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An economic viability and input-output relationship in organic farming of potato in inner Himalaya

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Abstract

The study of economic viability and input-output relationship in organic farming of potato in Malana village of Himachal Pradesh during the year 2002-03 using a simple random sampling technique without replacement revealed that on an average farm per hectare cost of cultivation (cost c_2) was Rs. 24,579, whereas, the gross returns were Rs. 33,798 per hectare. The yield gap was found to be 40.71 per cent. Moreover, small farmers recorded highest returns over cost A_1, cost A_2, cost B_1, cost B_2 and cost C_1, followed by medium farms and marginal farms. The regression coefficient of human labour, FYM and seed were non significant.

Introduction

Potato *(Solanum tuberosum)* a short duration crop, nutritionally superior and capable of producing high amount of food per unit area and time. It was introduced in India in early seventeen century and has been adopted throughout the country. The hill state of Himachal Pradesh is endowed with congenial natural condition for potato cultivation. The short duration and wide flexibility in its planting and harvesting time are valuable traits of potato that helps in adjusting this crop in various intensive cropping systems. Thus, all twelve districts of Himachal Pradesh grow potato with an area of 15036 hectares and yield of 115.30 q/ha (Anon., 2005). It occupies a unique position in the economy of Himachal Pradesh. The quality of potato of Himachal Pradesh is better as the cool temperate and sub-temperate climate supports low population of disease vectors. But there are regions in the state where the conditions are different from the rest of the state. So the present study has been purposefully conducted in such a remote village, Malana, where potato is one of the important vegetable crops and no study has been done in this regard in the village.

Malana is a small village situated in the north-east of Kullu district of Himachal Pradesh popularly known as Malana valley. It is regarded as an oldest democracy, which is often called as Malana Democratic Republic. The village has its own lifestyle, social status and an unique system of self-governance (Singh and Sikka, 1992). The village is located at an elevation of 2650m above mean sea level. In this village, agriculture sector assumes special significance as it is the mainstay of almost entire working population dwelling the hinter land due to lack of non farm avenues of employment. Moreover, agriculture in this part of the state is entirely different due to several factors like small and fragmented land holdings, lack of infra-structural facilities, low literacy rate, aloofness from the mainstream, unavailability of improved technology etc.

Keeping in view, the above facts an attempt has been made to work out the economic viability and input-output relationship of potato farming in the study area.

Material and Methods

Sampling plan: Simple random sampling (without replacement) technique was employed to select a sample of households in the study area. A complete list of households residing in Malana village was framed with the help of *Patwari* and the head of the community. From this list of 272 households, a sample of 101 households was chosen by employing simple random sampling technique using lottery method (Keeping time and other resources in view out of the total 272 households 40 per cent of the total households which turn out to be 108 were chosen. However, eight schedules were rejected on technical grounds and then a sample of 101 households was selected.)

Selected farmers were arranged in ascending order on the basis of their total land holdings. With the help of cube root cumulative frequency (^{3}f) method, the farmers were

classified into three categories viz; marginal, small and medium categories (Table 1).

Collection of data: The primary data were collected on a well-designed pre-tested schedule using personal interview method. The present study pertains to the agricultural year 2002-03. Different mathematical and statistical tools were employed to analyze the data in the present study.

Table 1. Distribution of selected sample households

Sr. No.	Category	Size of holding (ha)	Number of farmers
1.	Marginal	Less than 0.4	48 (47.52)
2.	Small	0.4 – 0.96	31 (30.69)
3.	Medium	More than 0.96	22 (21.79)
4.	All farms	-	101 (100)

Figures in parentheses represent per cent to total farmers

Cost concepts: Various concepts (Reddy *et al.*, 2004) used in computing cost of cultivation and net returns were as under.

Cost A_1 = Imputed value of owned seed + imputed value of manures+ land revenue + depreciation on farm machinery, implements, equipments + interest on working capital.

Cost A_2 = Cost A_1 + Rent paid for leased in land.

Cost B_1 = Cost A_2 + Interest on amount of own capital invested in the business excluding the value to land.

Cost B_2 = Cost B_1 + rental value of owned land (less land revenue) + rent paid for leased in land.

Cost C_1 = Cost B_1 + imputed value of family labour

Cost C_2 = Cost B_2 + imputed value of family labour

For standardization of labour, the following conversion rates suggested by (Dhongade and Dangat, 1985) were used:

Adult male = 1.00 unit

Adult female =0.90 unit

Adolescent boys and girls (13-21 years) = 1.00 unit

Children (9-13 years) = 0.80 unit

Statistical and mathematical techniques

To examine the input–output relationship, following Cobb-Douglas type of production function was employed:

$Y = ax_1^{b1}x_2^{b2}x_3^{b3}e^u$

Where, Y = Yield of the crop in q/ha, a = Constant term, X_1 = Seed rate (kg/ha), X_2 = Farm yard manure (q/ha), X_3 = Human labour (man days), b_1 to b_3 = Regression coefficients, e^u = Error term.

Results and Discussion

In Table 2 an attempt has been made to work out the economic viability of potato in the study area. The economics was influenced by various factors like available infrastructural facilities, input supply system, market availability and market price. Thus, computation of cost gave an idea of profitability of the crop. The economic analysis helped in identifying the capital intensive and more profitable crops, which could be taken up to reap comparative advantage in future.

Table 2. Per hectare returns and cost of cultivation in potato (Per cent)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
A.	Gross returns (Rs)	32,426	35,586	32,748	33,798
B.	Cost				
1.	Seed	18.71	17.46	17.56	17.73
2.	FYM	11.49	8.87	9.84	9.78
3.	Family labour	68.10	72.41	71.38	71.18
4.	Depreciation	0.64	0.28	0.21	0.31
5.	Land revenue	0.20	0.23	0.23	0.22
6.	Interest on working capital (for half of the crop period)	0.86	0.75	0.78	0.78
7.	Total cost (Rs)	14,458	12,918	13,126	13,269

It was observed that on an average farm situation, higher seed rate was used for all crops to warrant poor germination of these crops grown under rainfed conditions. Farming is purely organic. No fertilizers and pesticides were applied at all to all the crops grown in the area due to lack of awareness and non-availability of these inputs, only farm yard manure was being

applied. Interestingly, owing to religious beliefs, bullock labour was banned in the village. Agricultural operations like ploughing, sowing and threshing, which are usually done by bullocks in other part of the state, were carried out by the human labour with the help of small tools. So, human labour was found to play significant role in crop production.

Potato was an important *Kharif* crop of the study area as during *rabi* season the area is covered by snow. It was observed that maximum returns of Rs. 35,586 per hectare were computed on small farms category followed by Rs.32,748 for medium farm category and Rs. 32,426 per hectare for marginal farms (Table 2). However, it was Rs. 33,798 per hectare for overall farm category. Family labour accounted for 71.18 per cent of the total cost for overall farm category. It was maximum on small farms (72.41 per cent) while its share on medium and marginal farm categories was 71.38 and 68.10 per cent, which accounted for 17.73 per cent of the total cost on overall farm category. However, category wise analysis revealed that it was highest on marginal farms and lowest on small farms.

Cost C_2 was found highest at Rs. 25,832 per hectare on marginal farms, followed by Rs. 24,415 per hectare for medium farms and Rs. 24,217 for small farms (Table 3). Overall it was Rs. 24,579 per hectare. Cost A_2 followed similar trend on all the farm categories. On overall farms, it was Rs. 3,824 per hectare.

Net returns in potato over cost C_2 showed positive values for all the farm categories (Table 4). However, highest net returns over cost C_2 were obtained from small farms (11,369) and the lowest (6,595) were obtained from marginal farms. Small farms also recorded highest returns over cost A_1, cost A_2, cost B_1, cost B_2 and cost C_1, followed by medium farms and marginal farms.

Table 3.Different costs of cultivation for potato production (Rs/ha)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	4,613	3,564	3,756	3,824
2.	Cost A_2	4,613	3,564	3,756	3,824
3.	Cost B_1	4,736	3,613	3,796	3,884
4.	Cost B_2	15,986	14,863	15,046	15,134
5.	Cost C_1	14,582	12,967	13,165	13,329
6.	Cost C_2	25,832	24,217	24,415	24,579

Table 4. Net returns over different costs in potato (Rs/ha)

Sr. No.	Returns over	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	27,814	32,022	28,992	29,974
2.	Cost A_2	27,814	32,022	28,992	29,974
3.	Cost B_1	27,690	31,973	28,952	29,914
4.	Cost B_2	16,440	20,723	17,702	18,664
5.	Cost C_1	17,845	22,619	19,583	20,469
6.	Cost C_2	6,595	11,369	8,333	9,219

Study of Table 5 showed the results of Cobb-Douglas production function for potato on all farms. It was observed that regression coefficient of human labour, FYM and seed were non significant. The value of R^2 and F were 0.0229 and 0.6637, respectively. In the present study, the yield gap was found to be 40.71 per cent.

Policy Implications

The hill regions of the country like Malana, which are still practicing traditional agriculture with nil or low fertilizer and pesticide use, are the potential areas for organic farming. In these areas, traditional agriculture seems to be in equilibrium, though at a very low productivity level, which would require more strenuous efforts, in–depth analysis and comprehension to break this low productivity equilibrium trap in agriculture. So, there is need to organize small farmers in to bio-villages and introduce the system of marketing and certification for desired results.

Table 5. Cobb-Douglas production function for potato on all farms

Particulars	Constant (a)	Human labour (X_1)	Farm Yard Manure (X_2)	Seed (X_3)
Regression coefficients	4.0686	0.0405	0.0145	-0.0763
Standard error	0.4807	0.0549	0.0385	0.0650
t- value	8.4639	0.7377	0.3766	-1.1738
R^2	0.0229			
F- value	0.6637			
Degrees of freedom	85			

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