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The return to nitrogen was highest in 1975-76 than in 1972-73, thus indicating that the increase in the input of nitrogen was rational. Similarly, the increase in labour was also justified. What is even more interesting is that the return to phosphate and potash had decreased which justified the reduction in their input by the farmers. It was observed that all of these factors received sufficient return. The return to nitrogen was especially high in paddy in 1975-76, thus indicating that there is scope for further increasing its input.

IMPACT OF INCREASE IN INPUT PRICES ON PRODUCTION AND PROFITABILITY OF MAJOR CROPS IN TARAI

D. K. Marothia*

With the adoption of new farm technology, the role of purchased inputs such as fertilizers, pesticides and insecticides and farm equipments/machinery manufactured in the non-agricultural sector has become more significant in Indian farming than those of labour, bullocks and organic manure which originate in the agricultural sector. The use of these purchased inputs in agriculture has brought about considerable changes in farm output and income. The available empirical evidence about the impact of increase in the purchased input prices on production and profitability of crop enterprises is far from clear. The present study makes an attempt to examine (1) the changes in the prices of purchased and non-purchased inputs, (2) the changing levels of inputs use and their (inputs) importance in the cost structure of the crops, and (3) the impact of the above two factors on the production and profitability to the farmer.

METHODOLOGY

To fulfil the objectives of this study 40 progressive farmers were randomly selected from four blocks (Rudrapur, Bilaspur, Bazpur and Kashipur) of Nainital district in the Tarai region of Uttar Pradesh. Since the majority of the Tarai farmers keep proper records, reliable data were obtained by using the survey method regarding the investments on inputs, prices of inputs, yield and farm returns over a period of four years (1967-68 to 1970-71). Inputs were grouped into two categories, namely, purchased and non-purchased inputs. Purchased inputs include seeds, fertilizers, insecticides and pesticides and equipments/machineries. Since the sample farmers purchased seeds from the seed agencies, it was considered as purchased input. Non-purchased in-

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puts include human labour, bullock labour and irrigation (all the farmers included in this study had independent irrigation facilities on their farms).

Three major crops, maize, paddy and wheat, were chosen for detailed economic analysis. These crops cover the major part of the cultivated area and are the main sources of farm income in Tarai. All the sample farms grew the high-yielding varieties of these crops and used the elements of new technology. This study is thus confined to the capital intensive/enterprising farmers of Tarai.[1]

RESULTS AND DISCUSSION

1. *Prices of Inputs*

To study the relative importance of purchased inputs in the cost structure, the major inputs used for selected crops were considered. The details of the inputs (purchased and non-purchased) prices for 1967-68 and 1970-71 are given in Table I. The table indicates that during the short period of four

TABLE I—CHANGES IN THE PRICES OF SELECTED PURCHASED AND NON-PURCHASED INPUTS

(*Rupees*)

Inputs	1967-68	1970-71	Percentage change over 1967-68
(1)	(2)	(3)	(4)
A. *Purchased inputs*			
1. Seeds			
Maize (per kg.)	2·50	2·25	—10·00
Paddy (per kg.)	1·20	1·10	— 8·34
Wheat (per kg.)	1·40	1·20	—14·29
2. Fertilizers			
C. A. N. 25% (per kg.)	0·44	0·55	27·12
Muriate of potash (per kg.)	0·39	0·57	44·64
Urea (per kg.)	0·84	0·94	12·26
3. Plant protection materials			
B. H. C. 10% (per kg.)	0·30	0·45	50·00
Agroson (G. N.) (per. kg.)	4·00	6·50	62·50
Endrine (per litre)	11·42	18·50	61·99
4. Equipments/machinery			
Tractor 35 H. P. (International)	19,305·00	21,610·00	11·93
Seed-cum-fertilizer drill (per piece)	450·00	525·00	16·66
Olpad thresher (per piece)	292·00	460·00	17·35
5. Power use in equipments/machinery			
Diesel oil (per litre)	0·63	0·85	34·92
Mobil oil (per litre)	1·70	2·35	38·23
B. *Non-purchased inputs*			
1. Human labour wage per day	3·00	4·50	50·00
2. Bullock labour cost per day (per pair)	7·00	10·00	42·85
3. Irrigation charges (per irrigation)	12·00	15·00	25·00

1. I. J. Singh and D. K. Marothia, "Land Ceilings and Mechanization of Capital Intensive Farms of Tarai in Uttar Pradesh," in Problems of Agriculture in Uttar Pradesh, published by Society for Development of Uttar Pradesh, January 9, 1974, pp. 23-29. I. J. Singh, "Enterprizing Farmers of Tarai," *Eastern Economist*, Vol. 60, No. 15, April 13, 1972.

years the prices of most of the inputs used in the production of crops have increased substantially. The highest increase in price was observed in the case of plant protection materials, which rose by 50 to nearly 62 per cent during the four years. This increase was due to the limited availability of basic chemicals for pesticides formulation. Secondly, the process of manufacturing of insecticides and pesticides requires a high level of technology as it constitutes the lethal ingredients in them. This has its implication with the pollution of environments too. Thus the combination of the above two caused the price to rise steeply. The increase in the price of power used in the equipments/machines was to the extent of 35 to 38 per cent, of fertilizers by 12 to 45 per cent and of equipments/machineries by 12 to 17 per cent. The price of seed has not increased during the period of study. It may be due to the fact that quality seed became easily available from various sources. The prices of non-purchased inputs have also increased substantially. This increase was 50 per cent in human wages, nearly 43 per cent in bullock labour cost and 25 per cent in irrigation charges.

The increase in the prices of purchased inputs is significant in view of the increasing demand for these growth promoting inputs and these have increased the cost of human and bullock labour which are the pre-requisites for the adoption of new farm technology.

2. *Levels of Inputs Use and Their Costs*

A detailed analysis of the levels of use of different inputs (purchased and non-purchased) and their relative importance in the cost structure for maize, paddy and wheat have been provided in Table II.

The cost of working expenditure per hectare of wheat, maize and paddy has significantly increased by 33, 33 and 13 per cent over a period of four years (1967-68 to 1970-71). This increase in the cost of working expenditure was due to the increased intensity in the use of purchased inputs along with the increase in the prices of these inputs. The expenditure on purchased inputs had increased by 154.56, 122.82 and 97.89 per cent for paddy, maize and wheat, respectively, while the cost of non-purchased inputs declined by 43.18, 16.42 and 9.22 per cent for paddy, maize and wheat, respectively. Further, the ratio between the purchased and non-purchased imputs confirms the above fact. This increase in investment on purchased inputs was mainly due to a large increase in the price of input factors during the reference period.

In addition to the percentage change in the inputs, the levels of inputs use have also changed considerably during 1967-68 to 1970-71. The cost of seeds declined by nearly 25 per cent in paddy, 14 per cent in maize and 6 per cent in wheat during the span of four years. The decline in the cost of seed may be due to the fact that the government and agricultural universities feel directly responsible for the supply of this very crucial input in crop production. The cost of fertilizer input has increased by 2.80, 1.72 and 1.32 times

TABLE II—LEVELS OF INPUTS USE AND THEIR COST STRUCTURE FOR MAJOR CROPS ON SAMPLE FARMS IN TARAI

(*Rs. per hectare*)

Levels of inputs use	1967-68			1970-71			Percentage change over 1967-68		
	Maize	Paddy	Wheat	Maize	Paddy	Wheat	Maize	Paddy	Wheat
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A. *Purchased inputs*									
1. Seeds	20·00 (3·06)	25·00 (3·56)	67·00 (10·41)	17·20 (1·98)	18·85 (2·37)	63·00 (7·36)	—14·00	—24·60	—5·98
2. Fertilizers	170·00 (26·01)	118·00 (16·80)	90·00 (13·98)	226·00 (26·06)	202·95 (25·58)	180·72 (21·11)	32·94	71·98	100·80
3. Plant protection materials	5·00 (0·76)	10·00 (1·42)	8·20 (1·27)	24·35 (2·80)	32·45 (4·10)	22·33 (2·60)	387·00	224·50	172·31
4. Tractor, implements and machinery use	35·64 (5·45)	46·30 (6·50)	88·25 (13·71)	246·36 (28·40)	253·10 (31·91)	235·50 (27·52)	591·24	446·65	166·85
Sub-total (A)	230·64 (35·30)	199·30 (28·38)	253·45 (39·38)	513·91 (59·26)	507·35 (63·97)	501·55 (58·61)	122·82	154·56	97·89
B. *Non-purchased inputs*									
1. Human labour	330·10 (50·52)	356·90 (50·82)	260·00 (40·55)	272·62 (31·43)	206·00 (25·97)	244·20 (28·53)	—17·42	—42·29	—6·08
2. Bullock labour	89·56 (13·70)	110·60 (15·66)	90·00 (13·98)	65·67 (7·57)	40·15 (5·06)	59·95 (7·00)	—26·68	—63·50	—33·40
3. Irrigation	3·00 (0·45)	36·00 (5·12)	40·10 (6·23)	15·00 (1·72)	39·60 (5·00)	50·00 (5·84)	400·00	9.94	24·68
Sub-total (B)	422·66 (64·70)	502·90 (71·62)	390·10 (60·61)	353·29 (40·73)	285·75 (27·03)	354·15 (41·39)	—16·42	—43·18	—9·22
Total cost of purchased and non-purchased inputs (A+B)	653·30 (100·00)	702·20 (100·00)	643·55 (100·00)	867·20 (100·00)	793·10 (100·00)	855·70 (100·00)	32·73	12·93	32·96
Ratio between purchased and non-purchased inputs use (A+B)	0·54	0·40	0·65	1·45	1·77	1·41	—	—	—

Note :—Figures in parentheses indicate the percentage to the total.

in the case of wheat, paddy and maize, respectively. This represented an increase of nearly 101, 72 and 33 per cent for wheat, paddy and maize. The expenditure on plant protection materials increased by 387, 224 and 172 per cent in maize, paddy and wheat respectively. The large increase in the expenditure on these inputs during the short period may be attributed to the fact that the capital intensive farmers understood the great importance of the use of insecticides and pesticides in crop production and storage due to its economics in relation to mechanical and other methods previously used to control the attack of insects and pests. The most spectacular change was observed in the use of tractor and machineries. Whereas in 1967-68, the expenses on tractor and machineries use accounted for less than 6, 7 and 14 per cent of the total working expenditure, its share rose to nearly 28, 32 and 27 per cent for maize, paddy and wheat, respectively, during 1970-71. This increase in interest on tractor and machineries use was mainly due to the higher wages for human and bullock labour in Tarai. This is probably the reason for the rapid adoption of farm mechanization in Tarai. The cost share of human labour declined by 42.29, 17.42 and 6.08 per cent in the case of paddy, maize and wheat, respectively, during the period of four years. Similarly, the expenses on bullock labour also declined by 63, 50, 33.40 and 26.68 per cent in paddy, wheat and maize, respectively. This indicates lower intensity in human and bullock labour use during 1967-68 to 1970-71 as the prices per unit for these inputs increased whereas their share of costs declined.

TABLE III—AVERAGE YIELD AND RETURNS OF MAJOR CROPS ON SAMPLE FARMS IN TARAI

Crops	1967-68			1970-71		
	Yield (quintals)	Price (Rs./ quintals)	Returns (Rs.)	Yield (quintals)	Price (Rs./ quintals)	Returns (Rs.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Maize	17·50	61·00	1,067·50	27·00	55·00	1,485·00
Paddy	19·80	57·00	1,128·60	30·73	52·00	1,597·96
Wheat	15·10	77·00	1,162·70	26·16	76·00	1,988·16

	Percentage change over 1967-68		
	Yield (quintals)	Price (Rs./quintals)	Returns (Rs.)
(1)	(8)	(9)	(10)
Maize	+ 54·28	—9·84	+ 39·11
Paddy	+ 55·20	—8·78	+ 41·58
Wheat	+ 73·24	—1·30	+ 70·99

2. D. K. Marothia, "Impact of Farm Mechanization in Tarai Farming," *The Economic Times*, Vol. XV, Nos. 74 and 75, May 21 and 22, 1975.

The above findings reveal that human and bullock labour as source of power are being increasingly replaced by mechanical power. This has finally paved the way for large-scale mechanization on the capital intensive farms of Tarai.[3] The cost of irrigation has also increased remarkably.

3. *Yields, Prices and Returns*

Table III indicates that the average yield of wheat, paddy and maize on the sample farms increased by about 73, 55 and 54 per cent in 1970-71 as compared to 1967-68. The gross returns to the farmer have increased in 1970-71 over 1967-68 for all the three crops. This increase was to the tune of 71, 42 and 39 per cent for wheat, paddy and maize, respectively, although the prices of these commodities declined during the same period. Further, the higher yields and returns observed in the major crops revealed the profitable use of growth promoting inputs on the same farms. The substantial increase in the prices of different purchased and non-purchased inputs was offset by the high productivity of land, capital and other growth promoting inputs,[4] more investment on land development and irrigation facilities[5] and rapid adoption of high-yielding varieties and farm mechanization on Tarai farms.[6] Another important factor which compensated the increase in the prices of input was the most effective and sound technical know-how provided to the farmers by the research and extension workers of G. B. Pant University of Agriculture and Technology, Pantnagar for optimum allocation of the resources in crop production. Due to the efficient allocation of the resources and sufficient availablity of capital, the Tarai farms operated in the second stage of production functions.[7]

INPUT PRICES, PRODUCTION AND PROFITABILITY IN HARYANA

D. S. Nandal and D. K. Grover*

With the diffusion of improved agricultural technology, the farmers have moved into the market economy and thereby the importance of market incentives, particularly price incentive has assumed added importance in the production programme of the farmers. In the present study, an attempt has been made to examine the impact of increased input prices on production and profitability in Haryana. Specifically, the main objectives of the study are

3. D. K. Marothia, *op. cit.*
4. D. K. Marothia, "The Effects of New Technology on Factor Intensities and Farm Returns in Tarai," *Financing Agriculture*, Annual Number, 1975, pp. 43-46.
5. S. L. Shah and L. R. Singh, "Capital Formation in Agriculture of Tarai Region of Uttar Pradesh," *Indian Journal of Agricultural Economics*, Vol. XXIV, No. 4, October-December, 1969, pp. 88-92.
6. D. K. Marothia, "Farm Mechanization, Labour Use, and Farm Size in Developing Economy" (forthcoming article in the *Bangladesh Development Studies*).
7. D. K. Marothia, "Economics of Scale and Farm Size in Tarai," *The Economic Times*, Vol. XIV, No. 137, July 29, 1974.

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