	-	-		357	325	330
2000-01	320	404	45.16	46.22	-	-	-	-	-
2001-02	365	449	43.44	44.46	-	-	-	-	-
2002-03	403	453	39.13	40.05	-	-	-	-	-

Note:

- Not calculated during the period.

** After 2000-01, above mentioned crops have been excluded from the support price programme.

Source: Support Price Policies – Various crops and issues, APCom, Islamabad.

Table-12: Export Parity Prices of Agricultural Commodities: 1980-81 to 2002-03

Years	Seed cotton based on Afzal 1-1/32" cif (North Europe) price	Rice (paddy) based on actual export prices		Sugarcane based on fob (London) price of white sugar		Onions*	Potatoes*
		Basmati	IRRI	Punjab & NWFP	Sindh	Based on actual exports prices	
	---------- Rupees per 40 kgs' ----------						
1980-81	-	-	-	-	-	-	-
1981-82	-	-	-	-	-	-	-
1982-83	-	-	-	-	-	-	-
1983-84	-	-	-	-	-	-	-
1984-85	-	-	-	-	-	-	-
1985-86	-	169	30	-	-	39	-
1986-87	191	229	46	-	-	-	-
1987-88	352	229	46	-	-	-	-
1988-89	279	228	66	-	-	20	9
1989-90	426	237	94	-	-	164	87
1990-91	477	134	40	-	-	49	39
1991-92	-	155	84	-	-	52	112
1992-93	391	167	82	-	-	33	136
1993-94	539	201	70	19	19	169	121
1994-95	711	162	74	27	26	127	79
1995-96	851	168	110	-	-	117	87
1996-97	903	244	129	33**	34**	125	105
1997-98	844	359	155	34**	34**	190	118
1998-99	514	421	189	22	22	530	223
1999-00	514	489	165	22	23	193	142
2000-01	936	509	170	26.90	27.53	-	-
2001-02	660	486	161	25.36	25.96	-	-
2002-03	807	494	168	26.05	26.66	-	-

Note:

* After 2000-01, this crop has been excluded from the support price programme.

** Based on previous three years average prices.

Source: Support Price Policies - Various issues, APCom, Islamabad.

Table-13: Support and Market Prices of Wheat and Quantities Procured: 1980-81 To 2002-03

Year	Support price	Market price *	Difference between market and support prices	Procurement by government agency	Government agency
	Rs per 40 kgs		Per cent	Million tonnes	
1980-81	58	60	3	3.99	PASSCO and Provincial Food Departments
1981-82	58	62	6	3.13	
1982-83	64	67	4	3.82	
1983-84	64	71	10	2.28	
1984-85	70	77	9	2.53	
1985-86	80	82	2	5.04	
1986-87	80	80	-	3.98	
1987-88	83	85	3	3.49	
1988-89	85	93	8.60	4.13	
1989-90	96	102	5.88	4.41	
1990-91	112	121	7.44	3.16	
1991-92	124	134	7.46	3.25	
1992-93	130	139	6.47	4.12	
1993-94	160	170	5.88	3.64	
1994-95	160	176	9.09	3.74	
1995-96	173	185	6.49	3.45	
1996-97	240	273	12.09	2.72	
1997-98	240	259	7.34	3.98	
1998-99	240	261	8.05	4.07	
1999-00	300	297	-1	8.55	
2000-01	300	275	-25	4.00	
2001-02	300	292	-8	4.04	
2002-03	300	305	5	3.51	

Note: * Average market price of Multan, Okara and Hyderabad during post harvest period: April – July.

Sources:

- MINFAL, Islamabad.
- ALMA, Karachi.
- Directorate of Agriculture (E&M), Punjab, Lahore.
- PASSCO, Lahore.
- Provincial Food Departments.

Table-14: Support and Market Prices of Basmati (Paddy) and Quantities Procured: 1980-81 to 2002-03

Year	Support price*	Market price **	Difference between market and support prices	Procurement by government agency	Government agency
	Rs per 40 kgs		Per cent	000 tonnes	
1980-81	75	N.A	N.A	-	
1981-82	85	N.A	N.A	-	
1982-83	88	90	2	-	
1983-84	90	92	2	-	
1984-85	90	92	2	-	
1985-86	93	114	23	-	
1986-87	102	113	11	-	
1987-88	130	141	8	-	
1988-89	135	135	-	-	
1989-90	143	136	-5	21.52	
1990-91	143	143	-	18.06	
1991-92	155	158	2	5.70	
1992-93	175	190	9	5.57	
1993-94	185	194	5	78.00	PASSCO
1994-95	211	192	-9	21.00	
1995-96	222	231	4	0.12	
1996-97	255	296	16	0.01	
1997-98	310	297	-4	Nil	
1998-99	330	362	10	Nil	
1999-00	350	358	2	Nil	
2000-01	385	302	-83	4.00	
2001-02	385	361	-29	Nil	
2002-03	-	471	-	-	

Notes:

* Support price of Basmati-385

** Average prices of Rice paddy (Basmati) in the main producing area markets of the Punjab during post-harvest period: November to January.

\- Support price not fixed

N.A Not available

Sources:

- MINFAL, Islamabad
- Directorate of Agriculture (E&M), Punjab, Lahore
- PASSCO, Lahore.

Table-15: Support and Market Prices of IRRI (Paddy) and Quantities Procured: 1980-81 to 2002-03

Year	Support price*	Market price**	Difference between market and support prices	Procurement by government agency	Government agency
	Rs per 40 kgs		Per cent	000 tonnes	
1980-81	39	N.A	N.A	N.A	PASSCO
1981-82	45	N.A	N.A	N.A	
1982-83	49	N.A	N.A	0.25	
1983-84	51	N.A	N.A	Nil	
1984-85	51	N.A	N.A	Nil	
1985-86	53	59	11	Nil	
1986-87	53	53	-	Nil	
1987-88	55	70	27	2.00	
1988-89	60	73	22	Nil	
1989-90	66	69	4	3.89	
1990-91	73	78	7	17.00	
1991-92	78	98	26	Nil	
1992-93	85	112	32	2.93	
1993-94	90	98	9	Nil	
1994-95	103	137	33	Nil	
1995-96	112	181	62	Nil	
1996-97	129	164	27	Nil	
1997-98	153	205	34	Nil	
1998-99	175	234	34	Nil	
1999-00	185	206	11	Nil	
2000-01	205	179	-26		
2001-02	205	205	-	Nil	
2002-03	-	221	-	Nil	

Notes:

* Support price of IRRI-6 (FAQ)

** Average market prices of rice paddy (IRRI-6) in the main producing areas of Sindh during post-harvest period: October-December

N.A Not available

\- Support price not fixed

Sources:

- MINFAL, Islamabad.
- ALMA, Karachi.
- Bureau of Supply and Prices, Government of Sindh, Karachi.
- PASSCO, Lahore.

Table-16: Support and Market Prices of Basmati (Rice Cleaned) and Quantities Procured: 1980-81 to 1999-2000

Crop year	Support price*	Market price**	Difference between market & support price	Procurement by government agency	Government agency	Remarks
	Rs per 40 kgs		Per cent	000 tonnes		
1980-81	137	188	37	320	RECP	-
1981-82	150	213	42	388	RECP	-
1982-83	154	208	35	337	RECP	-
1983-84	160	206	29	265	RECP	-
1984-85	160	200	25	265	RECP	-
1985-86	166	227	37	226	RECP	-
1986-87	230	221	-4	236	RECP	-
1987-88	250	272	9	220	RECP	-
1988-89	258	271	5	500	RECP	-
1989-90	276	271	-2	541	RECP	-
1990-91	276	326	18	143	RECP	-
1991-92	300	321	7	122	RECP	-
1992-93	330	470	42	500	RECP	-
1993-94	350	500	43	145	RECP	-
1994-95	378	396	5	284	RECP	-
1995-96	408	442	8	51	RECP	-
1996-97	449	559	25	-	-	-
1997-98	449	563	25	-	-	-
1998-99	-	767	-	-	-	No support price was fixed
1999-00	-	729	-	-	-	

Notes:

* From 1980-81 to 1989-90: The prices of Basmati-370 are taken for FAQ and since 1990-91 onward these are in case of Basmati-385 for 10% brokens.

** Market prices are the average wholesale prices during post harvest period i.e. November to January in Gujranwala market.

\- After 1999-2000, support price of rice cleaned have been excluded from the support price programme.

Sources:

- ALMA, Karachi.
- Directorate of Agriculture (E&M), Punjab, Lahore.
- Economic Survey, 1998-99, Finance Division, Economic Adviser's Wing, Government of Pakistan, Islamabad.
- Rice Export Corporation of Pakistan (RECP), Karachi.

Table-17: Support and Market Prices of IRRI-6 (Rice Cleaned) and Quantities Procured: 1980-81 to 1999-2000

Crop year	Support price*	Market price**	Difference between market & support price	Procurement by government agency	Government agency	Remarks
	Rs per 40 kgs		Per cent	000 tonnes		
1980-81	63	70	11	702	RECP	-
1981-82	73	82	13	706	RECP	-
1982-83	80	78	-2	890	RECP	-
1983-84	83	98	18	883	RECP	-
1984-85	83	120	47	959	RECP	-
1985-86	87	108	25	986	RECP	-
1986-87	87	95	10	1049	RECP	-
1987-88	89	95	7	614	RECP	-
1988-89	100	114	14	579	RECP	-
1989-90	113	120	6	793	RECP	-
1990-91	127	130	2	674	RECP	-
1991-92	140	159	14	370	RECP	-
1992-93	150	192	28	454	RECP	-
1993-94	157	197	25	681	RECP	-
1994-95	170	200	18	-	RECP	-
1995-96	183	251	37	155	RECP	-
1996-97	210	360	71	-	-	-
1997-98	252	323	28	-	-	-
1998-99	-	403	-	-	-	No support price was fixed
1999-00 ***	-	330	-	-	-	

Notes:

* For FAQ.

** Market prices are the average wholesale prices during post harvest period i.e. October to January in Sukkur market.

*** After 1999-2000, support price of rice cleaned have been excluded from the support price programme.

Sources:

- Economic Survey, 1998-99, Finance Division, Economic Adviser's Wing, Government of Pakistan, Islamabad.
- Agricultural Statistics of Pakistan, 1998-99: MINFAL, Islamabad.
- Rice Export Corporation of Pakistan (RECP), Karachi.

Table-18: Support and Market Prices of Seed Cotton: 1980-81 to 2002-03

Year	Support price[a]	Market price[b]	Difference between market and support prices
	Rs per 40 kgs		Per cent
1980-81	182	174	-5
1981-82	192	193	1
1982-83	197	188	-5
1983-84	200	336	40
1984-85	203	182	-12
1985-86	207	196	- 6
1986-87	207	211	2
1987-88	207	234	12
1988-89	210	238	12
1989-90	225	279	19
1990-91	260	334	22
1991-92	290	337	14
1992-93	310	382	19
1993-94	325	475	32
1994-95	423	794	47
1995-96	423	739	27
1996-97	540	840	26
1997-98	540	808	23
1998-99	-	876	-
1999-00	825(c)	580	-
2000-01	725	941	30
2001-02	780	783	0.4
2002-03	800	842	5

Notes:

(a) Support price of Sarmast, Qalandri, CIM-70, Deltapine, MS-84, K-68/69, MNH-93, MNH-129, K-68/69, MNH-93, MNH-129.

(b) Average market prices of seed cotton (phutti) in the main producing areas of the Punjab and Sindh.

(c) No agency procures seed cotton.

Sources:

- MINFAL, Islamabad.
- Pakistan Central Cotton Committee (PCCC), Karachi.
- ALMA, Karachi.
- Directorate of Agriculture (E&M), Punjab, Lahore.

Table-19: Support and Annual Average Spot Prices of Cotton (Lint) at Karachi and Quantities Procured: 1980-81 to 2002-03

Crop Year	Support price*	Market price**	Difference between market & support price	Procurement by government agency	Government agency	Remarks
	Rs per 40 kgs		Per cent	Tonnes		
1980-81	476	482	1	1,881	CEC	-
1981-82	473	453	-4	1,698	CEC	-
1982-83	473	496	5	1,793	CEC	-
1983-84	496	824	66	269	CEC	-
1984-85	500	549	10	3,245	CEC	-
1985-86	500	509	2	4,371	CEC	-
1986-87	500	538	8	3,616	CEC	-
1987-88	504	610	21	3,693	CEC	-
1988-89	507	617	22	1,660	CEC	-
1989-90	539	732	36	610	CEC	-
1990-91	645	840	30	1,002	CEC	-
1991-92	715	883	23	2,851	CEC	-
1992-93	770	982	28	36	CEC	-
1993-94	801	1,232	54	159	CEC	-
1994-95	986	2,060	109	-	-	-
1995-96	986	1,962	99	-	-	-
1996-97	-	2,575	-	-	-	No support price was fixed
1997-98	-	2,525	-	-	-	
1998-99	-	2,722	-	-	-	
1999-00	-	2,051	-	89,845	TCP	
2000-01	-	2,961	-	1,802	TCP	
2001-02	-	2,289	-	43,813	TCP	
2002-03	-	2,577	-	-	-	

Notes:

* B-557 and NIAB-78 group

** From 1980-81 to 1989-90, the prices of B-557 are taken and since 1990-91 to 1999-00 are in case of NIAB-78 from 2000-01 to 2002-03 the nominal and real prices of seed cotton are the prices of gra..... of most commenly grown varieties like NIAB-78, NIAB-Krishma, CIM-240, NIAB-86, FH-87, CRIS-9, CIM-109,Gohar-87, F-682 and MNH-147 etc. instead of MNH-93.

Sources:

- Economic Survey, 2002-03, Finance Division, Economic Advisor's Wing, Government of Pakistan, Islamabad.
- Pakistan Central Cotton Committee, Karachi.
- Cotton Export Corporation (CEC), Karachi.

Table-20: Support and Market Prices of Gram and Quantities Procured: 1980-81 to 1999-00

Year	Support price	Market price*	Difference between market and support prices	Procurement by Government agencies	Government agency
	Rs per 40 kgs		Per cent	000 tonnes	
1980-81	-	186	-	-	-
1981-82	-	249	-	18.00	PASSCO
1982-83	-	189	-	-	-
1983-84	153	149	-3	-	-
1984-85	153	169	9	-	-
1985-86	153	151	-6	-	-
1986-87	161	131	-22	7.00	PASSCO
1987-88	161	242	26	-	-
1988-89	180	245	18	-	-
1989-90	200	182	-10	-	-
1990-91	210	177	-19	8.07	PASSCO
1991-92	230	267	14	-	-
1992-93	235	338	30	-	-
1993-94	275	479	43	-	-
1994-95	315	632	50		-
1995-96	330	332	1	-	-
1996-97	400	423	5	-	-
1997-98	425	401	-6	-	-
1998-99	425	628	32	-	-
1999-00	-	760	-	-	-
1999-00	425	670	44	-	-

Note:

- Since 1999-00 no support prices have been fixed.
- For 1980-81 to 1999-00 average market prices of Mianwali, Bhakar, Sargodha & Jacobabad during post harvest season: April to June. For 2000-01 and 2001-02 Average market prices of Mianwali, Sargodha and Sukkur. For 2002-03 average price of Mianwali and Sargodha

Sources:

- MINFAL, Islamabad.
- ALMA, Karachi.
- Directorate of Agriculture (E&M), Punjab, Lahore.
- Bureau of Supply & Prices, Government of Sindh, Karachi.
- Market Committees of Mianwali and Bhakkar.
- PASSCO, Lahore.

Table-21: Support and Market Prices of Onions and Quantities Procured: 1980-81 to 1999-2000

Crop/ Year	Support price*	Market price**	Difference between market and support prices	Procurement by government agencies	Government Agency
	Rs per 40 kgs		Per cent	000 tonnes	
1980-81	19.30	27	40	Nil	-
1981-82	19.30	77	299	Nil	-
1982-83	25.00	49	96	Nil	-
1983-84	30.00	82	173	Nil	-
1984-85	30.00	62	107	Nil	-
1985-86	32.50	36	11	13.00	PASSCO, AM&SL
1986-87	34.50	76	120	5.00	AM&SL
1987-88	36.50	66	81	0.13	AM&SL
1988-89	40.00	94	135	Nil	-
1989-90	44.00	76	73	7.88	AM&SL
1990-91	54.50	123	126	Nil	-
1991-92	65.00	85	31	32.0	AM&SL
1992-93	70.00	156	123	Nil	-
1993-94	84.00	136	62	Nil	-
1994-95	84.00	168	100	Nil	-
1995-96	92.00	125	36	3.38	PASSCO
1996-97	106.00	201	90	Nil	-
1997-98	125.00	234	87	Nil	-
1998-99	140.00	257	84	Nil	-
1999-00	-	105	-	4.821	PASSCO

Notes:

- Since 1999-2000 no support prices have been fixed.
- * Support price of size above 50 mm upto 1988-89 and 40-50 mm afterward.
- ** Average market prices of Hyderabad (Jan-Feb) and Multan during post harvest season: May and June.

Sources:

- MINFAL, Islamabad.
- ALMA, Karachi.
- Directorate of Agriculture (E&M), Punjab, Lahore.
- Bureau of Supply & Prices, Government of Sindh, Karachi.

Table-22: Support and Market Prices of Potatoes and Quantities Procured: 1980-81 to 1999-2000

Crop/ Year	Support price*	Market price**	Difference between market and support prices	Procurement by government agencies	Government Agency
	Rs per 40 kgs		Per cent	000 tonnes	
1980-81	26.80	61	56	Nil	-
1981-82	26.80	53	49	Nil	-
1982-83	40.50	35	-16	64.50	AM&SL
1983-84	40.50	60	33	Nil	-
1984-85	40.50	61	34	65.00	PASSCO
1985-86	42.00	45	7	11.50	PASSCO
1986-87	44.50	47	5	15.00	AM&SL
1987-88	44.50	94	53	Nil	-
1988-89	50.00	85	41	2.49	AM&SL
1989-90	55.00	38	-45	0.11	AM&SL
1990-91	55.00	104	47	Nil	-
1991-92	65.00	81	20	1.14	AM&SL
1992-93	67.00	82	18	2.00	AM&SL
1993-94	77.00	77	0.0	Nil	-
1994-95	84.00	103	18	2.70	PASSCO
1995-96	84.00	238	65	Nil	-
1996-97	115.00	288	60	Nil	-
1997-98	145.00	116	-25	1.00	PASSCO
1998-99	145.00	106	-37	Nil	-
1999-00	145.00	111	-31	1.9	PASSCO

Notes:

- After 1999-2000 no support prices have been fixed.

* Support price for the size of 40-55 mm.

** Average market prices of Lahore, Faisalabad and Okara during post harvest season: January to April.

Sources:

- Various Price Policy Reports of APCom.
- AM&SL.
- PASSCO.
- MINFAL.
- ALMA, Karachi.

Table-23: Support Prices and Procurement of Non-traditional Oilseeds: 1980-81 to 1999-2000

Crop year	Sunflower		Soybean		Safflower		Procurement agency
	Support price*	Procurement	Support price*	Procurement	Support price*	Procurement	
	Rs/40 kgs	000 tonnes	Rs/40 kgs	000 tonnes	Rs/40 kgs	000 tonnes	
1980-81	117.90	-	107.18	-	96.46	-	GCP
1981-82	133	5.7	117	0.7	112	1.4	GCP
1982-83	140	7.7	122	1.0	120	1.0	GCP
1983-84	150	7.7	140	0.5	125	0.7	GCP
1984-85	170	9.2	160	0.3	140	0.3	GCP
1985-86	170	-	160	-	140	-	-
1986-87	170	32.6**	160	-	140	-	-
1987-88	170	32.3	160	0.3	140	0.3	GCP
1988-89	177	21.6	165	0.3	143	0.2	GCP
1989-90	205	16.3	185	0.2	165	0.1	GCP
1990-91	225	29.6	200	0.3	180	-	-
1991-92	250	29.8	230	-	220	-	-
1992-93	280	28.7	250	-	-	-	-
1993-94	315	0.1	275	-	270	-	-
1994-95	315	-	275	-	270	-	-
1995-96	315	-	275	-	270	-	-
1996-97	450	1.00	345	-	300	-	PASSCO
1997-98	450	-	345	-	300	-	-
1998-99	500	-	-	-	-	-	-
1999-00	500	-	410	-	350	-	-

Notes:

- After 1999-2000, above mentioned crops have been excluded from the support price programme.
- * Market prices of non-traditional oilseeds are not available.
- ** Sunflower + Soybean

Sources:

- Agricultural Statistics of Pakistan 2001-02.
- Various price policy reports, APCom.

Table-24: Average Prices of Fertilizer: 1980-81 to 2002-03

(Rs per nutrient kg)

Year	Nitrogen (N)	Phosphorus (P)	Potash (K)
1980-81	4.04	2.70	1.97
1981-82	4.14	2.66	1.48
1982-83	5.00	3.15	1.37
1983-84	5.45	3.94	1.60
1984-85	5.44	3.85	1.90
1985-86	5.46	3.86	1.52
1986-87	5.66	4.09	1.82
1987-88	5.68	4.68	2.21
1988-89	5.79	6.56	2.82
1989-90	6.64	6.47	3.59
1990-91	7.47	8.21	5.47
1991-92	7.91	8.27	6.20
1992-93	9.05	8.71	7.31
1993-94	10.47	12.69	10.79
1994-95	11.45	13.85	12.06
1995-96	11.95	16.14	13.22
1996-97	15.05	17.21	16.10
1997-98	15.39	17.94	20.81
1998-99	15.74	20.72	21.00
1999-00	14.99	20.11	22.60
2000-01	15.78	22.96	27.28
2001-02	17.13	24.17	30.56
2002-03(P)	18.13	26.17	31.12

Note:

(P) Provisional.

Source:

Pakistan Fertilizer Related Statistics (Various Issues) NFDC, Islamabad.

INSTRUCTIONS FOR CONTRIBUTORS

1. Manuscripts of articles, comments and reviews should be in English only and sent in triplicate preferably accompanied with 1.44 MB diskette in MS Words to the Chief Editor, Pakistan Journal of Agricultural Economics. Comments and Reviews should be submitted alongwith two copies of relevant book or paper.
2. All the articles should possibly be arranged into sections on (1) Introduction, (2) Hypotheses, (3) Methodological and Analytical Framework, (4) Results (5) Shortcomings and Limitations, (6) Policy Implications, (7) Conclusions and (8) Recommendations. An extract should also be prepared and given in the beginning of the article.
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