

Research Paper

Economic Evaluation of Cost and Returns of Potato Crop towards Livelihood Security of Farmers in the Nalanda District of Bihar

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ABSTRACT

India is the world's second – larger producer of veggies, after China. The primary vegetable grown in Nalanda is the potato. The goal of the current analysis was to analysis potato farming costs and returns using various cost models. The study was carried out in Bihar sarif and Noor Sharai block, which were chosen due to their high potato production and area. Number of farmers in each category based on probability proportional to size (PPS). Cost of cultivation of potato on the sample farms in Nalanda district of Bihar. Production is generally considered to be a function of area and yield. The selection of crop enterprise to be chosen in the farm and the location and distribution of resources within it depend to a great extent on the yield of the crop, its price and the cost of the inputs used for its production. These measurements for potatoes were developed as a result of taking into account the cost of cultivation and returns on various production aspects when choosing a crop. Per hectare, on an average ₹ 92552.03 was spent on potato. In the medium farm category, ₹ 100166 was spent on farming the highest. Followed by small farms ₹ 92867 and marginal farms ₹ 84623.09. The cost of various components of cultivation such as tubers (seeds) is the highest (22.95%) in the variable cost, followed by (19.46 per cent) Human labour. The remaining significant factor included the fertilizer (8.82 per cent), irrigation charge 7.77 per cent, machine charge 6.49 per cent, plant protection 3.79 per cent, manure 3.06 per cent, depreciation rate 1.62 per cent and land revenue 0.24 per cent and the percentage of rental value of own land includes cost of fixed cost (21.61 per cent), interest on fixed capital 2.95 per cent and interest on working capital 1.23 per cent.

HIGHLIGHTS

- ① Cost of farming is an important mechanism for generating data for the survey. These are very in-depth surveys that are used to bring together data on the different occupations carried out by farmers.
- ② The basis of data collection observation inquiry in these surveys is that information about enterprise usage is obtained from the farmer enquiry. Usage is a continuous process from beginning to end.
- ③ Data collection under in servers is officially recorded in multiple rounds to ensure that no information is included in the database.
- ④ A large amount of data is generated through these surveys. The data thus collected is generally used for extraction of cost per unit area or cost per unit.

Keywords: The cost of cultivation, the cost of production, Net returns, Returns per rupee, Farm business income

One of the most productive regions of the world, the vast Indo-Gangetic plains is represented by Bihar. It provides ideal agro- climatic conditions for raising a variety of crops. About 42% of Bihar's GDP is generated from agriculture, which employs about 80% of the state's workforce. Due to the fact that 89.5% of the state's population has a rural or

farming background, Bihar contributes 39% of the nation's agricultural GDP as opposed to the average

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of 24.3% for the entire country. With a per capita income of roughly one – fourth of the country, Bihar ranks third in people and tenth in the area. With 83 million people and an annual population growth of roughly 2.43 %, Bihar state of India has the highest population. Potato is the fourth most important food crop of Bihar after maize, wheat and rice. High in nutrients, simple to digest, and recognized as a healthful crop with enormous potential for assuring food and nutritional security for millions of people significant issues in Bihar. This crop was determined to be the most labour- and capital-intensive because of the high costs of seed, fertiliser, and human labour. Human labour alone made up over 35% of the ₹ 135317 total costs, backed by seed (23%). The return input ratio over the total shelled out of the cost was therefore 1:1.39. The investigation revealed that by optimising the use of labour, manures, and fertilisers, there is significant potential to increase the profit from the potato harvest (Sharma *et al.* 2017)

RESEARCH METHODOLOGY

According to the probability ratio of farmers in each size category, 150 farmers who cultivate potatoes on various types of land were chosen as a sample. A comprehensive list of every vegetable producer in the chosen villages was compiled for the purpose of choosing the farmers, and it was ordered in ascending order according to the area dedicated to the chosen crop. Based on the area planted with vegetables, there were three categories of farmers: marginal, small and medium. By probabilistic proportion to holding, the sample of 13 to 18 farmers from each village was chosen randomly.

ANALYTICAL TOOLS

Cost of cultivation

Various cost concepts provided by the Commission for Agricultural the Cost and Prices (CACP) were used to calculate the cost of growing the potato crop.

Cost A₁: It includes: –

- (i) Value of hired human labour
- (ii) Value of hired and owned bullock labour
- (iii) Value of hired and owned machine labour
- (iv) Value of seed (both farm seed and purchased)

- (v) Value of manures (owned and purchased) and fertilizers
- (vi) Depreciation
- (vii) Irrigation charges
- (viii) Land revenue
- (ix) Interest on working capital
- (x) Miscellaneous expanses

Cost A₂: Cost A1 + rent paid for leased-in land

Cost B₁: Cost A1 + interest on fixed capital (excluding land)

Cost B₂: Cost B1 + rental value of owned land + rent for leased-in land

Cost C₁: Cost B1 + imputed value of family labour

Cost C₂: Cost B2 + imputed value of family labour

Cost C₃: Cost C2 + 10 per cent of cost C2 as management cost.

Cost of production: The cost of production was worked by using following formula:

Cost of production (₹/q) =

$$\frac{\text{Cost of cultivation/ha}}{\text{Quantity of main product/ha}}$$

Income measures: Following income measures were calculated: –

1. **Gross income:** It is the total value of main product.

$$GI = (Qm \times Pm)$$

Where,

GI = Gross income

Qm = Quantity of main product

Pm = Price of main product

2. **Returns over variable cost (RVC)**

$$RVC = \text{Gross income} - \text{Cost A1}$$

3. **Farm business income (FBI)**

$$FBI = \text{Gross income} - \text{Cost A2}$$

4. **Family labour income (FLI) or returns to family labour**

$$FLI = \text{Gross income} - \text{Cost B2}$$

5. **Net income (NI)**

$$NI = \text{Gross income} - \text{Cost C2}$$

6. Farm investment income (FIN)

Farm business income – imputed value of family labour

7. Returns to management

$RM = \text{Gross income} - \text{Cost C3}$

8. Returns per rupee (RPR)

$$RPR = \frac{\text{Gross income/ha}}{\text{Cost C2 /ha}}$$

Cost of cultivation and different cost concept

In table 2, it is provided comparative estimates of various expenditures spent in the cultivation of potatoes for various size groups. Potato offers positive benefits to farmers of all farm size groups as far as farm business income, family labour income and farm investment income, return over variable cost, return per Rupees and Return to management are concerned, as shown in Table 2, the range of return above variable cost was from ₹ 162153.51 to ₹ 188016. As the size of the land holding expanded, the returns over variable costs also increased. There was no difference between cost A1 and A2 because land leasing for vegetable production was not common in the research area, therefore farm business revenue, which represents returns over costs A2, was the same as returns over variable cost. From ₹ 140969.04 on marginal farms to ₹ 166944 on medium farms, the family labour income per hectare of potato cultivation varied. The total household labour income was calculated to be ₹ 155625.70 per hectare. On a cost C3 basis, the total returns to management from potato farming were ₹ 13721.83 per hectare. On various land size holding, it ranges from ₹ 120236.73 to ₹ 153613.4.

RESULTS AND DISCUSSION

According to size group, Table 1 gives the expenses incurred by different size groups in different processes of potato growing. On an average ₹ 92552.03 was spent on potatoes per acre. The lowest cost of cultivation was in marginal and small farms (₹ 92867), while the highest was in medium farms (₹ 100166). The cost of cultivation's various components in variable cost like tuber (seed) accounted for the highest amount of (22.95%), followed by Human labor (19.46 per cent). The remaining significant factor included the fertilizer (8.82%), irrigation charge 7.77 %, machine charge 6.49 %, plant protection 3.79 per cent, manure 3.06 per cent and additional the expense involved with potato growing.

Table 1: The Cost of input of potato cultivation in different size of farms holdings

Items	Marginal	%	Small	%	Medium	%	Sample Average	%
Variable cost								
Family labour	12270	14.50	11874	12.79	3314	3.31	9152.67	9.89
Hired	4576	5.41	7099	7.64	14900	14.88	8858.33	9.57
Machine charge	4753	5.62	5775	6.22	7502	7.49	6010.00	6.49
(Tubers) Seed	16552	19.56	21155	22.78	26012	25.97	21239.67	22.95
Manure	2405	2.84	2740	2.95	3349	3.34	2831.33	3.06
Fertilizer	8114	9.59	8066	8.69	8312	8.30	8164.00	8.82
Plant protection measures	3168	3.74	3535	3.81	3827	3.82	3510.00	3.79
Irrigation charger	7751	9.16	7211	7.76	6624	6.61	7195.33	7.77
Depreciation	1347.37	1.59	1548	1.67	1602	1.60	1499.12	1.62
Land revenue	230.52	0.27	225	0.24	210	0.21	221.84	0.24
Total variable cost	48896.89	57.78	57354	61.76	72338	72.22	59529.63	64.32
Fixed cost								
Interest on fixed capital @ 11 %	2271.73	2.68	2481	2.67	3442	3.44	2731.58	2.95
Rental value of own land	20000	23.63	20000	21.54	20000	19.97	20000.00	21.61
Interest on working capital @7.5%	1184.47	1.40	1158	1.25	1072	1.07	1138.16	1.23
Total Fixed cost	23456.2	27.72	23639	25.45	24514	24.47	23869.73	25.79
Total Cost	84623.09	100	92867	100	100166	100	92552.03	100

Table 2: Cost and returns in potato production

Particulars	Marginal	Small	Medium	Sample Average
Cost of Cultivation (₹/ha)	84623.09	92867	100166	92552.03
Production (Q/ha)	191.31	196.67	202.92	196.97
Price (₹/ha)	1115.06	1220.1	1300	1211.72
Gross returns (₹/Ha)	213322.13	239957.07	263796	238668.45
Net returns (₹/ha)	128699.04	147090.07	163630	146473.04
Cost of production (₹/Q)	442.33	472.20	493.62	469.39

Table 3: The cost of cultivation of potato on different the cost concepts various-sized holdings (Rupees per hectare)

Particulars	Marginal (<1 ha)	Small (1-2 ha)	Medium (2-10 ha)	Sample Average
Cost A1	51168.62	59835	75780	62261.21
Cost A2	51168.62	59835	75780	62261.21
Cost B1	52353.09	60993	76852	63399.36
Cost B2	72353.09	80993	96852	83399.36
Cost C1	64623.09	72867	80166	72552.03
Cost C2	84623.09	92867	100166	92552.03
Cost C3	93085.40	102153.7	110182.6	101807.23

Table 2: Potato production costs and returns with growing the farm size of households, it was observed that parameters like the cost of cultivation, gross return, and the cost of production of potatoes were rising. However, marginal, small, and medium potato growers, respectively, had net returns on production of ₹ 128699.04, ₹ 147090.07 and ₹ 163630 of potatoes. This showed that medium farmers used their resources the best, followed by small farmers and finally marginal potato growers. The yield of potatoes per hectare was, on average, 196.97 quintals. The figure shows that, on average, potato growers made ₹ 238668.45/Ha. in net income from potato farming.

The data on table 3 indicates that on marginal, small and medium farms, respectively, the total cost of cultivation (C2) for potatoes per hectare was ₹ 84623.09, ₹ 92867, and ₹ 100166, cost A1 was, on average, ₹ 62261.21; The figure shows that the average cost to produce one hectare of potatoes in the study region was calculated at ₹ 62261.21, of which cost A1, which is a sum of all variable costs, came to be calculate at ₹ 62261.21 per hectare of the overall expenses (Cost C3). Cost A1 increased to ₹ 63399.36 per hectare after interest on the fixed capital was added. This expense is referred to as cost B1 of the total expense. Cost B2 of the total cost was ₹ 83399.36. Cost C1, which is the sum of

cost B1 and the imputed value of family labour, was determined to be ₹ 72552.03. Cost C2, which made up ₹ 92552.03 per acre of the total cost, is made up of Cost B2 and the imputed value of family labour. The total cost, or cost C3, which is comprised of cost C2 and 10% of cost C2 as managerial costs, was calculated to be ₹ 101807.23 per acre total, which includes administrative costs. As the size of the farm increased, an upward tendency in various costs was seen.

Income Measures

In Table 4, there is a comparison of different income indicators from potato farming in Nalanda district. Potato offers positive benefits to farmers of all farm size groups as far as farm business income, family labour income and farm investment income, return over variable cost, return per Rupees and Return to management are concerned, as shown in Table 4. The range of return over variable cost was from ₹ 162153.51 to 188016. As the size of the land holding expanded, the returns over variable costs also increased. Costs A1 and A2 were same since land leasing for vegetable production was uncommon in the study area. As a result, farm business revenue, which represents returns over costs A2, was identical to returns over variable costs.

Table 4: Returns from cultivation of potato crop on sample farms (₹/Ha.)

Particulars	Marginal	Small	Medium	Sample Average
Return over variable cost	162153.51	180122.07	188016	176763.86
Farm business income	162153.51	180122.07	188016	176763.86
Family labour income	140969.04	158964.07	166944	155625.70
Farm investment income	149883.51	168248.07	184702	167611.19
Return per rupees	2.52	2.58	2.63	2.58
Return to management	120236.73	137803.37	153613.4	137217.83

Table 5: Net returns per hectare from potato cultivation on various cost concept (₹)

Particulars	Marginal (<1 ha)	Small (1-2 ha)	Medium (2-10 ha)	Sample Average
Cost A1	162153.51	180122.07	188016	176763.86
Cost A2	162153.51	180122.07	188016	176763.86
Cost B1	160969.04	178964.07	186944	175625.70
Cost B2	140969.04	158964.07	166944	155625.70
Cost C1	148699.04	167090.07	183630	166473.04
Cost C2	128699.04	147090.07	163630	146473.04
Cost C3	120236.73	137803.37	153613.4	137217.83

Table 6: Returns per rupees of investment in potato cultivation

Particulars	Marginal (<1 ha)	Small (1-2 ha)	Medium (2-10 ha)	Sample Average
Cost A1	4.17	4.01	3.48	3.89
Cost A2	4.17	4.01	3.48	3.89
Cost B1	4.07	3.93	3.43	3.81
Cost B2	2.95	2.96	3.29	3.07
Cost C1	3.30	3.29	3.29	3.29
Cost C2	2.52	2.58	2.63	2.58
Cost C3	2.29	2.35	2.39	2.34

The family labour income per hectare of potato cultivation ranged from ₹ 140969.04 on marginal farms to ₹ 166944 on medium farms, and the total household labour income was assessed to be ₹ 155625.70 per hectare. On a cost-3 basis, the total returns to management from potato cultivation were ₹ 137217.83/ha. The average total farm investment income was ₹ 167611.19/ha. On various the land size holding, it ranges from ₹ 120236.73 to ₹ 153613.4.

Net returns on different cost concept basis

It is clear from Table 5 that, altogether, the returns from costs A1, A2, B1, B2, C1, C2 and C3 were, respectively, ₹ 176736.86, ₹ 176763.86, ₹ 175625.70, ₹ 155625.70, ₹ 166473.04, ₹ 146473.04 and ₹ 137217.83 per hectare of potato production.

One of the best ways to gauge the economic viability of any crop is return on investment in rupees. For the cultivation of potato, this is shown in Table 6. This table clearly shows that the average values for the C1 C2 and C3 were 3.89, 3.89, 3.81, 3.07, 3.29 and 2.34, respectively. Medium farms yielded the best returns per rupees of investment on a cost – per – unit (C2) basis (2.63), followed by marginal (2.58) and small (2.52). The results demonstrated that medium farms were more effective than small – sized and marginal sized farms, mostly due to lower cost per unit of output.

In Table 7, it is shown how much it costs to produce potato across various categories of land size. According to costs C2 basis, it is revealed that a quintal of potatoes cost, on average, 469.39

Table 7: The Cost of production of potato different size holding

Particulars	Marginal (<1 ha)	Small (1-2 ha)	Medium (2-10 ha)	Sample Average
Cost A1	267.46	304.24	373.45	315.05
Cost A2	267.46	304.24	373.45	315.05
Cost B1	273.66	310.13	378.73	320.84
Cost B2	378.20	411.82	477.29	422.44
Cost C1	337.79	370.50	395.06	367.79
Cost C2	442.33	472.20	493.62	469.39
Cost C3	486.57	519.42	542.99	516.32

to produce. Production costs were 315.05, 315.05, 320.84, 422.44, 367.79 and 516.32. C2 is the main production cost, using the following bases: A1, A2, B1, B2, C1, and C3. A marginal, small, and medium-sized group's trend towards growth is 2.58.

CONCLUSION

Potato cultivation costs tended to rise as holding size increased. The yield per hectare was higher on medium farms than on small and marginal farms. As a result, medium farms had greater gross returns per hectare of potato farming. According to a study area sample farm cost of cultivation analysis, the average total (cost C2) per hectare of potato production was ₹ 92552.03 medium farms had the greatest C2 costs, followed by small and marginal farms. The total gross income from potato farming per hectare was ₹ 238668.45. On medium-sized farms, this was higher than on marginal and small farms. The pattern was the same for the family's labour – based income. The household labour income per hectare, on an average, was ₹ 155625.70. Potato production generated that medium farm made the most money per hectare, followed by small and marginal sized farms. The average cost of production on the sample farms was (₹ 469.39). on an average, 2.58 rupees were earned for every rupee invested. It was highest on (2.63) medium Farms, (2.58) small farms and (2.52) marginal farms respectively.

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