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COMPARING THE PROFITABILITY OF TWO NEW VARIETIES OF POTATO: EVIDENCE FROM MUNSHIGANJ DISTRICT

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Abstract

The overarching goal of the study was to examine the profitability of two new varieties of potato production using evidence from the Munshiganj district. The sample size for this study was purposefully set at 60 from various income categories. In March and April of 2019, data were collected through a farm survey utilizing a pre-tested questionnaire. According to the study, the gross and net returns from Diamant variety of potato were higher than those from Algure potato. The benefit-cost ratio of Diamant potato was higher than that of Algure potato. On the basis of total cost, average per ha cost was estimated at Tk.137317 and Tk.102289 for Diamant and Algure potato respectively. Net return from Diamant potato was Tk.43164 per ha and from Algure potato was Tk.26479 per ha. In case of producing Diamant, BCR was 1.31 and for the Algure potato production it was 1.25 on full cost basis. Farmers age, education level, farm size played a positive role in increasing net return for both Diamant and Algure potato. Family size had negative influence on both variety and year of farming experience had positive influence on Diamant potato and negative effect on Algure potato. The study estimated several technical, economic, marketing, and social issues that impede the expansion of potato production due to its high demand, such as a lack of good quality seed and fertilizers, insufficient funds, high input costs, a lack of adequate cold storage facilities, loss of production due to theft, and so on. Finally, well-planned management training tailored to their challenges, requirements, goals, and resources can lead to the development of successful production techniques and long-term income from potato farming in the study area.

Keywords: Farm, Economics, Production, Quality, Diamant, Algure.

1. Introduction

Agriculture is the main stay of the economy of Bangladesh. It is enjoying a sub-tropical monsoon climate. Bangladesh has been famous for growing large variety of tropical crops particularly rice, wheat, potato, jute, pulses, oilseeds, sugarcane, etc. Potato is one of the important crops and very common vegetable in Bangladesh. It is both a vegetable crop and cash crop. It is an important food crop from the very beginning of human civilization and occupying its position just after wheat and rice in respect of production and consumption (Thompson and Kelly,

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1957). In Bangladesh, potato occupied the first position among all the vegetables in respect of area coverage and production. It contributed 65.65 percent of the total production of vegetables in Bangladesh in 2015 (BBS, 2015). In Indian sub-continent, the cultivation of potato was probably started during the 17th century (Ahmed, 1977). But in Bangladesh the cultivation of potato was started in the late 19th century (Siddique and Hussain, 1988). Potato cultivation was started as a cash crop after 1920 (Hoque, 2004) in Bangladesh. At least in 100 countries, potato is the most important vegetable crop for human consumption.

Potato varieties that are cultivated in Bangladesh are broadly categorized into two groups, local and high yielding. The so-called local cultivars are in fact, not strictly native. There are about 27 local cultivars of potatoes cultivated in different parts of the country. They have familiar local names. The familiar local varieties are: *Sheel bilatee, Lal sheel, Lal pakri, Du hajari, Jhau bilatee and Suryamukhi* are notable. Bangladesh Agricultural Research Institute (BARI) has also established a farm at Debiganj in Panchgarah district for the production of HYV seed potatoes. Among the high yielding popular varieties followings are notable: Cardinal, Diamant, Algure, Kufri shindhury, Patronis, Alpha, Archa, Multa, Ukama, Hira, Maurin, Origo, Alisa etc. Though Bangladesh has become a major potato producer in the SAARC countries, the status of this crop has remained vegetable in the country. The time has come to understand and appreciate the role of potato that can play an important role in the present food situation of Bangladesh, potato is one of the main commercial crops grown all over the country. Various other food items are also made from potato. Adequate supply of potato stabilizes the vegetable market round the year (Moazzem and Fujita, 2004). Recently, the government has been trying to diversifying food habits and encourage potato consumption to reduce pressure on rice. So, potato is becoming an important food item for the food security in Bangladesh.

Elias *et al.* (1980) carried out an economic analysis on potato production in a few locations in Bangladesh. They calculated the average per hectare potato production cost to be Tk.7376 and the average gross return to be Tk. 9931. Elias *et al.* (1982) investigated improved potato technology in two districts of Bangladesh, Bogra and Munshigonj. They estimated that the average net return per hectare was Tk.7211, which was greater in Munshigonj (Tk.8751) than in Bogra (Tk.7211). Islam (1987) conducted a research on potato preservation in cold storage in Bangladesh, including marketing considerations. Sabur (1988) did a study on marketed excess of potatoes in two districts of Bangladesh and discovered that production and marketed surplus of potatoes were moving in the right direction. Das (1992) investigated the economics of potato growing. He calculated the net return above full costs per hectare to be Tk. 11085.89. In the Bogra district, Hakim (1993) did a comparative economic study on Cardinal and various kinds of potatoes. He found that net returns per hectare on a full costs basis were Tk. 45196.65 and Tk. 451.65.

Rashid (1994) examined the profitability of various planting patterns with and without potatoes in two villages in the Dinajpur district. Huq (1998) conducted a study in Dinapjur to evaluate the comparative profitability of potatoes and the factors influencing yield and profit variance. Arif (1998) conducted a potato product research in selected districts of the Comilla district. He demonstrated that the net returns per hectare for small, medium, and large farmers were Tk.37607, Tk.37179, and Tk.366617, respectively. Akhter et al. (2001) carried out a survey on potato production in a few districts in Bangladesh. According to this study, potato growing is highly profitable and might provide farmers with cash. Ahamed (2009) conducted research to compare the economics of Boro rice and potato production. The study's main finding was that rice and potato farming was profitable from the perspective of farmers.

The specific objectives of this study were:

i. to analyze the profitability and influencing aspects of the two potato varieties production; and
ii. to find out the constraints of new variety of potato.

2. Methodology

The present study was conducted in some selected villages under three upazillas namely Gozaria, Sreenagar and Tongibari of Munshiganj district. A total number of 60 households were selected in the proposed research by following purposive random sampling technique with a view to fulfilling the objectives of the study. The period of the investigation covered by the study was potato growing season of 2018-2019. In the study area, potatoes are generally sown in September to October and harvested in January to February.

The following equation was used to estimate the gross return (GR): $GR_i = \Sigma Q_{mi} P_{mi}$

Here, GR_i= Gross return from i^{th} product (Tk./hectare;

Q_{mi}= Quantity of the i^{th} product (kg/hectare;

P_{mi}= Average price of the i^{th} product (Tk./kg);

i= 1,2,3…n

Gross margin (GM) has given an estimate of the difference between total return and variable costs,

GM= TR-VC

Here, GM= Gross margin;

TR= Total return;

VC= Variable cost

Net return (NR) was calculated by deducting all costs (variable and fixed) from total return.

Net return= TR-TC

Here, TC= Total fixed cost + Total variable cost

Multiple linear regression model (log-linear model) model was used to identify the effects of key variables and to determine the contributions of the most important variables in the production process of potato. The following specification of the function was made:

$$Y_i=aX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}e^{ui}$$

The Multiple linear regression model (log-linear model) was converted to the following logarithmic form so that it could be solved by the ordinary least squares method:

$$\log Y_i= \log a+b_1\log X_1+b_2\log X_2+b_3\log X_3+b_4\log X_4+b_5\log X_5+u_i$$

Here,

Y_i= Gross return from potato production (Tk.)

X_1= Farmer's age (year)

X_2= Education level (year)

X_3= Family size (No.)

X_4= Farm size (hectare)

X_5= Year of farming experience (year)

b_1- b_6= Production co-efficient to be estimated

a= Intercept

u_i= Random error term

3. Results and Discussion

Total labor cost for Diamant potato cultivation was Tk.24073 per ha which is 17.53 percent on total cost basis (Table 1). On the other hand, total labor cost of Algure potato cultivation is Tk.21099 per ha which is 20.63 percent of total cost on total cost basis. Land preparation cost for Diamant potato was Tk.12031 per ha which shared 12.87 percent of total cost on total cost basis. For Algure potato land preparation cost was Tk.13161 per ha and it shared 12.87 percent of total cost on total cost basis. Cost of seed was Tk. 20059 per ha for Diamant potato which bears 14.60 percent of total cost on total cost basis and Tk.14893/ha for Algure potato which bears 14.56 percent of total cost on total cost basis (Table 1). Fertilizer cost was determined by the actual market prices paid by the farmers. Average requirement of urea, TSP, MP and boric acid for Diamant potato cultivation were 347.51 kg, 323.21kg, 183.97 kg, 5.34 kg per ha. Cost of urea, TSP, MP, boric acid were Tk.5727, Tk.7807, Tk.2694, Tk.108.77 per ha in the study area which

required 4.17 percent, 5.68 percent, 1.96 percent, 0.41 percent of the total cost respectively on total cost basis.

Table 1. Per hectare average costs and returns of Diamant and Algure potato production on total cost basis

Items		Unit	Diamant Potato				Algure Potato			
			Average				Average			
			Quantity	Price per unit (Tk.)	Cost/ Returns (Tk./ha)	Percentage of total cost	Quantity	Price per unit (Tk.)	Cost/ Returns (Tk./ha)	Percentage of total cost
Labor cost										
Human labor		Tk.	-	-	24073	17.53	-	-	21099	20.63
Material cost										
Land preparation		Tk.	-	-	12031	8.76	-	-	13161	12.87
Seed		Kg	1203.71	17.07	20059	14.60	966.62	15.78	14893	14.56
Chemical fertilizers	Urea	Kg	347.51	16.88	5727	4.17	331.96	17.00	5511	5.39
	TSP	Kg	323.21	24.74	7807	5.68	331.96	24.79	8036	7.86
	MP	Kg	183.97	15.00	2694	1.96	189.30	15.00	2772	2.70
	Boric acid	Kg	5.34	108.77	566	0.41	7.15	108.78	777	0.75
	Others	Tk.	-	-	1073	0.720	-		923.64	0.88
Insecticides		Tk.	-	-	1705	1.24	-	-	1515	1.48
Irrigation		Tk.	-	-	2877	2.10	-	-	1946	1.90
Sorting and packaging		Tk.	-	-	5183	3.77	-	-	4000	3.91
Transportation		Tk.	-	-	2680	1.95	-	-	1500	1.47
Storage		Tk.	-	-	38765	28.23	-	-	14550	14.22
Interest on operating capital		Tk.	-	-	1565	1.14	-	-	1133	1.11
Land use cost		Tk.	-	-	10505	7.65	-	-	10505	10.27
A. Gross cost		Tk.	-	-	137317	100	-	-	102289	100
B. Total Production		Kg	13316	-	-	-	9533	-	-	-
C. Gross return		Tk.	-	13.87	180482	-	-	13.83	128768	-
D. Net return (C-A)		Tk.	-	-	43164	-	-	-	26479	-
E. BCR (C/A)			-	-	1.31	-	-	-	1.25	-

Source: Field survey, 2019

For Allgure potato cultivation average requirement of urea, TSP, MP and boric acid were 331.96 kg, 331.96 kg, 189.30 kg, 7.15 kg per ha cost of urea, TSP, MP and boric acid were Tk.5511, Tk.8036, Tk.2772, Tk.777 per ha in the study area which required 5.39 percent, 7.86 percent, 2.70 percent, 0.75 percent of the total cost respectively on total cost basis. The total average cost for insecticides was Tk.1705/ha for Diamant potato cultivation and it shared 1.24 percent of total cost on total cost basis. For Algure potato cultivation total average cost of insecticides was Tk. 1515 per ha and it shared 1.48 percent of total cost on total cost basis. For Diamant potato cultivation total cost of irrigation was Tk.2877 per ha which bears 2.10 percent of total cost on total cost basis. For Algure potato cultivation total cost of irrigation was Tk.1946 per ha which bears 1.90 percent of total cost on total cost basis. Total average cost of sorting and packaging for Diamant potato is Tk. 5183 per ha and it required 3.77 percent of total cost on total cost basis. For Algure potato total average cost of sorting and packaging is Tk.4000 per ha and it required 3.91 percent of total cost on total cost basis. For Diamant potato the average total transportation cost is Tk. 2680 per ha which shared 1.95 percent of total cost on total cost basis. For Algure potato average transportation cost is Tk.1500 per ha which shared 1.47 percent of total cost on total cost basis.

Average storage cost of Diamant potato is Tk.38765 per ha which required 28.23 percent of total cost on total cost basis (Table 1). Average storage cost of Algure potato is Tk.14550 per ha which required 14.22 percent of total cost on total cost basis. Interest on operating capital of Diamant and Algure potato were estimated at TK.1565 and Tk.1133 per ha respectively. The operating cost of capital was multiplied by 10 per cent interest for both varieties for three months the cost item was included in total cost analysis and it constituted 1.14 percent and 1.11 percent of gross cost of Diamant and Algure potato cultivation respectively. The average perha land use cost was Tk.10758 which representing 7.65 percent and 10.27 of total cost of Diamant and Algure potato cultivation respectively. On the basis of total cost, average per ha cost was estimated at Tk.137317 and Tk.102289 for Diamant and Algure potato respectively. It appears from Table 1 that the storage cost was the highest item in producing Diamant potato, which shared 28.23 percent of total cost. Table 1 reveals that human labor cost is the major cost item for producing Algure potato, which consumed 20.63 percent of total cost. Return from Diamant potato was Tk.180482/ha and from Algure potato was Tk.128768/ha. Per hectare net return of Diamant potato was Tk.43164 and per ha return of Algure potato was Tk.26479 in the study area. In case of producing Diamant potato, BCR was 1.31 and for the Algure potato production, the BCR was 1.25 on full cost basis. Table 1 reveals that per ha cost of Diamant potato production is higher than that of Algure potato production. Per hectare yield of Diamant potato was 13316 kg which was higher than per ha yield of Algure potato 9533 kg. As a result, gross return from Diamant potato was higher than that of Allgure potato. Net return from Diamant potato was also higher than the net return from Algure potato. Benefit cost ratio was higher in Diamant potato than that of Allgure potato.

Table 2. Estimated values of co-efficient and related statistics of multiple linear regression model (log-linear model)

Explanatory variables	Coefficient for Diamant potato	Coefficient for Algure potato
Intercept	3.618	9.072
Farmer's Age	0.956** (0.009)	1.427*** (0.058)
Education level	0.064 (0.119)	0.338** (0.040)
Family size	-0.257** (0.01)	-1.027 (0.188)
Farm size	0.363** (0.0047)	0.751* (0.0006)
Year of farming experience	0.021 (0.403)	-0.462 (0.145)
R^2	0.699	0.591
R^2 (adjusted)	0.637	0.506
F-value	11.164	14.615

Source: Author's calculation based on field survey, 2019

Note: Figures in the parentheses indicate P-values

***,** and * indicates significant at 10%, 5% and 1% level of significance, respectively

Table 3. Major problems faced by the farmers in producing potato

Name of the problem	Diamant	Algure
	Number	Number
Technical Problems		
i. Unavailability of good quality seed	13 (43.33)	15 (50)
ii. Unavailability of sufficient fertilizers in time	10 (33.33)	9 (30)
iii. Lack of farmers' knowledge on scientific method	17 (56.67)	20 (66.67)
iv. Disease infestation	5 (16.67)	6 (20)
v. Ineffective pesticides	6 (20)	7 (23.33)
Economic Problems		
i. Lack of adequate funds	16 (53.33)	18 (60)
ii. High cost of inputs	12 (40)	13 (43.33)
iii. High cost of fertilizers and insecticides	9 (63.33)	21 (70)
Marketing Problems		
i. Lack of adequate cold storage facilities	25 (83.33)	27 (90)
ii. High cold storage charge	17 (56.67)	15 (50)
iii. Low prices at peak harvest period	23 (76.67)	3 (10)
Social Problems		
i. Damage by rat, wild animals or domestic animals	10 (33.33)	9 (30)
ii. Wastage	6 (20)	5 (16.67)
iii. Loss of production due to theft	4 (13.33)	3 (10)

Figures in the parenthesis indicate percentage

Source: Field Survey, 2019

From the above discussion, income of the potato farmers is a complex variable, which is a function of the combined influences of a large number of interacting factors. In this study, multiple linear regression model (log-linear model) analysis

was used to determine the influence of some important factors. Farmer's age, education level, farm size played a positive role in increasing net return for both Diamant and Algure potato (Table 2). Family size had negative influence on both variety and year of farming experience had positive influence on Diamant potato and negative effect on Algure potato. The log linear regression model had the value of coefficient of multiple determinations (R^2) at 0.699 and 0.591 for Diamant and Algure potato respectively. The F-values were highly significant. Most of the variables included in the model were significant in explaining the production of potato. Three variables out of five variables were significant in explaining the net return.

Major Problems Associated with Production and Marketing of Potato:

There were tremendous problems associated with Diamant and Algure potato production in the study area. Problems based on the opinions of the respondents are reported here.

4. Conclusion and Recommendations

From the results of the present study, it can be concluded that considerable scope apparently exists in the study area to increase the productivity of potato and to increase income, employment and nutritional status of the farmers. It is easily realized that potato cultivation is not a highly profitable for the farmers. Farmers are used to grow potato every year and they hardly prefer to grow alternative crops due to their customized nature of growing this crop in that locality. The study revealed that Diamant potato growing was more profitable than Algure potato growing and farmers like to grow Diamant potato due to the little bit higher profit. Farmers generally sell Algure potato in the harvesting season, because the price of potato remains higher when Algure potato is harvested. But in case of Diamant potato, the price becomes very lower in the harvesting season. So the rich farmers store it and sell them later when the price rises. For this reason, storage cost is a major cost item for Diamant potato cultivation. The management practices of production in the study area were not found efficient enough. Effective education system and technological support may increase the income level of potato growing farmers. Farmers were not known about the application of inputs in right time with right doses. Consequently, they made over or under use of some inputs. Functional analysis proves that farmer's age, education level, farm size played a positive role in increasing net return for both Diamant and Algure potato farmers. Farmers should take care those issues. Thus, well planned management training in accordance with their problems, needs, goals and resource can lead to grow viable production practices and sustainable income from potato cultivation in the study areas.

The analysis found that seed, manure, fertilizer, irrigation, and insecticide all had a substantial impact on potato yield. However, the expenses of these inputs are extremely significant. As a result, the government's concerned department should do everything in its power to provide farmers with the necessary inputs and other assistance in order to greatly enhance potato production.

One of the significant issues that farmers in the research area experienced was a lack of suitable cold storage facilities and a high storage price. BADC should take steps to establish new cold storage facilities and provide enough amenities in the research area. The government's responsible body should also take the appropriate actions to limit the cold storage charge.

To boost potato productivity, the DAE training wing should offer farmers with training by extension service personnel to make farmers aware of the efficient use of inputs.

Quality seeds of improved kinds in sufficient quantity are acknowledged as one of the critical components for increasing agricultural production: Farmers also claimed becoming victims of seed adulteration. As a result, the DAE and other related organizations should make better seed available to farmers, and the DAE should take steps to control seed adulteration.

The potato is an important crop all across the world. Potato yield is considerably reduced due to the onslaught of many insect pests and illnesses, including viruses, which contribute to seed stock degeneration. Farmers must have access to high-quality seed materials in order to increase tuber crop productivity. As a result, focus should be placed on producing seed that is free of disease and insects.

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