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Pakistan J of Science, 22(3-4), 1970, 185-192

ECONOMIES OF PRODUCING IRRIGATED CROPS IN EAST PAKISTAN

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INTRODUCTION

Rice is the indispensable part of our life. We need to produce more rice for feeding the increasing mouths and for eliminating the dependence on imports at the cost of our valuable foreign exchange. Moreover, food stuff including rice is not so easily available now in the world market as it was a few years back.

Although Pakistan fixed the target of attaining food self-sufficiency by the end of 1969-70, the goal is too far to be achieved. Rice production in East Pakistan has increased from 7,598,000 tons in 1957-58 to 1,995,000 tons in 1967-68. Since yield per acre has stagnated at about 11 mds till 1962-63 and at 12 mds after that, total production increased during the period concerned due mainly to larger acreage under rice cultivation which increased from 20,235,000 acres in 1957-58 to 24,437,000 acres in 1967-68. During the same period Boro acreage increased from 816,000 acres to 1,534,000 acres and yield per acre of Boro paddy increased from 12.0 mds to 19.8 mds.[1]

Of 35.28 million acres of land available for cultivation in East Pakistan, only 22.43 million acres was cultivated during 1966-67[2] mostly under rain-fed condition. Rainfall in East Pakistan not being normally distributed throughout the year, these lands get heavy rain during the rainy season and very little rain during the winter months. As a result vast land areas remain unutilized during the rabi crop season due to shortage of water. Despite increasing the yield of present cultivated acreages, Government effort to attain self-sufficiency in food will heavily depend on the provision of irrigation facilities to bring these vast land areas under production during the rabi season. The provincial Government, of course, has taken specific policies and programmes in this direction. The 3rd plan target was to bring 750,000 acres of land under power pump irrigation only. To that end large numbers of pumps are being supplied by the Government through the East Pakistan Agricultural Development Corporation at subsidized rates. Canal irrigation also brought huge area under cultivation. Total irrigated area in East Pakistan increased from 698,000 acres in 1957-58 to 1,532,000 acres in 1966-67[3]. Much of this increase was due to increased acreages of irrigated boro cultivation.

It can be expected that the Government will continue to finance the old projects, provide other supplies like fertilizer, insecticides, credit etc., along with irrigation and will start new projects. Therefore, it is necessary to evaluate the already gone into operation projects to see the performance of the new technology, to determine the nature and extent of success or failure of the technology, to determine the factors or causes contributing to success or failure. The results of such studies will be of immense use to the farmers, the extension workers, the researchers and the planners-the sets of people

whose combined action results production. The research results will point to the farmers the possible ways of improving farming efficiency, it will explore the possible areas where the farmers need the services of the extension agents, it will acquaint the researchers with problems that require solving and, lastly, it will provide factual information to the planners on the basis of which more objective, efficient and broad based plan can be prepared to bring about better results.

The Faculty of Agricultural Economics and Rural Sociology of the East Pakistan Agricultural University, Mymynsingh conducted a number of studies on the relevant subject, a review of some of which is presented here.

Costs and Returns in the Production of Potato

In our country, potato was so far considered as a vegetable crop and very rarely as a food crop. Considering the nutrient content and food value of potato, nutrition specialists recommended potato as a promising food crop to supplement other food grains. It will very much help to solve the food problem of the country. Potato has also many other uses in the preparation of various food items and industrial products.

The Government of Pakistan has given due importance on the production of potato and to that end provided irrigation facilities, imported new high yielding varieties etc. In East Pakistan potato acreage increased from 77,000 acres in 1957-58 to 188,000 acres in 1967-68, resulting in 701,000 tons of potato production in 1967-68 as compared to 174,000 tons in 1957-58. Yield per acre increased from 61.3 mds. to 101.5 mds. During the same period.[4]

A study on the costs and returns in potato production[5] was conduced in Comilla Kotwali Thana in 1966-67 Potato season. Area, production and yield per acre of Potato in Comilla Kotwali Thana increased from 80.40 acres, 4,824mds and 60 mds in 1961-62 to 617 acres, 58,615 mds and 95mds respectively in 1965-66.[6] The study covered 50 farms selected at random, all of whom were members of village cooperatives and received their supplies of irrigation, fertilizer, seed, credit etc, through the cooperatives. Most of the farmers produced Holland and Burma - two newly imported varieties of potato. Local variety was also grown on most farms in combination with the improved varieties.

Average total per acre cost of production was Rs. 1029.24. Average per acre yield being 85.54 mds average cost pr maund was Rs. 12.03. Average return per acre and per maund were Rs. 1392.15 and Rs. 16.27 respectively resulting in average per acre and per maund profit of Rs. 362.91 and Rs. 4.24 respectively (Table1).

Cash or purchased cost accounted for 54.1% of the total cost of production. Labour and seed accounted for 60.8% and 27.2% of the total costs respectively. Since 30 out of 50 farms used indigenous system of irrigation, it was the largest consumer of man time. Land preparation and ploughing covered 35% of the total labour cost. Table shows the variation in costs and returns per acre.

Table 1: Summary of average per acre costs and returns[7]

Items	Average/acre		Average/md.		% of total cost
	Quantity	Value Rs.	Quantity	Value Rs.	
Human Labour hrs.	1032.80	388.97	12.08	4.55	60.8
Animal Labour hrs.	177.44	59.08	2.08	0.69	5.7
Seed, mds.	7.10	280.12	0.08	3.27	27.2
Cow-dung,mds.	113.20	55.97	1.32	0.65	5.5
Oil-cake, mds.	4.49	65.37	0.05	0.76	6.4
Fertilizer, mds.	3.77	39.21	0.04	0.46	3.8
Water	–	8.52	–	0.10	0.8
Plant protection	–	8.58	–	0.11	0.8
Interest on cost	–	15.70	–	0.18	1.5
Marketing	–	30.29	–	0.26	3.0
Land Revenue	–	2.05	–	0.02	0.2
Interest on land value	–	75.28	–	0.88	7.3
Total cost	–	1029.24	–	12.03	100.0
Return (Gross)	85.54	1392.15	–	16.27	–
Net profit	–	362.91	–	4.24	–
Return/hr. labor	–	0.97	–	–	–

Table 2: Variation in per acre costs and returns

Item	Lowest	Highest	Average
Yields, md.	56.25	141.92	85.54
Total cost, Rs.	820.85	1397.83	1029.24
Gross return, Rs.	890.48	2422.42	1392.15
Net return, Rs.	243.75	1338.60	362.91
Price received md.,Rs.	7.00	25.00	16.27

Production of best net results were associated with factors like (i) good variety, (ii) use of pump irrigation, (iii) 8-9 times ploughing of land, (iv) use of 8 mds or more seed per acre, (v) use of fertilizer, insecticides etc., (vi) timely planting (vii) size of farm (viii) good price. Since in economic calculations, the influence of these factors cannot be rigorously isolated, the combined effect of the factors was considered. Holland yielded better than Burma, the difference was not very high. Cost per acre was larger on smaller farms resulting in smaller net profit. Ploughing more than 9 times and use of more than 9 mds of seeds were associated with decreased marginal return. Money return was the main attraction of potato production.

The following suggestions were made for augmenting and encouraging the farmers for more potato cultivation[8].

i. Large-scale supply of credit.
ii. Timely supply of seed at reasonable price.
iii. Augmented supplies and services of other kinds

iv. Storage and marketing facilities.
v. Continued technical knowledge understood by the producers
vi. Fundamental and applied research on potato production and marketing. Research and development of potato technology and processing, seed production, certification and distribution would be helpful.

Costs and Returns in the Production of Irrigated Boro Paddy (Local variety)

A study on the above subject was conducted in Mymensingh Kotwali Thana in 1966-67 boro season[9]. The study covered 40 farms producing irrigated local boro paddy. Boro acreage per farm averaged 0.735 acre in the area under study and the number of fields per farm averaged 2.3. 15.9% of the total cropland was under boro.

Average net cost of production per acre and per maund were Rs. 295.03 and Rs. 16.07 respectively. Average per acre yield was 18.36 mds.

Average gross return per acre and per md. was Rs. 420.53 and Rs. 22.90 respectively resulting in a net profit of Rs. 125.50 and Rs. 6.83 respectively (Table 3). Return per hour of labour was Rs. 0.42. Labour accounted for 43.1% of the total costs followed by seedling (15.9%), land use (11.4%) and water (9.1%).

Table 3: Summary of Average per Acre Costs and Returns[10]

Item	Average/Acre		Average/md.		Percent of total cost
	Quantity	Value Rs.	Quantity	Value Rs.	
Human Labour hrs.	643.42	152.30	35.00	8.29	43.1
Animal Labour hrs.	281.31	25.68	15.30	1.40	7.3
Manure mds.	38.69	19.47	2.11	1.06	5.5
Fertilizer, mds.	1.17	12.04	0.06	0.66	3.4
Water	–	32.00	–	1.74	9.1
Seeding	–	56.42	–	3.07	15.9
Fuel for spray and equipment	–	10.77	–	0.59	3.1
Land use	–	40.42	–	2.20	11.4
Others	–	4.41	–	0.24	1.2
Total gross cost	–	353.51	–	19.25	100.0
Credit for straw md.	29.24	58.48	1.59	3.18	–
Net cost	–	295.03	–	16.07	–
Return (gross)	18.36	420.53	1.00	22.90	–
Net profit	–	125.50	–	6.83	–
Return/hr. labour	–	0.42	–	–	–

Yield per acre varied from 7.69 mds. to 22.69 mds. averaging 18.36 mds. The coefficient of variation of yield being 37%. Return per hour of labour varied from less than 0 to Rs. 0.90 averaging Rs. 0.42. Average net cost per acre was lowered by about

Rs.85 on farms having 0.75 acre or more as compared to those having 0.50 acres or less making a difference of 45% in net profit per acre between the two extremes. Both the absolute size of the plot and the scatteration of the plots affected the amount of labour required and cost. Good preparation of land, uniform water use, greater number of inter cultural operation, top dressing, spraying, heavy manuring and fertilization etc., were associated with high yields, net profit and labour return. But decreasing return to heavy fertilizer use was found in a number of cases. However, variation among individual farms was wide but no one factor could be identified as responsible for success or failure rather a combination of these simultaneously.

A separate calculation was also made of the cost of producing seedling. Average total per acre cost of raising seedling was Rs. 463.85 of which labour, animal power, seed, manures-fertilizers, and water accounted for 42%, 6%, 39%, 6.1% and 4.8% of the total costs respectively.[11]

The study mentioned three factors as responsible for the slower growth of technology in our society, namely, (i) illiteracy of the farmer which inhibit quick dissemination (ii) fatalistic attitude of the farmer which inhibit innovation (iii) lack of understanding of the farmer about the operation technique and prospective return. However, the study reported that the farmers showed increasing interest towards adopting new technology.

Costs and Returns in the Production of IRRI Boro Paddy

With irrigation facilities and other inputs like fertilizers, insecticides, credit etc., available, productivity of local boro paddy has increased much. But the highest point of positive return on increased investment is very quickly arrived at so that heavy investment of modern inputs cannot be done beyond certain limit. On the other hand, IRRI- a hybrid rice variety developed by the International Rice Research Institute, Manila, is a very high yielder. Although it involves heavy investment in the form of water, fertilizer, insecticide, labour and management, return from it is very much higher than that from local variety.

In its effort to attain food self-sufficiency, the Government of Pakistan has imported this rice and has taken every possible step to popularize its cultivation. During 1967-68, 166,000 acres of IRRI paddy was cultivated producing 241,000 tons of paddy so that yield per acre averaged at 41.07 maunds.[12] It is expected that during 1968-69, area, production and yield per acre have increased. Although IRRI acreage is on increase year after year, it will take a long time to replace local boro paddy. IRRI is more than a new variety to our farmers. It is an innovation requiring able and efficient managerial ability. Therefore, it is necessary to evaluate the viability of this innovation by computing the costs that it involves and the returns that it results.

Out of 118 farms producing pump irrigated boro paddy for the first time in two village, 80 in Nandina and 38 in Sharifpur under Jamalpur Subdivision of Mumensingh district, 50 farms - 34 from Nandina and 16 from Sharifpur were studied by Elias[13] of which all 16 in Sharifpur produced only IR-8 variety and 7 out of 34 farms in Nandina produced IR-8 along with local and 8 farms produced only IR-8 variety. The area per farm varied from 0.22 acre to 2.14 acres, averaging 0.77 acre in Sharifpur. Seven out of 16 farms produced less than 0.50 acre, 4 produced less than 1.0 acre and the rest above

1.0 acre of IR-8 paddy per farm. In Nandina, area under boro paddy varied from 0.07 acre to 3.30 acres averaging 0.98 acres per farm. Fifteen out of 34 farms cultivated less then 0.50 acre, 8 produced less than 1.0 acre, 7 produced less than 2.0 acres and the rest above two acres of boro paddy per farm. The total number of plots per farm producing boro averaged at 3.2 in Sharifpur and 2.06 in Nandina. The number of fragments per farm increased with the increase in the size of farm but that did not reduce the size of each fragment.

The proportion of total cropland devoted to boro varied from 5.59% to 26% averaging 12.77% in Sharifpur and from 12% to 42.1% averaging 16.47% in Nandina.

The total gross costs per acre averaged at Rs. 745.86 in Sharifpur, Rs. 568.89 and Rs. 526.90 on farms growing only IRRI and those growing IRRI with local variety in Nandina. Net costs per acre averaged at Rs. 660.20, Rs.530.82 and Rs. 479.89 respectively on the three types of farms. Yield per acre averaged at 56.99, 26.37 and 35.34 mds. respectively on the three categories of farms so that gross money return averaged at Rs.1339.17, Rs.619.62 and Rs. 830.40 resulting in average net profit per acre of Rs. 678.97, Rs. 88.80 and Rs. 355.51 respectively on the three categories of farms. Return per hour of labour averaged at Rs.0.84, Rs.0.44 and Rs. 0.78 on the three categories of farms respectively (Table 4).

In Sharifpur, human labour accounted for 49.87% of the total gross costs followed by water and land use with 14.96% and 14.15% respectively. In Nandina, on farms growing only IRRI, human labour accounted for 45.04% of the total gross costs followed by land use, animal labour, seedling and water with 19.79%, 9.39%, 9.32% and 8.97% respectively. On farms growing IRRL along with local variety in Nandina, human labour accounted for 44.39% of the total gross costs followed by land use, water and animal labour with 21.84%, 9.68% and 8.50% respectively. Cost due to land use was higher in Nandina because of the use of greater land area. Cost due to water use was more than double in Sharifpur than in Nandina because (i) two power pumps were used to cover the distance between the crop land and the source of water, (ii) long distance travel resulted in enormous loss of water, (iii) the total cost was distributed over smaller acres and (iv) the water had to be utilized for longer duration than in Nandina.[17] A little below 20% of the total gross cost was given as subsidy to the farmers in all cases.

There was an enormous variation in yield, costs and returns. Net cost per acre varied from less than Rs. 400.00 on one farm growing IRRI with local in Nandina to more than Rs. 900.00 on one farm in Sharifpur. Six out of 16 farms in Sahrifpur incurred cost less than average and 5 had round about the average. Five out of 8 farms growing only IRRI in Nandina incurred more than the average and 5 out of 7 farms growing IRRI with local incurred more than average cost per acre. The coefficient of variation in net cost was 12.5% in Sharifpur, 23.2% and 13.6% on farms growing IRRI alone and IRRI with local variety respectively in Nandina.[18]

Yield per acre varied from less than 10 mds on one farm growing IRRI alone in Nandina to 68 mds on one farm in Sharifpur. The coefficient of variation was 15.92% in Sharifpur, 39.63% and 24.51% on farms growing IRRI and IRRI with local respectively in Nandina.

Net profit per acre varied from less than Rs.250.00 on two farms growing IRRI alone in Nandina to more than Rs. 850.00 on one farm in Sharifpur. None of the 16

farms in Sharifpur produced negative net return. Fifty percent of all the IRRI farms obtained net profit more than Rs. 350.00 per acre.

Table 4: Summary of Average per Acre Costs and Returns in Producing IRRI Paddy

	In Sahrifpur[14]		In Nandina			
	Quantity	Value Rs.	Only IRRI[15]		IRRI with Deshi[16]	
			Quantity	Value Rs.	Quantity	Value Rs.
Human labour, hrs.	1243.45	371.94 (49.87)	778.77	256.25 (45.04)	759.06	233.90 (44.09)
Animal labour, hrs.	290.98	44.92 (6.02)	247.92	53.43 (9.39)	237.47	44.79 (1.50)
Manures (mds.)	10.97	4.39 (0.59)	25.38	10.15 (1.78)	14.26	5.70 (1.08)
Fertilizers (mds)	5.28	50.30 (6.74)	–	22.49 (3.96)	3.00	27.82 (5.28)
Water	–	111.60 (14.96)	–	51.00 (8.97)	–	51.00 (9.68)
Seeding	–	42.65 (5.72)	–	53.04 (9.32)	–	36.53 (6.93)
Equipment	–	5.24 (0.70)	–	4.59 (0.81)	–	3.43 (0.65)
Spray fuel	–	2.78 (0.37)	–	0.51 (0.09)	–	1.17 (0.23)
Land use	–	105.49 (14.15)	–	112.55 (19.79)	–	117.29 (21.84)
Interest on operating cost	–	6.55 (0.88)	–	4.87 (0.85)	–	5.27 1.00
Total gross cost	–	745.86 (100.00)	–	568.89 (100.00)	–	526.90 (100.00)
Credit for straw (mds.)	57.11	85.66	25.38	38.07	34.67	52.01
Net cost	–	660.20	–	530.82	–	474.89
Gross Return (mds.)	56.99	1339.17	26.37	619.62	34.34	830.40
Net Return	–	678.97	–	88.80	–	335.51
Return/hour of labor	–	0.84	–	0.44	–	0.78

Return per hour of labour, a measure of labour efficiency, varied from less than 0 on 2 farms growing IRRI alone in Nandina to more than Rs. 1.00 on 2 farms in Sharifpur. The coefficient of variation was 19.9% in Sharifpur and 103.4%, 25.8% on farms growing IRRI alone and with local respectively in Nandina.

These variations in costs and returns were associated with no single factor rather a combination of factors. Boro as an innovation was unknown to the farmers. Therefore, the level of management varied a lot to cause variation in yield, costs and returns. Such factors as larger farm size, increased number of weeding, top-dressing, spraying and use

of larger amount of chemical fertilizer, especially all three types, were associated with higher yield, high net profit and higher return per hour of labour with a few exceptions.

Introduction of boro paddy changed the cropping pattern in Sharifpur, but the intensity of cropping did not change because the Aus season was missed due to late harvesting of IRRI paddy. In Nandina cropping Intensity increased from 143% before irrigation to 223% after irrigation.

CONCLUSIONS

IRRI is more profitable than local boro paddy but no conclusion can be made about the approximate average costs and returns in the production of IRRI paddy. Continuation of such studies on a larger scale is essential.

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