

Profitability of Pakistan's Agriculture

BASHIR AHMAD and ALI MUHAMMAD CHAUDHRY*

INTRODUCTION

The population of Pakistan reached the figure of 97.7 million in 1985-86. Growing at the current rate of 3.1 percent per annum, it would be over 144 million by the turn of this century. Under the pressure of such population growth, the demand for primary products would increase by a sizeable margin. An idea of this alarming situation can be formed from the projected requirements of wheat which have been estimated to be 22 million tons by the year 2000. To meet this expected demand for wheat, its production should increase by 70 percent of the existing levels, which means an annual yield growth rate of over 4.5 percent. But in the past thirty-five years i.e., during 1949-50 to 1984-85 it has grown at the rate of 2.53 percent per annum only. Supplies of other basic essentials would also be required to be increased by a similar margin to meet their increased demand.

What are the sources for such large additional production? A review of past production trends shows that so far, the most important source of incremental production has been expansion in acreage. However, the available indicators suggest that the scope of additional production, through acreage increase, has since been exhausted to a great extent. The position regarding irrigation supplies, which constitute the base of additional acreage, does not appear promising any longer. Details are given in Table 1.

It is evident from Table 1 that the availability of water, at the farm gate, increased by a small margin upto 1983-84, but thereafter, it decreased steeply till it reached its lowest ebb in 1984-85 as compared to 1980-81. Of the sources of additional irrigation water, tubewells are by far the most important as well as flexible, but their role has also been declining. Only 5000 tubewells are being added

*Dr Bashir Ahmad is Associate Professor and Chairman, Department of Farm Management, and Dr Ali Mohammad Chaudhry is Professor and Dean, Faculty of Agricultural Economics and Rural Sociology, University of Agriculture, Faisalabad. This paper is based on two studies conducted for the Planning and Development Department, Government of the Punjab and USAID, Islamabad.

Table 1
Availability of Irrigation Supplies and Land use in Pakistan

Years	Irrigation Water at Farm Gate (Acre Feet)	Net Sown Area (Hectare)	Cultivated Area (Hectare)	Cropped Area (Hectare)
1980-81	97.79	15.41	20.30	19.33
1981-82	98.86	15.33	20.42	19.78
1982-83	101.49	15.77	20.36	20.13
1983-84	103.36	15.66	20.33	19.99
1984-85	97.33	15.42	20.54	19.79

Source: Agricultural Statistics of Pakistan (1985).

per year for the last many years, whereas 20,000 to 25,000 are going out of use after completing their useful life of 8 to 10 years each. Under the pressure of stagnant/declining water supplies, net area sown, cultivated area and the cropped area have been rather stagnant since 1980-81 (Table 1). Under these circumstances, the only option left open for increasing production is that of raising the productivity of crops grown as a means to feed the rapidly increasing population, to maintain exports, contain imports, feed the growing industrial sector with raw material and raise the standard of living of the masses, especially of the rural population which depends directly or indirectly on agriculture for its livelihood.

TRENDS OF CROP PRODUCTIVITIES

In order to suggest appropriate measures for increasing crop productivities, it would require proper analysis of the past trends in yields of various crops as well as of the input supplies and the economic incentives available to the Pakistan peasantry. Some details are submitted as follows :

During the period 1949-50 to 1964-65, wheat yield increased at the rate of only 0.22 percent per annum. In the decade ending 1975, the growth rate of yield averaged 5.57 percent, but in the subsequent decade ending 1985, it dropped to 1.33 percent per year i.e. to less than half of that of population growth (Table 2). The

Table 2

Average Annual Growth Rates of Yields of Various Crops in Pakistan

Years/Period	Wheat	Rice	Cotton	S. Cane	Maize	Gram	Over All
1949-50 to 1964-65	0.22	0.50	1.88	0.76	0.50	-0.10	0.56
1965-66 to 1974-75	5.57	6.21	2.77	-0.83	1.36	0.88	3.51
1975-76 to 1984-85	1.33	1.39	3.49	0.03	0.12	-0.96	2.30

Sources: Agricultural Prices Commission, Government of Pakistan, Islamabad, 1986.
Pakistan Economic Survey 1985-86.

behaviour of yield of rice was somewhat similar to that of wheat. The yield of sugar-cane increased at the rate of 0.76 percent per year upto 1965. Subsequently, from 1965 to 1975, it declined by 0.83 percent per year. Further, during 1975-85, cane yield remained almost stagnant, registering a nominal rate of increase of only 0.03 percent per year. The behaviour of yields of maize and gram was more or less similar to that of sugar-cane. The yield of cotton, however, increased at the rate of 1.88 percent per year upto 1965. It improved to 2.77 percent per year during 1965-75 and to 3.49 percent per year during 1975-85. Details are given in Table 2. Collectively, the rate of growth of productivity of all important crops averaged 0.56 percent per year during 1949-50 to 1964-65. In the decade ending 1975, the growth rate of productivity increased to 3.51 percent per year. The composite rate of growth of yield, during the decade ending 1985, dropped to 2.30 percent per annum or by 35 percent during the 1975-76 to 1985-86 period on average, over the 1965-66 to 1975-76 period.

The productivity of different crops, among other factors, is influenced by economic forces i.e. the costs and returns associated with each crop. The subsequent sections of this paper analyse the profitability and present the estimates of costs and returns over time, in respect of the major crops, grown in the irrigated areas of the Punjab. The next section presents the methodology used for estimating the cost of each crop and the sampling procedures. The second and third sections deal with the net income (gross income minus total cost) and net cash income (gross income minus total variable cost) per acre over time, for wheat, rice, cotton and sugar-cane.

METHODOLOGY OF COST ESTIMATION

Sampling Procedure

As a first step, the Punjab Province was stratified into four ecologically homogeneous irrigated zones to represent the various agro-climatic regions of the province. In each zone, one tehsil was selected to represent the average conditions of the zone. A three-stage stratified sampling technique was adopted wherein the tehsil was the primary, the village the secondary, and the operational holding the ultimate sampling unit. Four to six villages, depending upon their size, were selected from each tehsil. From each group of villages, 61 to 201 operational holdings were chosen. In all, about 650 respondents were selected for data collection for the year 1980.

A more or less proportional random sample was drawn from the selected villages. The overall structure of the costs of a given sample represented the average cost structure for that zone. To arrive at the overall cost of production of various crops, per unit of area, for the irrigated Punjab, cost estimates for individual items in various zones were weighted in proportion to the areas under these crops in each zone.

Cost Estimation Procedures

Estimation of the cost of production of a given farm enterprise is a complex issue. Farming in Pakistan represents a diversified activity, encompassing a host of all the year round farm enterprises, all of which are interdependent and interrelated. Together, they utilize the services of many cost items in varying proportions and intensities. Unless all the necessary details are skillfully mapped, the cost of fixed items, which represent the major portion of total farm expenditure, cannot be appropriately allocated to various farm enterprises.

The procedure adopted in estimating the cost of various items and the adjustment of base year (1980) data, in order to estimate profitability over time, is given in Seckler, Chaudhry, Ahmad and Khan (forthcoming).

NET INCOME PER ACRE

Net income per acre is the money available to management after meeting all the crop production expenses. It was calculated for each crop by deducting total cost, including land rent, from the gross income earned from an acre of land.

Total income per acre was calculated by (i) multiplying the yield per acre by the farm-gate price; (ii) determining the value of by-products, e.g., wheat bhoosa, cotton sticks, and rice straw; and (iii) adding the money values obtained in steps (i) and (ii).

With the exception of cotton for a few years, net income per acre remained consistently negative for all crops throughout the study period (Table 3). Moreover,

Table 3
Costs and Returns per Acre of Wheat, Rice, Cotton and Sugar-cane in Irrigated Punjab

Items	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86
Wheat											
Gross Income	691.84	700.67	709.49	873.83	1033.17	1076.62	1089.53	1216.49	1230.73	1361.71	1574.13
Total Cost	1100.48	1284.51	1276.87	1390.20	1612.90	1769.76	1873.10	2031.87	2147.31	2595.88	2482.19
Net Income	-400.64	-583.84	-567.38	-524.37	-549.73	-692.14	-783.57	-015.38	-916.58	-934.17	-908.86
Rice											
Gross Income	631.94	727.92	671.23	735.93	760.17	949.37	1087.55	1106.89	1124.99	1147.89	1177.76
Total Cost	1173.30	1332.62	1306.15	1375.71	1524.59	1802.90	1989.90	2085.54	2211.85	3231.36	2427.18
Net Income	-541.36	-604.70	-634.92	-639.78	-764.41	-853.53	-902.44	-978.65	-1086.86	-1173.46	-1249.41
Cotton											
Gross Income	1360.17	1409.06	1591.66	1627.31	1662.95	1018.96	1933.15	2028.30	2103.06	2179.17	2268.37
Total Cost	1347.19	1472.96	1553.91	1609.35	1702.98	1885.82	2042.06	2168.03	2280.39	2308.43	2476.00
Net Income	12.98	-63.10	37.75	17.96	-40.03	-66.86	-108.91	-139.73	-177.33	-209.26	-207.63
Sugar-cane											
Gross Income	2092.37	2089.63	2086.93	2084.21	2534.87	3256.06	3251.80	3247.54	3243.28	3239.02	3234.76
Total Cost	2707.64	2881.37	2868.74	2929.51	3361.66	4022.73	4257.54	4378.17	4621.99	4746.11	4866.45
Net Income	-615.27	-791.72	-781.01	-745.30	-826.77	-766.67	-1006.14	-1130.62	-1370.71	-1507.09	-1631.72

Source : Calculated by the authors.

the magnitude of loss increased for all crops. Studies conducted by other organizations also yielded negative returns where land rent was estimated by appropriate procedures and farm-gate prices were used in their calculations. For example, the latest study conducted by the Punjab Economic Research Institute (PERI) for the year 1983, reports positive net returns per acre for wheat, rice, cotton and sugarcane [Saleem and Haq (1982-83)]. However, the study charged land rent for a particular crop on the basis of the number of months for which the crop was kept in the field. Land rent for six months was charged for wheat, rice and cotton. The analysis is based on the implicit assumption that the cropping intensity is 200 percent, which, in fact, is not true. Cropping intensity is 136 percent in a rice-wheat cropping system, 125 percent in a cotton-wheat system, and 128 percent in a sugar-cane-wheat system. When the cropping intensity is less than 200 percent, as is the case in various irrigated cropping systems, the charging of land rent for six months underestimates the true land rent and, hence, the total cost of production of various crops. Moreover, more than one-fourth of the farms are operated by tenants; the amount paid by them to the landlord approximates the true land rent.

It may also be pointed out that in the study conducted by the Punjab Economic Research Institute, rice and cotton have been valued at prices much higher than the support prices. If the proper procedure is used for the land rent estimation and farm-gate prices are used, the net returns obtained by deducting total cost from gross income become negative for all the crops.

The Department of Agriculture has also reported a loss of Rs 312.15 from wheat production with average resources under irrigated conditions in the Punjab for the year 1983 (Punjab Department of Agriculture 1982).

The Agricultural Prices Commission (APCOM) has estimated the 1985 and 1986 costs of production, including land rent of average farms, for seed cotton in the Punjab. The estimate is almost the same as the farm-gate price (Niaz 1985a). The cost of production of average farms growing IRRI (paddy) in the Punjab was found to be Rs 56.88 per maund for 1985 and Rs 59.46 per maund for 1986. These costs were higher than the prevalent procurement/support prices of Rs 51.00 per maund in 1985 and Rs 53.00 per maund in 1986 (Niaz 1985b). It may also be pointed out that the cost estimates of various crops by the Agricultural Prices Commission (APCOM) underestimate land rent, which is calculated on the basis of the number of months the crop remains on the field. As in the study by the Punjab Economic Research Institute, the APCOM study has also based its analysis on the implicit assumption that cropping intensity is 200 percent, which, in fact, is not true for any of the irrigated cropping systems in the province. Moreover, in almost all the above studies, cultivation with bullocks was priced at the opportunity cost of ploughing by tractor, which is about one-third of the cost with bullocks. The cultivation cost is roughly 30 percent of the total cost. Thus, these studies underestimate the

actual cost of production. The net returns associated with all the major crops are, indeed, negative.

NET CASH INCOME PER ACRE

Net cash income per acre is the money available to the farmer for his living expenses and new farm investment. This is computed by deducting variable costs from the total income earned from a crop acre. Variable costs per acre include the following items :

- (a) Cost of casual hired labour;
- (b) Seventy percent of the operational cost of machines, viz. of tractors and tubewells;
- (c) Cost of plant protection and seed;
- (d) Cost of farmyard manure and fertilizer; and
- (e) Interest charges on plant protection, seed, farmyard manure and fertilizer.

Both the nominal and real net cash incomes were calculated for the 1976-1986 period (Tables 4 and 5). Indices of real net cash inflow showed that they have deteriorated over time for all commodities. Indices of real net cash income of wheat have improved over the base period in 1979 when the procurement/support price of wheat was increased from Rs 39.65 to Rs 48.23 per 40 kg. Further improvements in indices occurred in 1980, when the price was further increased from Rs 48.32 to Rs 58.00 per 40 kg. Indices of real net cash income of rice were higher in 1977 than in the base year, as the price of basmati increased from Rs 47.80 to Rs 55.73 and of IRRI from Rs 26.79 to Rs 32.15 per 40 kg. Indices of real net cash income of cotton and sugar-cane deteriorated substantially over time. Deterioration in income occurred mainly because of the following three factors :

- (1) Prices of various agricultural commodities have shown substantial improvement, but the increase in these prices has been less than the increase in the general wholesale price index. For example, over the period from 1976 to 1986, the price of wheat increased by 101.76 percent, of basmati price by 100.84 percent, of IRRI rice by 97.84 percent, of cotton by 35.92 percent and of sugar-cane by 56.66 percent. During the same period, the general wholesale price index increased by 116.75 percent.
- (2) Variable costs of production registered a striking increase over the study period. Variable costs of production of wheat increased by 142.46 percent, of rice by 169.77 percent, of cotton by 128.57 percent

Table 4
*Nominal Net Cash Income per Acre from Various Crops in
 Irrigated Punjab (1975-76 to 1985-86)*

Years	Wheat		Rice		Cotton		Sugar-cane	
	Net Cash Income (Rupees)	Index	Net Cash Income (Rupees)	Index	Net Cash Income (Rupees)	Index	Net Cash Income (Rupees)	Index
1975-76	292.60	100.00	294.70	100.00	1057.48	100.00	1079.62	100.00
1976-77	291.82	99.73	367.20	124.63	1060.63	100.30	1097.33	101.64
1977-78	297.59	101.71	311.20	105.60	1262.11	119.35	1048.01	101.70
1978-79	426.47	145.75	366.24	124.28	124.28	1262.55	119.39	1070.74
1979-80	540.57	184.75	301.88	102.44	1272.91	120.37	1374.61	127.32
1980-81	445.75	152.34	347.99	118.08	1367.60	129.33	1766.33	163.61
1981-82	414.04	141.50	439.45	149.12	1419.76	134.26	1573.34	145.73
1982-83	444.98	152.08	385.83	130.92	1425.27	134.70	1464.97	135.69
1983-84	376.17	128.56	333.49	113.16	1469.38	138.95	1237.84	114.66
1984-85	464.26	158.67	313.40	106.35	1512.44	143.02	1211.94	112.26
1985-86	606.15	207.16	267.98	90.93	1576.51	149.08	1068.08	98.93

Source: Calculated by the authors.

and of sugar-cane by 113.94 percent. These cost increases were due to increases in the prices of variable inputs, as pointed out by Ghaffar Chaudhry (1984) and we quote :

“Against the limited increase of only 28 percent in wheat prices, the retail price of a 50 kg. bag of urea was increased by 103.2 percent, from Rs 63.00 in 1979-80 to Rs 128.00 in 1983-84. Depending on their brand names, price increases varied between 150 percent and 530 percent in the case of liquid insecticides, and between 470 percent and 825 percent in the case of granular insecticides over the period from 1979-80 to 1983-84. There has been a near doubling of water charges over the period under consideration. The index of energy prices went up from 100 percent in 1979-80 to nearly 150 percent in 1983-84” (Chaudhry 1984, p. 262).

- (3) The decline in real net cash income for wheat and cotton was partially offset by an increase in the yield of these crops. The yield of wheat improved by 12.75 percent and of cotton by 23.44 percent over the period from 1976 to 1986. However, compared with the yield levels in 1976, rice yield declined by 6.68 percent and sugar-cane by 1.30 percent in 1986.

SUMMARY

The trend of net income for major crops has consistently been negative, the magnitude of this negative trend has been increasing substantially over time. The index of net real cash income obtained per acre, for all the commodities, has deteriorated over time. The indices of real net cash income, for wheat, has improved between the base year 1976 and 1979 when the procurement/support price of wheat was increased from Rs 39.65 to Rs 48.23 per 40 kg. Further improvement in wheat indices occurred in 1980 when the price was again increased from Rs 48.23 to Rs 58.00 per 40 kg. Indices of real net cash income for rice were higher in 1977 than in the base year, as the price of basmati increased from Rs 47.80 to Rs 55.73 per 40 kg. and of IRRI increased from Rs 26.79 to Rs 32.15 per 40 kg. Indices of real net cash income of cotton and sugar-cane have deteriorated over time.

REFERENCES

- Chaudhry, A.M., and Bashir Ahmed (1982). “Cost of Producing Major Crops in Bahawalpur District, 1979-80”. Punjab Agricultural Research Coordination Board and Department of Farm Management, University of Agriculture. Faisalabad.
- Chaudry, A.M., and Bashir Ahmed (1982a). “Cost of Producing Major Crops in the Canal Irrigated Area of Gujranwala District, 1979-80”. Punjab Agricultural

- Research Coordination Board and Department of Farm Management, University of Agriculture, Faisalabad.
- Chaudhry, A.M., and Bashir Ahmed (1982b). "Cost of Producing Major Crops in Faisalabad District, 1979-80". Punjab Agricultural Research Coordination Board and Department of Farm Management, University of Agriculture, Faisalabad.
- Chaudhry, A.M., and Bashir Ahmed (1982c). "Cost of Producing Major Crops in Jhelum District, 1979-80". Punjab Agricultural Research Coordination Board and Department of Farm Management, University of Agriculture, Faisalabad.
- Chaudhry, A.M., and Bashir Ahmed (1982d). "Cost of Producing Major Crops in the Non-Canal Irrigated Area of Gujranwala District 1979-80". Punjab Agricultural Research Coordination Board and Department of Farm Management, University of Agriculture, Faisalabad.
- Chaudhry, A.M., and Bashir Ahmed (1982e). "Cost of Producing Major Crops in Sargodha District, 1979-80". Punjab Agricultural Research Coordination Board and Department of Farm Management, University of Agriculture, Faisalabad.
- Chaudhry, A.M., and Bashir Ahmed (1982f). "Cost of Producing Major Crops in Vehari District 1979-80". Punjab Agricultural Research Coordination Board and Department of Farm Management, University of Agriculture, Faisalabad.
- Chaudhry, A.M., and Bashir Ahmed (1984). "Cost of Producing Major Crops in Punjab 1979-80". Punjab Agricultural Research Coordination Board and Department of Farm Management, University of Agriculture, Faisalabad.
- Chaudhry, M.G. (1984). "Autarky in Food, Evidence and Prospects". *Pakistan Development Review*. Vol. XXIII, Nos. 2 and 3. pp. 257-267.
- Niaz, M.S. (1985a). "Support Price for Seed-Cotton 1985-86 Crop". Islamabad: Agricultural Prices Commission. (APCOM Series No. 29).
- Niaz, M.S. (1985b). "Support Price Policy for Rice (Paddy), 1985-86 Crop". Islamabad: Agricultural Prices Commission. (APCOM Series No. 30).
- Pakistan, Government of (n.d.). *Pakistan Economic Survey 1985-86*. Islamabad: Finance Division. Economic Adviser's Wing.
- Pakistan, Government of (1986). *Agricultural Statistics of Pakistan 1985*. Islamabad: Ministry of Food, Agriculture and Cooperatives. Food and Agriculture Division (Planning Unit).
- Punjab, Government of the (n.d.). "Cost of Production of Wheat (under Irrigated Conditions), Average Resources, 1982-83 Lahore". (Contained in official letter No. CRD/Cp.C/80-3(81/81/5151-62) dated 21st June, 1982, Appendix Table 1.) Department of Agriculture.
- Saleem, M., and Mazhar-ul-Haq (n.d.). "Farm Accounts, Family Budget of Rural Families and Cost of Production of Major Crops, 1982-83". Lahore: Punjab Economic Research Institute (PERI). Vol. 19.
- Seckler, David, A. M. Chaudhry, B. Ahmed and M. H. Khan (Forthcoming). "Agricultural Development in Pakistan". Islamabad: USAID.

Comments on “Profitability of Pakistan’s Agriculture”

The paper is an excellent attempt to empirically estimate the profitability of agriculture. It generates time-series data on the profitability of agriculture, using basic input data for the base year 1980 and the wholesale price indices for agricultural crops and inputs over time. The time-series data on gross incomes and costs are then used to study the trend in the profitability of agriculture.

It is difficult to deny the usefulness and the importance of the paper. The paper is novel in many respects. It, perhaps, is the first attempt to generate time-series data on the profitability of agriculture. The paper gives every minute detail of the estimation of cost of the production of crops. The conclusions of the paper are robust, well-founded and consistent with the general expectations, given the time trend in the prices of agricultural crops and key agricultural inputs, especially, since the adoption of the new agricultural policy in 1980. The paper concludes that the profitability of agriculture, whether based on net incomes or net cash incomes, is the result of the withdrawal of input subsidies. As a consequence, the more rapid increases in input prices, accompanied by rising rural wages and land rent, than those in the prices of agricultural commodities are sufficiently warranted to inflict losses on the farm sector unless it is willing to forego rent of land and wages for own labour. Although, I am highly appreciative of the paper, I would like to draw the attention of the authors to four specific points.

Firstly, the paper is based on data from the Punjab which may or may not reflect the conditions in the other provinces of Pakistan. Unless it is specifically shown that these data are representative of Pakistan, it may not be appropriate to title it as has been done. I would be quite contented to title it “Profitability of agriculture in the Punjab”.

My second comment deals with the authoritative statement of the paper that the scope of additional production through acreage increases has been exhausted. The authors use 1980–85 data to support their conclusion. The conclusion would hold only if it is assumed that the profitability of agriculture will continue to fall in future leaving little incentive for intensive margins of cultivation. I, however, believe that a stagnant agriculture in Pakistan has always induced the government to adopt a favourable agricultural price policy. If this were to happen, the rising profitability of agriculture would be accompanied by normal increases in output and acreage as a

result of intensive cultivation of land, and more efficient use of irrigation water and other complementary inputs especially in view of the existence of a large gap between actual and potential yields of most agricultural crops.

Thirdly, although there is an explicit statement in the paper, that appropriate measures for raising crop productivities would require proper analysis of the past trends, it stops short of such analysis. It does report on the growth rates of output of various crops but there is no mention of the factors underlying these growth rates.

Fourthly, in spite of the fact that the paper's findings have clear policy implications, it stops short of policy recommendations. It is highly undesirable that farmers should be subjected to losses as great as those reported in this paper. To change the status quo, it is only natural that the government should change its price policy in favour of agriculture to ensure some minimum level of profit, as is being done in the case of the industrial sector. Pending a favourable government response, the government may be warned to face stagnation in agriculture and its expectant consequences.

Pakistan Institute of
Development Economics,
Islamabad

M. Ghaffar Chaudhry