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Economics of Potato Production in Kangra District of Himachal Pradesh, India

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ABSTRACT

Keywords

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Potato of Kangra region has a high percentage of dry matter up to 20 per cent which is an important requirement for production of chips. Another advantage that the region enjoys is the time when it harvests its potato. While the crop is harvested in May here, the farmers can supply the produce till July, which is a period when no fresh potato is available in the market. This study reports the economics of potato production based upon the primary survey of 60 growers grouped into small and large based upon the area of cultivation of potato crop from Kangra district during 2014-15. This crop was found to be most capital and labour intensive due to substantial cost incurred on seed, fertilizer and human labour. Out of the total cost of Rs. 135317, the human labour alone accounted for around 35% followed by seed (23%). As such, the output input ratio over all paid out cost was 1:1.39. The analysis showed that there is a lot of scope for increasing the profit from potato crop by rationalizing the use of human labour, manures and fertilizers.

Introduction

Potato is one of the principal cash crops in Himachal Pradesh and it occupies 14685 hectares of area which is about 20 per cent of the total area under vegetables in the state. The production of potato in the state is 1.81 lakh tonnes (Statistical Yearbook of Himachal Pradesh, 2014-15). The climatic conditions in many parts of the state offer excellent opportunity for producing both disease-free quality seed and table potato. In district Kangra it is grown in an area of 1250 hectares spread over in 15 development blocks and the production is 14170 tonnes of quality potato. Potato of this region has a high percentage of dry matter up to 20 per cent which is an important requirement for production of

chips. Another advantage that the region enjoys is the time when it harvests its potato. In the Kangra district, specifically the Palampur and Nagrota Bagwan belt of Kangra district has also caught the fancy of food processing industries.

About 80 per cent of the total cultivated area in the state is rainfed and is dominated by small and marginal farmers (Statistical Yearbook of Himachal Pradesh, 2014-15). The supply of cultivable land in the state is very limited because of geographical and topographical reasons. In spite of these, the diversification towards there high value cash crops in the state is gaining momentum as

these crops provide higher returns and promote value added agribusiness enterprises.

Materials and Methods

The study was conducted in Kangra during 2014-2015. List of potato growing blocks in the district was prepared and arranged in descending order based on the area under crop. The first two potato growing blocks were selected purposively. After selection of blocks two stage stratified random sampling technique was employed for selection of potato growing villages (stage I) and farmers (stage II). In the first stage of sampling, a complete list of potato growing villages in each selected block was prepared in consultation with officials of the revenue and agriculture department. Further a sample of five villages was drawn randomly from each block for the study. Thus a total sample of ten villages was selected for the study. In the second stage of sampling, a complete list of farmers growing potato in each sample village was prepared with the help of revenue officials. Keeping the time and resources availability at the disposal of the researcher in view, a manageable sample of 60 farmers was drawn from the selected villages through the proportional allocation technique. With the help of cube root cumulative frequency ($3\sqrt{f}$) method, the farmers were classified into two categories. In this way, 28 small and 32 large farmers were selected. Data were collected by personnel interview with the growers on well-structured and designed schedules. The collected data were analysed by using the tabular method and production function analysis. The concepts used in working out costs and returns of potato were as follows.

Cost concepts

The following concepts were used in working out the costs and returns of potato as per the standard farm management methodology:

Cost A: Material cost + bullock/ tractor charges + interest on working capital.

Cost B: Cost A + interest on fixed capital + rental value of owned land.

Cost C: Cost B + imputed value of family labour.

Cost D: Cost C + 10 per cent of Cost C.

The interest on working capital at 10 per cent rate for half of the crop period and 8 per cent on fixed capital was computed as per the prevailing lending rates during 2014-15. Based on the sample survey customary average rental value of land was used.

Farm efficiency measures

To evaluate the farm income and profits, the following measures of farm income and profit efficiency were employed.

Gross farm income (GFI): It is defined as gross value of output including by-product priced at farm harvest rates.

Net farm income (NFI): This represents the remuneration for the farmers' management and has been calculated by deducting farm expenses from the gross farm income. $NFI = GFI - \text{Cost C}$

Farm family labour income (FLI): This represents returns to family labour and has been calculated by deducting Cost B from the Gross Farm Income. $FLI = GFI - \text{Cost B}$

Farm business income (FBI): It is defined as the return to labour, owned land, owned fixed capital and management and is calculated by deducting Cost A from the Gross Farm Income.

$FBI = GFI - \text{Cost A}$

Farm investment income: It is defined as the sum total of net farm income, interest on owned fixed capital and rental value of land

Production function analysis

To examine the extent of use of various resources in production of potato, production functions were estimated using input-output data from individual farmers.

Depending upon the value of R^2 (best fit) and the statistical significance of regression coefficients, multiple log linear production function was employed for analysis and discussion.

The production function used was of the following form:

$$Y = b_0 X_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5} e^U$$

Logarithm form of the function is:

$$\log Y = \log b_0 + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + U$$

Where,

Y= Output of potato (q/ha) X_1 = Seed rate (kg/ha) X_2 = Farmyard manure (q/ha)

X_3 = Fertilizers (kg/ha) X_4 = Human labour (Man days/ha) X_5 = Operational holding (ha)

b_0 = Constant term

b_i 's = Regression coefficients, $i= 1, 2, \dots, 5$

U = Random term

Statistical tools

For testing statistical significance of regression coefficient of (production elasticity) t statistics was applied.

Return to scale

In Cobb-Douglas production function return to scale is obtained by the summation of elasticity of coefficients of independent variable i.e. ($\sum_{i=1}^n b_i$)

If $\sum b_i=1$, implies constant return to scale.

If $\sum b_i>1$, implies increasing return to scale.

If $\sum b_i<1$, implies decreasing return to scale.

Results and Discussion

Area and production of potato

Potato occupies an important place in the economy of Himachal Pradesh because of the natural advantages that state enjoys in respect of potato seed production. The cool temperate climate with high wind velocity and moderate humidity found in higher hills coupled with negligible or low aphid population are the right conditions under which the disease free potatoes are produced in the State. In Himachal Pradesh potato occupied 14685 ha of area and produced 1.81 lakh tonnes with the productivity of 123.51 q/ha.

Cost of cultivation

The computation of cost of cultivation is necessary to determine the relative profitability of various crops over different crops. The detailed cost structure of the cultivation of potato has been presented in table 1. The table shows that the cost of cultivation that includes material costs, labour cost and other indirect cost was estimated to be Rs 135317 per ha on an average farm and it varied from Rs 133069 on the large farms to Rs 139893 on small farms.. The major component of the cost of cultivation was turned out to be human labour which contributed about 37 per cent to total cost. After human labour, next major component of cost was seed which accounted for about 26

per cent of total cost of cultivation. In case of material cost after seed, the expenditure on farm yard manure, fertilisers and pesticides/chemicals was to the extent of 5.13 per cent, 1.83 per cent and 1.72 per cent, respectively. The share of the other indirect nominal expenses in the total cost was worked out to be about 25 per cent. The interest on fixed capital and charges for depreciation on tools and machinery together accounted for about eight per cent of the total cost of cultivation on an average farm. It was also evident from this table that the total cost of cultivation, however, did not differ much significantly across small and large category of farms but it was slightly on higher side in case of small category of farms.

Costs and returns

The cost and returns of potato production under various categories of farms are presented in table 2. It can be seen from the table that the total cost (Cost D) per ha was estimated to be Rs 108527 on an average farm and was slightly higher in a small category of farms (Rs 114628) as compared to large farms

(Rs 104443). The Cost C and Cost B per ha on an average farm were amounted to Rs 98661 and Rs 67661 and were slightly higher in case of small category of farms than large category of farms.. The operational cost (Cost A) per hectare was found to be Rs 53877 and did not reveal any significant difference across the different categories of farms. The gross returns per hectare were estimated to be Rs 150480 and found to be fairly higher (about 7%) on large farms than on small farms.

It has been noticed from the table that the net return per farm over Cost C and Cost D were found to be, however positive on all the categories of farms. The input output ratio was estimated to be 1.39 and was comparatively higher on large farms (1.48) than on the small farms (1.26).

Analysis of costs and returns is of vital importance both from the point of view of evolving sound production plans and for the formulation of price policy. The costs and returns study of a particular crop enterprise also provides very useful information for improving the farm efficiency.

Table.1 Cost of cultivation of potato on sample farms

(Rs)

Sr. No.	Particulars	Small			Large			Overall		
		Per farm	Per ha	Percent (%)	Per farm	Per ha	Percent (%)	Per farm	Per ha	Percent (%)
1	Material cost									
i	Seed	4498	36871	26.36	16577	35178	26.44	10943	35490	26.23
ii	FYM	875	7170	5.12	3245	6886	5.18	2319	6938	5.13
iii	Fertilisers	334	2741	1.96	1175	2493	1.87	764	2478	1.83
iv	Pesticides	286	2348	1.68	1307	2773	2.08	717	2327	1.72
	Sub total	5993	49130	35.12	22304	47330	35.57	14743	47233	34.91
2	Human labour	6442	52800	37.74	23000	49000	36.82	15600	50400	37.25
3	Bullock labour/tractor charges	559	4574	3.27	2289	4857	3.65	1481	4804	3.55
4	Other nominal cost									
i	Interest on working capital	225	1848	1.32	866	1842	1.38	540	1840	1.36
ii	Interest on fixed capital	1313	10762	7.69	3782	8025	6.03	2821	9149	6.76
iii	Depreciation	291	2388	1.71	953	2023	1.52	661	2144	1.58
iv	Rental value of owned land	426	3493	2.50	2306	4894	3.68	1424	4635	3.42
v	Imputed management cost	1818	14898	10.65	7115	15098	11.35	4677	15112	11.17
	Subtotal	4073	33389	23.87	15022	31882	23.96	10123	32880	24.29
5	Total cost of cultivation	17067	139893	100.00	62615	133069	100.00	41947	135317	100.00

Table.2 Costs and returns from potato on sample farms

		(Rs)					
Sr. No.	Particular	Small		Large		Overall	
1	Cost A	6777	55552	25459	54029	16612	53877
2	Cost B	8516	69807	31547	66948	20862	67661
3	Cost C	12713	104207	44747	94948	30420	98661
4	Cost D	13985	114628	49222	104443	33462	108527
5	Gross returns	17656	144720	73097	155112	46398	150480
6	Net returns over						
i	Cost A	10879	89168	47638	101083	29353	95691
ii	Cost B	9140	74913	41550	88164	25108	81907
iii	Cost C	4943	40513	28350	60164	15978	51819
iv	Cost D	3671	30092	23875	50669	12936	41953
7	Output-input ratio	1.26	1.26	1.48	1.48	1.39	1.39

Table.3 Measures of farm business returns for potato on sample farms

		(Rs)					
Sr. No.	Particular	Small		Large		Overall	
		Per farm	Per ha	Per farm	Per ha	Per farm	Per ha
1	Gross farm income	17656	144720	73097	155112	46398	150480
2	Net farm income	4953	40513	28350	60164	15978	51819
3	Farm family labour income	9140	74913	41550	88164	25108	81907
4	Farm business income	10879	89168	47638	101083	29353	95691
5	Farm investment income	6691	54768	34438	73083	20223	65603

Table.4 Estimated regression coefficients of different factors influencing potato production

Sr. No.	Particulars	Regression coefficient	Small	Large	Overall
1	Constant	b0	0.8686 (0.3301)	0.1451 (0.2635)	0.4212 (0.1696)
2	Seed (X1)	b1	1.0940* (0.3365)	0.1812 (0.2131)	0.5144* (0.1715)
3	FYM (X2)	b2	-0.1436 (0.1527)	-0.1983** (0.1257)	-0.0523 (0.2173)
4	Fertiliser (X3)	b3	-0.1048 (0.5142)	1.3894* (1.0418)	0.5638* (0.2173)
5	Human labour (X4)	b4	0.1485 (0.2257)	-0.3654** (0.2237)	-0.0370 (0.1393)
6	Operational holding (X5)	b5	0.1308** (0.0828)	0.0078 (0.1311)	0.0677** (0.0460)
7	Adjusted coefficient of multiple determination	R 2	0.9273*	0.9408*	0.9324*
8	Return to scale	Σb_i	1.1250	1.0148	1.0566

Note: Figures in parentheses indicate standard errors

* Significant at 1% level of significance

** Significant at 10% level of significance

Farm efficiency

In order to analyse the efficiency of potato production under different categories of farms the various farm efficiency measures have been worked out and are presented in table 3. This table indicates that the gross farm income per hectare was found to be Rs 150480 on an average farm and did not reveal much significantly difference across the small and large category of farms. However, as per farm basis the gross farm income from potato in case of large farms was recorded to be higher than four per cent in case of large farms (Rs 73097) as compared to small farms (Rs 17656). The net farm income per hectare was recorded to be Rs 51819 on an average farm, however, on per farm basis it was found to be Rs 4943 in case of small farms. Farm family labour income on per farm basis was found to be quite high in case of large farms (Rs 41550) as compared to the small farms (Rs 9140). This shows that more availability and utilisation of family labour by the large farms than there of small farms. The other income measures such as farm business income and farm investment income also revealed similar trends across small and large category of farms. Therefore, it can be concluded that a wide disparity was observed in various business returns on per farm basis whereas, as per hectare basis the various farm income measures were found to be fairly high in case of large farms.

Production function analysis

The summary of the values of the related statistics of the Cobb-Douglas production function model are given in table 4. The production function explained about 93 per cent variation in production of potato. On an average farm the quantity of seed (X1), fertilisers (X3) and the size of the holding (X5) had significant effect on potato production. This indicates that there is a scope for increasing the production as well as profit from potato. The size of operational holding (X5) had also a positive significant effect on the production of potato on an average farm. This indicates that the

production of potato could be increased with increasing the size of total holding by putting more area under this crop. The table further shows that the FYM (X2), human labour(X4) exhibited negative significant effect on production in case of large farms. This indicates that there is over utilisation of FYM and human labour by the large farms and there is need to divert the use of excess FYM and employment of surplus human labour to other competing crops. In small farms, seed (X1) and operational holding (X5) had significant positive influence on production of potato. The sum of elasticities was 1.0566 and was significantly different from unity and thus revealed increasing returns to scales. This indicates economics of scale and scope for enhancing the production while more use of seed (X1), fertiliser (X2) and size of operational holding (X5).

Irrespective of farm size, the cost of seed, labour, manure, fertilizer and pesticides were the important components of operational cost. Similarly rental value of owned land, interest on fixed capital and depreciation charges were the major component of fixed cost. The result indicated that the cost of labour constituted the largest amount to the total variable cost. The output –input ratio was higher on large farms (1.48) than on small farms (1.26). Production function analysis indicated that seed, fertiliser and size of operational holding were the most important factors affecting the production of potato.

The resource use efficiency indicates the scope for enhancing the production while more use of seed, fertiliser and size of operational holding. The cost of seed potato accounted for one-fourth of the total cost, hence the provisions of cheap and good quality seed to farmers will help them to raise the yield levels and lower the cost of production. The use of seed, fertilizers, farm yard manure and pesticides was found much below their recommended levels. So farmers need to be educated to use these inputs as per package of practices to enhance the profitability of potato.

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