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Profitability analysis of potato cultivation: A study in Munshiganj district of Bangladesh

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ABSTRACT

The overall objective of the study was to analyze the profitability of potato cultivation in some selected areas of Munshiganj district. For this study, 100 respondents with different income groups were selected as sample size purposively. Data were collected through farm survey by using a suitable pre-tested questionnaire in February-March, 2018. The study found that potato production was lucrative. Total cost of potato growing was BDT Tk. 144584.41 and the gross return amount was BDT Tk. 254000.00 per hectare. The net return from potato production was BDT Tk. 109415.49 per hectare. Undiscounted Benefit Cost Ratio (BCR) was found at 1.78 and 1.75. Potato is not an outstanding source of energy yet a good source of high quality protein. Potato is a rich source of vitamin C; it is rich in important minerals. These were grouped into economic and technical, marketing and storage problems. Though farmers were facing some acute problems such as low market prices of potato and high input prices, it would not hinder the expansion of potato production due to its huge demand.

Key Words: *Potato, Profitability, Production, Benefit Cost Ratio and Problems.*

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I. Introduction

Potato (*Solanum tuberosum*) is a leading agricultural crop in Bangladesh. It is called as "The King of Vegetable". It has emerged as the third most important crop in Bangladesh. Our soil and the climatic feature offer a high potential for potato growth. Bangladesh grows potato in about 9.47 million hectares of area with an average return of 19.93-per hectare (BBS, 2016). Potato production has been rapidly commensurate to cereal crops such as wheat and rice (Azimuddin et al., 2009). Potato growing is a profitable business and institutions are giving loans for that (Majid, 2004). In Rangpur district alternative production of rice and potatoes was profitable (Firdawsi, 2008). Therefore, the net return on the production of potatoes was higher per hectare than that of rice Aman and Boro. The average daily calorie consumption per capita was in larger households (2407 K. calorie) followed by marginal (1856 K. calorie).

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In two districts of Bangladesh i.e. Bogra and Munshigonj yield per acre hectare was much higher Munshigonj (25009 kg) than that of Bogra (13278 kg). The estimated average net return per hectare was TK. 7211, which was higher in Munshigonj (TK. 8751) than in Bogra (TK. 4953) (Elias et al. 1982). While in Thakurgaon the gross returns per hectare were BDT 206623. The net returns were BDT 77296 and 93563, respectively, on total and cash costs. The gross returns per hectare were BDT 206623 (Yeasmin, 2008). Evidence has shown that both full-cost and cash-based potato growing was profitable and institutional loans were lucrative in Bogra. The average potato production per acre was 800, 740 and 760 kg for small, medium and large farmers. Through loan support by RAKUB (contributes more than other institutional sources of loans) small-scale loan farmers, follow-up to medium and large farmers, was increased income (Majid, 2004). In Mymensingh, potato growing was profitable under institutional credit. Sonali Bank Ltd. was more involved than any other institutional source as a potato finance agency. The average potato yield per hectare was 30732, 28934 and 28043 kg for small, medium and large farmers, respectively. The results indicate highest benefit for small loan farmers (Hossain, 2008). The profitability varies depends on different issues. Under this circumstance a preliminary survey was to analyze the profitability of potato cultivation in some selected areas of Munshiganj district.

II. Materials and Methods

Sampling technique

The study was conducted in five upazilas of Munshiganj district, which were: Sreenagar, Sirajdikhan, Tongibari, Munshiganj Sadar and Gazaria. A total of 100 potato farmers taking at least 15 farmers from each upazila were selected by random sampling technique.

Method of data collection

Following the conventional survey techniques, primary data on resource availability and their use, input-output levels, prices of farm production and inputs, and some other information were collected by interviewing the farmers personally using a designed and pre-tested questionnaire in February-March, 2018.

Data analysis

Both fixed cost and variable cost were taken into account in calculating the cost of potato cultivation. Land use cost was calculated based on per year existing lease value of land. Irrespective of potato varieties, the profitability of potato production was examined based on gross return, gross margin, net return and benefit cost ratio analysis. The collected data were edited, summarized, tabulated and analyzed to fulfill the objectives of the study. The cost of purchased inputs and home supplied inputs were not calculated separately. The cost of potato cultivation can be broadly classified under the following two heads:

a) Variable cost

- Cost of seed
- Labor cost
- Fertilizers cost
- Machinery and animal cost and
- Interest on operating capital

b) Fixed cost

- Land use cost

Cost of seed: Seed cost the one of the main cost items for potato farms. Cost of seed is the money value of total costs of potato seed, purchased or kept from previous year by the farmers during Potato cultivation

Human labor cost: Human labor cost was another most important input in the production of potato. Labor cost includes both family labor and Hired labors because there was significant use of hired labor in this cultivation. Eight adult male hours were equivalent to one man-day and the opportunity cost principle was used to estimate the wage rate of labor.

Fertilizer cost: Fertilizer was one of the largest and the major cost items of potato cultivation. Cost of fertilizer included (Urea, TSP, MP, Gypsum etc.). Fertilizer costs were calculated at the prevailing local market rates.

Animal labor cost: Animal were generally used for laddering in land preparation and threshing. Most of the farmers of the study areas used their own animals. Sometimes they also hired power animals on pair hour basis. Animal labor included a pair of animals and an attended. An animal pair day consisted of six hours. For calculating animal labor cost, the cost of human labor was deducted from the cost paid for the services of a pair of with the ploughman, because the cost of attended was included in the human labor cost.

Machinery cost: The cost of machinery services was estimated based on the real costs incurred by farmers in potato. In the field of research, almost every sample farmer used electricity tiller and other land preparation and threshing machinery. They used power tiller hired mainly. An owner of power tiller provided both fuel and a driver to prepare and thresh the ground. The expense of the equipment included the service fee.

Land use cost: Depending on the location, topography and fertility of the soil, land use costs may vary for different points. Land has been used to cultivate potato for a span of four months from soil preparation to harvesting. In this analysis, cost for land use has been determined by taking into account the cash rental value of the land as the other alternative.

Operating capital interest: In this analysis, the amount of money required to cover the costs of inputs bought or leased was considered to be the operating capital. At a rate of 10 percent per year, operating capital interest has been estimated. Operating capital interest was measured with the formulation that follows (Mia et al., 2013).

$$IOC = AIit$$

Where,

IOC= Interest on operating capital
I= Rate of interest
AI = Total investment / 2
t = Total time period of a cycle

III. Results and Discussion

Table 01 showed per hectare variable cost of potato cultivation of farmers. Total variable cost included tillage, seeds, urea, TSP, MoP, gypsum, manure, oil cake insecticides and irrigation, etc. The total other variable cost is Tk. 93887. The average price of Potato seed was found Tk. 48 per kg. Per hectare cost of seeds for Potato production was calculated at Tk. 57600 which constituted 39 percent of the total production cost. The present study calculated per hectare cost of fertilizer and irrigation was Tk. 31100, which was 21.5 percent of the total cost.

Table 01. Variable cost of potato production in study area

Items of returns/costs	Unit	Quantity	Price per unit (Tk)	Total value (Tk)	% of total
Tillage	Tk	3 times	1729	5187	6%
Seeds	Kg	1200	48	57600	61%
Urea	Kg	300	22	6600	7%
TSP	Kg	150	25	3750	4%
MOP	Kg	200	15	3000	3%
Gypsum	Kg	25	8	200	0%
Manure and oil cake	Kg	7000	1	7000	7%
Insecticides	Tk	n.a	-	3550	4%
Irrigation	Tk	n.a	-	7000	7%
Total	Tk	-	-	93887	100%

Source: Field Survey 2018

In Table 02, per hectare, human labor costs of potato cultivation of farmers were shown. Total human labor cost included ladder, first time applying, fertilizer, applying cow dung, making peet, making bead, seedlings, land use, second time applying fertilizer, to lift the soil, third time applying, fertilizer weeding, irrigation, making fence, pesticides, lift and carry, drying and warehousing, carrying cost on local market etc. Fixed cost included also land value. In the study area, the average wage rate was determined Tk. 300 per man-day, women laborers were used during the harvesting periods. Per

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hectare cost of human labor was calculated in the present study was Tk. 48264.9, which was 33.36 percent of the total cost.

Table 02. Human labor cost of potato production in study area

Particulars	Family			Hired			Total		
	No	Wage	Cost (Tk./ha)	No	Wage	Cost (Tk./ha)	No	Wage	Cost (Tk./ha)
Land cleaning	3.9	300.7	1174.5	3.3	290.6	952.1	7.2	295.7	2123.4
Land preparation	3.4	308.8	1050.7	2.3	304.6	690.9	5.7	306.7	1739.2
Ladder	4.7	312.0	1474.2	2.9	306.7	888.9	7.6	309.3	2358.2
1st fertilizer application	3.9	310.0	1210.9	1.1	343.3	389.3	5.0	326.7	1646.4
Applying cowdung	2.4	356.0	852.3	12.1	340.6	4120	14.5	348.3	5046.9
Making peet	4.9	326.0	1588.3	5.9	333.9	1977.5	10.8	330.0	3561.7
Making bed	2.5	359.4	887.7	13.3	353.8	4687.9	15.7	356.6	5605.8
Seedlings	3.1	320.9	993.9	4.1	306.9	1242.9	7.1	313.9	2243.5
Land use									24325.1
2nd fertilizer application	3.7	331.3	1235.7	1.4	325.0	451.8	5.1	328.2	1680.1
To lift the soil	4.5	344.2	1542.0	7.0	348.6	2433.0	11.5	346.4	3969.6
3rd fertilizer application	4.0	327.5	1303.5	1.9	326.7	617.5	5.9	327.1	1920.1
Weeding	3.4	323.8	1084.7	0.9	337.5	297.0	4.2	330.7	1398.6
Irrigation	3.5	325.6	1149.4	2.3	333.3	756.7	5.8	329.5	1910.9
Making fence	1.9	340.0	642.6	0	0	0	1.9	340.0	642.6
Pesticides	4.4	331.1	1460.2	6.6	360.0	2376.0	11.0	345.6	3804.5
Lift and carry	4.0	327.5	1303.5	1.9	326.7	617.5	5.9	327.1	1920.1
Drying and warehousing	3.9	310.0	1210.9	1.1	343.3	389.3	5.0	326.7	1646.4
Carrying cost on local market	2.4	356.0	852.3	12.1	340.6	4120	14.5	348.3	5046.9
Total	64.5	5910.8	21017.3	80.2	5622.1	27008.3	144.4	5936.8	48264.9

Source: Field Survey 2018

In Table 03, per hectare fixed cost was Tk. 2432.51. In this study, land valuation as its rental price considered the method of estimating the land value. Land cost of potato cultivation was estimated considering land used over a production period of 1 year.

Table 03. Fixed cost of potato production in study area

Items of returns/costs	Unit	Quantity	Price per unit (Tk)	Total value (Tk)	% of total
Interest on OC (Land use)	Tk	24325.1	@10%	2432.51	1.24

In order to estimate total cost per hectare all the resources used in potato production has been recapture together. Per hectare total cost of potato production was tk. 144584.41 Too get the average per hectare cost of all the resources used in the production process of Potato by the farmers the previous mentioned costs have been summed up in the Table 04.

Table 04. Per hectare total cost of potato production in study area

Items of returns/costs	Unit	Ariable cost	Fixed cost	Total (Tk)	% of total
Total cost	Tk	142151.90	2432.51	144584.41	100

Source: Field Survey 2018

The average yield of Potato per hectare was 30500 kg and its respective value was calculated at Tk. 254000 in the above Table 05. It may be noted here that the price of potato was reported to be Tk. 8 per kg which was the average farm gate price in the study area. In the case of potato production, the return of by-products is very difficult. But potato chips are one of the most popular food items in our local area. There is very little valuation of the by-product of potatoes.

Table 05. Gross returns of potato production in study area

Items of returns/cost	Unit	Quantity	Price per unit (TK)	Total value (Tk)	% of Total
Main product	Kg	30500.00	8.00	244000.00	96.99
By-product	TK	N/A	-	10,000.00	3.01
Total returns	TK	-	-	254000.00	100.00

Source: Field Survey 2018

The total value of the by-products was Tk. 10,000.00 which was 3.01 percent of the total value. The quantity of the main product was 30500.00 kg. If the price of the potato per unit was Tk. 8.00, the total value of the main product of the potato was Tk. 2,44,000.00 in the study area. It is considered to be 96.9 per cent. Thus, the gross return on potato production was= (2,44,000.00+ 10,000.00) Tk. = Tk. 2,54,000.00.

From Table 06 it was clear that that NR was calculated by subtracting TC from GR. NR was estimated at Tk. 109415.49 per hectare for potato production. Potato production is profitable for the farmers of the study area.

Table 06. Net Return (Gross return – Total cost) of potato production in study area

Items of returns/costs	Unit	Quantity	Price per unit (Tk)	Total value (Tk)
Net return	Tk	-	-	109415.49

Source: Field Survey 2018

The undiscounted benefit cost ratio (BCR) is a relative measure which is used to compare benefits per unit of cost. It is evident from the table that BCR was 1.78 and 1.75 which indicates that farmers get higher profit. The result clearly suggests that potato production was profitable for farmers in 2018 and per kg cost became Tk. 4.74 for potato (Table 07).

Table 07. BCR (Benefit Cost Ratio) of potato production in study area

Items of returns/costs	GR (Tk.)	Total cost/TVC (TK.)	Ratio
BCR (Full Cost Basis)	2,54,000.00.	TC 144584.41	GR/TC 1.75
BCR (Variable Cost Basis)	2,54,000.00.	TVC (142151.90)	GR/TVC 1.78

Source: Field Survey 2018

Profitability of potato cultivation

The yield of potato was 29.5 tons per hectare which was higher than the national average yield (19.13 t ha^{-1}) (BBS, 2015). Earlier Elias et al, (1982) studied improved technology of potato in two district of Bangladesh, Bogra and Munshigonj. They found that the yield per acre hectre was much higher Munshigonj (25009 kg) than that of Bogra (13278 kg). Estimated BCR implicate that the cultivation of potato was still remunerative to the farmers. According to survey in study area the price of potato was reported to be Tk. 8 per kg which was the average farm gate price and the yield of potato 30500 kg per hectare. The gross return and gross margin of potato cultivation were Tk. 2,54,000 and Tk. 1,11,848 per hectare, respectively. The net return of potato cultivation was Tk. 1,09,415.49 per hectare. Although extra amount of variable inputs were used by farmer the average benefit-cost ratios (BCR) were 1.78 and 1.75 on full cost and variable cost basis.

Problems on potato cultivation

For the sake of analytical convenience constraints were broadly classified under three categories such as-

Economic and technical problems: The multifarious problems faced by potato growers are universal and are interlinked with one another. The researcher has attempted to throw light on economic and technical problems, based on empirical studies. About 20% farmers said that Lack of scientific knowledge, High prices fertilizer and insecticides and Lack of capital or institution credit are the major problem in the Table 08.

Table 08. Major constraints faced by the farmers in producing and marketing of potato

Nature of problems	No of potato farmers	Percentage
Lack of capital or institution credit	18	18
Lack of scientific knowledge	20	20
Insufficient irrigation	13	13
High prices fertilizer and insecticides	19	19
Lack of human labor availability	15	15
Non availability of quality seed	15	15

Source: Field survey, 2018

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Marketing problems: Results indicates that around 50% marketing problem related to low market price during harvesting period. Then around 44% was packaging problem in the study area (Table 09).

Table 09. Marketing Problem

Nature of problems	No of potato Farmers	Percentage
Low market price of product during harvesting period	50	50
Packaging problem	44	44
g and handling problem	6	6

Source: Field survey, 2018

Storage Problems: In Table 10 we found that around 36% storage problem related to pest and diseases. Farmers were not aware regarding pest and diseases in the study area.

Table 10. Storage Problem

Nature of problems	No of potato Farmers	Percentage
Attack by pest and diseases	36	36
Damage by domestic animal	24	24
Loss of product due to theft	30	30

Source: Field survey, 2018

IV. Conclusion

From the results of the current study, it may be concluded that there are ample scopes which needs to be taken into account to increase the productivity of potato and to rise income, employment rate and nutritional status of the farmers. The management practices of potato production in the study area were not found productive enough. Farmers were still ignorant about the application of inputs in right time with right doses. As a result, they misuse the inputs either by overdose or insufficient dose. Thus well planned management structure with skillful trainer aligned with solving farmer's problems, fulfilling their needs, achieving goals and utilizing resource effectively can lead to enduring production practices and sustainable income earnings from potato.

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