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The general opinion in view of other risks is that net ICBR should be recommended higher than 2.50 for the adoption of improved agricultural practices. But the average ICBR having value a little more than one indicated that the response to fertilizer was a little more than twice the cost of fertilizer. The general conclusion which emerges from this analysis is that the level of profitability is enough to attract the farmers to adopt the full package of fertilizer in wheat cultivation even in established wheat revolution areas at the current price structure. Under the prevailing price structure the outlook of sustaining fertilizer use appears to be bleak.

With the steep falling trend in the prices of agricultural products a further set-back in the use of improved inputs whose demand has been already sluggish is not ruled out. The use of modern inputs is essentially a business proposition and will be resorted to only if it is profitable to the farmer. The mere need for higher agricultural production in the country has hardly any relevance to the farmers in taking a decision on the use of non-conventional inputs. The adverse terms of trade in the use of modern inputs will have adverse effect on the rural economy. The future scope of increasing agricultural production in India lies only in increasing agricultural productivity per unit with the use of modern inputs. Thus the prevailing adverse terms of trade in the use of purchased inputs have to be made favourable to the farmer for the adoption of improved technology for rapid agricultural development with stability.

CONCLUSION

The faster increase in the prices of modern inputs has shifted the competitive advantage from capital intensive agriculture to traditional agriculture. A decline in output prices witnessed since late 1975 will make intensive agriculture uneconomical posing a serious policy dilemma for agricultural development. It requires a set of policies designed to enhance resource efficiency in the agricultural sector in the long run. Till then substantial subsidies for using modern inputs and/or higher output prices seem to be the only alternative.

IMPACT OF INPUT PRICES ON PRODUCTION AND PROFITABILITY OF WHEAT AND PADDY IN THE PUNJAB

S. S. Grewal and P. S. Rangt*

In subsistence type of farming, the role of purchased inputs is very insignificant. The major inputs are the human and bullock labour. However, as agriculture undergoes a change with the adoption of new technology the role of monetized inputs assumes importance. During the last one decade, the

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Punjab State experienced a technological break-through in agriculture and the farmers have started using non-conventional inputs, *i.e.*, fertilizers, pesticides, machinery, irrigation, etc., in a big way. The way input-output relationships behave in a developing agriculture is of paramount importance. In a country like India, where the investing ability of the majority of the farmers is very low, changes in input prices cause a big difference in the application of these inputs. The recent spurt in fertilizer prices (of about 90 per cent) experienced in 1974 seemed to have affected the fertilizer use. Not only the farmers but the Government also felt concerned about it. There were apprehensions that it would affect agricultural production adversely.

In this paper we examine the impact of increase in the prices of some key inputs on the production and profitability of wheat and paddy which are the two most important crops of the Punjab State and which consume a large part of the fertilizer used in the State. The hypothesis to be tested here is that the price increase of inputs affects production and profitability of the crops.

Farm inputs are of two types, *i.e.*, fixed and variable. Although in the long-run, the price changes in all these inputs assume importance but in the short-run it is the price behaviour of the variable inputs which is of concern to the producer. In this paper we examine the trend in prices of some important variable inputs, *i.e.*, fertilizers, casual labour, pesticides and fuel and their relationship with production and profitability.

Source of Data and Techniques of Analysis

The data used in this study have been derived mostly from secondary sources and the sources of data have been indicated at the relevant places. A composite price (weighted) for all types of fertilizer, *viz.*, nitrogenous, phosphatic and potassic has been worked out. This weighted price was obtained by assigning weights to the prices of N, P and K nutrients; the weights being the quantities used of respective fertilizers. Due to lack of sufficient time-series data particularly on input prices, it was not possible to apply the rigorous analytical techniques. It was, therefore, thought proper to present our viewpoint with the help of simple averages and percentages.

Trend in Input Prices

The prices of various important inputs, *viz.*, fertilizers, pesticides, casual labour and fuel are shown in Table I. A look at this table brings out that the increase in prices of these inputs was rather slow upto the year 1972. Thereafter, the prices started moving up particularly during the year 1974. The prices of fertilizer, pesticides, casual labour and diesel oil increased by about 90, 88, 12 and 18 per cent respectively during 1974 over the year 1973. The major factors associated with the increase in prices of most of these inputs were the energy crisis faced all over the world. In the year 1976 there has been a reduction in the price of key input, *i.e.*, fertilizer by about 20 per cent. How-

TABLE I—PRICES OF IMPORTANT INPUTS IN PUNJAB STATE: 1967-76

Year	Fertilizer			Pesticides	Labour	Fuel
	Rs./tonnes, nutrients			B.H.C. Rs./kg.	Agricultural worker Rs./day	Diesel oil Rs./litre
1967	2,393	0.25	4.24	0.86
1968	2,421	0.30	4.81	0.87
1969	2,579	0.45	5.91	0.87
1970	2,685	0.45	6.10	0.87
1971	2,390	0.45	6.28	0.88
1972	2,422	0.45	6.69	0.91
1973	2,524	0.64	8.50	0.91
1974	4,707	1.20	9.50	1.07
1975	4,774	1.20	9.50	1.18
1976	3,820*	1.10	9.50	1.41

Note:—Prices of inputs relate to 30th June every year.

Source: Department of Economics and Sociology, Punjab Agricultural University, Ludhiana.

* Estimated.

ever, the price of diesel oil and labour wages have not come down. The increase in prices of the inputs could influence production via their usage. In the subsequent section, therefore, we examine the trend in the use of one of the most crucial inputs, *i.e.*, fertilizer. The time-series data on use of other inputs were not available.

Relationship between Fertilizer Use and Its Price

The consumption of fertilizer in the State is shown in Table II. A perusal of these figures would show that the consumption of all types of fertilizer

TABLE II—CONSUMPTION OF FERTILIZER IN PUNJAB STATE : 1966-67 TO 1975-76

(thousand metric tonnes of nutrients)

Year	Kharif			Rabi			Total				
	N	P	K	N	P	K	N	P	K	Total	
1966-67	..	15	1.5	0.2	31	2.5	0.4	46	4	0.6	50.6
1967-68	..	28	4	1	55	8	3	83	12	4	99.0
1968-69	..	45	6	3	90	21	7	135	27	10	172.0
1969-70	..	41	3	1	106	18	5	147	21	6	174.0
1970-71	..	53	3	1	122	28	6	175	31	7	213.0
1971-72	..	70	8	3	155	45	9	225	53	12	290.0
1972-73	..	80	12	7	160	54	15	240	66	19	325.0
1973-74	..	77	13	5	141	55	16	218	68	21	307.0
1974-75	..	74	11	5	115	31	8	189	42	13	244.0
1975-76	..	92	10	3	141	43	6	233	53	9	295.0

Source : Directorate of Agriculture, Punjab, Chandigarh.

i.e., nitrogenous, phosphatic and potassic in general has shown an increase upto the year 1972-73 despite slight fluctuations in the prices of these fertilizers during these years. This is true both for *kharif* and *rabi* seasons as well as total consumption in the State in each year. Thereafter, in the year 1973-74, there was a reduction in the consumption of nitrogenous fertilizers from 240 thousand tonnes (nutrients) to 218 thousand tonnes. This fall in consumption can largely be explained in terms of the overall shortage of fertilizer in the country and the price factor was not responsible for this fall in usage. In the subsequent year *i.e.*, 1974-75 there was a comparatively large fall in the consumption of all types of fertilizers. The consumption of N, P and K fertilizers in the State decreased by 29, 26 and 8 thousand tonnes respectively. This fall comes to about 13.3 per cent in nitrogenous fertilizers and 38 per cent each in phosphatic and potassic fertilizers. The combined reduction in all types of fertilizers in 1974-75 compared to the earlier years was to the tune of 63 thousand tonnes, *i.e.*, 20 per cent whereas in the preceding year the comparative fall was only 18 thousand tonnes which comes to about 5.5 per cent.

The major factor responsible for this fall in consumption in 1974-75 was the unprecedented price hike of about 90 per cent in the price of fertilizers. This situation was further aggravated by the shortage of supplementary inputs, *viz.*, diesel oil, electric energy and canal water. During the year 1975-76, however, the fertilizer consumption again picked up and there was an increase of 51 thousand tonnes over the year 1974-75 (21 per cent.) This revival in fertilizer consumption again seems to be associated with the decline in fertilizer price which was of the tune of 20 per cent and also the favourable product prices which will be discussed in a subsequent section.

Relationship between Fertilizer Price, Its Use and Production of Crops

Production of a crop is a function of the area put under it and its productivity. The input prices would only influence productivity via their effect on usage and even this effect may be overshadowed by the abnormality in weather, attack of pests and diseases, etc. There are several factors which determine the area put under a crop. These are the relative profitability of competing crops, availability of inputs, etc. It is thus evident that fertilizer prices is only one of the several variables which affect production.

In this background if we examine the production of paddy in the Punjab, it showed a consistent increase in total production throughout the period from 1966-67 to 1975-76 (Table III). The area also showed an increase except for the last year, *i.e.*, 1975-76 when there was a minor drop of 0.03 lakh hectares. The productivity of paddy, however, has been fluctuating particularly after 1972-73 onwards. If we relate the production of paddy with fertilizer price and the use of fertilizer on this crop, we notice that paddy production has increased despite sharp increase in fertilizer prices and slight fall in fertilizer consumption during the year 1974-75. Thus it can be inferred

TABLE III—FERTILIZER USE AND PRODUCTION OF WHEAT AND PADDY IN THE PUNJAB STATE : 1966-67 TO 1975-76

Year	Wheat				Paddy			
	Use of fertilizer (kg./hectares)	Production (lakh tonnes)	Yield (kg./hectare)	Area (lakh hectares)	Use of fertilizer (kg./hectare)	Production (lakh tonnes)	Yield (kg./hectare)	Area (lakh hectares)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1966-67	.. .. 16.4	24.51	1524	16.08	35.8	3.38	1185	2.85
1967-68	.. .. 29.5	33.35	1863	17.90	63.1	4.15	1322	3.14
1968-69	.. .. 45.8	44.91	2177	20.63	93.9	4.70	1364	3.45
1969-70	.. .. 47.6	48.65	2245	21.66	75.2	5.35	1490	3.59
1970-71	.. .. 54.3	51.45	2238	22.99	87.7	6.88	1765	3.90
1971-72	.. .. 71.5	56.18	2406	23.36	108.0	9.20	2045	4.50
1972-73	.. .. 76.2	53.68	2233	24.04	124.8	9.55	2007	4.76
1973-74	.. .. 72.5	51.81	2216	23.38	114.2	11.40	2287	4.99
1974-75	.. .. 55.8	52.84	2395	22.06	94.9	11.78	2071	5.69
1975-76*	.. .. 63.1	56.20	2332	24.10	111.3	24.45	2553	5.66

Source : Statistical Abstract of Punjab, 1975.

* Estimates.

that the production of paddy has not been found to be dependent upon input prices only during this period but it was governed by a variety of other factors which include the trend in product prices affecting its relative profitability vis-a-vis other crops and, above all, the weather factor.

In the case of wheat also there was a sharp fall in its production by 2.5 lakh tonnes during 1972-73 as compared to the previous year. This was in spite of the fact that there was no change in fertilizer prices and there was an increase in area under this crop to the extent of 0.68 lakh hectares compared to the year 1971-72 and the use of fertilizer per unit area also increased. The abnormal weather coupled with heavy attack of wheat rusts was largely responsible for this fall in production. During the subsequent years also, there seems to be no relationship between production of wheat with price of fertilizer and its use. The production behaviour during 1975-76 testifies this. Punjab State recorded the highest production of wheat in this year in spite of the fact that fertilizer price was much higher in 1975-76 compared to the year 1971-72, which was a year of record production in the State.

It can be concluded that the production of these crops has not been affected by the rise in input prices particularly fertilizer prices because its influence

was eclipsed by several other factors mentioned above, of which weather, the physical availability of fertilizers and the product prices are the most important ones.

We now proceed to examine the impact of increase in input prices on the profitability of wheat and paddy crops.

Impact on Profitability

If the increase in input prices is not matched with the increase in output prices, there would be a squeeze on profit margins and consequently this would influence the production. If, however, the product prices are also increased simultaneously this situation may not come up. Both for wheat and paddy, when there was an increase in the cost of production of these crops due to price hike in inputs, *i.e.*, fertilizer, the product prices were enhanced. The relevant data on profit margins for wheat and paddy crops are provided in Table IV. It is apparent that due to an increase in input prices the per hectare expenditure on cost A_2 basis has increased from Rs. 1,239.20 in 1971-72 to Rs. 1,605.30 during 1974-75 in the case of paddy. This increase in expenditure in the same period for wheat was from Rs. 1,020.10 to Rs. 1,433.32 per hectare. At the same time, there was no reduction in the net profit margin per hectare (over A_2 cost). Rather, it has improved both for paddy and wheat crops. This is the result of enhancement of product prices.

TABLE IV—PROFIT MARGIN IN WHEAT AND PADDY CULTIVATION OVER TIME IN PUNJAB STATE

Crop	(Rs./hectare)		
	1971-72	1973-74	1974-75
Wheat*			
Expenditure	1,020.10	1,209.04	1,433.32
(A_2 cost)			
Gross income	2,219.14	2,860.01	3,420.15
Net margin (over A_2 cost) ..	1,199.04	1,650.97	1,986.83
Paddy†			
Expenditure	1,239.20	1,458.25	1,605.30
(A_2 cost)			
Gross income	2,057.00	2,835.95	2,743.31
Net profit (over A_2 cost)	817.80	1,377.70	1,138.01

Source : * Calculated by the Directorate of Economics and Statistics, Government of India, New Delhi.

† Calculated by the Department of Economics and Sociology, PAU, Ludhiana in the Reports on Cost of Cultivation and Input Structure for Principal Crops in Punjab.

Thus the hypothesis that the increase in input prices has affected the production and profitability of wheat and paddy crops is not substantiated. But one has to be very cautious in drawing out such inferences because the period under study is quite short and the data base is rather narrow. However, this conclusion has other implications. The farmers now have to make higher initial investment to get almost the same margin of profit. If the trend of price hike in input prices persists, it may lead to some distortions in the cropping pattern unless we have an integrated price policy. Although we have examined here the effect of increase in certain items of variable costs, yet it would be quite pertinent to examine the impact of increase in machinery prices on production. There has been a substantial increase in the prices of agricultural machinery and implements, particularly the tractors. The impact of this increase in machinery prices on capital formation and its resultant impact on productivity needs to be examined very carefully.

IMPACT OF INPUT PRICES ON LEVEL OF THEIR USE AND PRODUCTIVITY IN AGRICULTURE (A CASE STUDY)

R. I. Singh, G. N. Singh, R. K. Singh and V. Prasad*

The introduction of High-Yielding Varieties (HYV) Programme in 1966-67 brought about the Green Revolution in the country. This called for the use of high doses of modern farm inputs like quality seeds, fertilizer, plant protection chemicals, assured irrigation, etc., as the high-yielding varieties are very much responsive to high doses of fertilizers and irrigation and are susceptible to insects, pests and diseases. All round efforts being made by the Government, farm financing institutions and extension agencies in recent years resulted in higher productivity of agricultural commodities particularly that of high-yielding varieties of paddy and wheat, which reached a peak in 1970-71. After 1970-71, the prices of purchased inputs particularly that of fertilizers, irrigation water rose to a very high level and resulted in their low level of use. This adversely affected the level of productivity of agricultural commodities which either remained stagnant or declined after 1970-71.

With a view to determining the level of productivity and use of inputs in relation to their prices, a study was conducted by the Department of Agricultural Economics, C. S. Azad University of Agriculture and Technology, Kanpur, in district Jaunpur, Uttar Pradesh at three points of time, *i.e.*, 1967-68 (one year after the adoption of the HYV Programme), 1970-71 and 1973-74 with a gap of three years each. The main objectives of the study were: (i) to study the levels of farm productivity on the farms as a whole and that of the important crop enterprises separately, (ii) to examine the level of pro-

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