

**PROFITABILITY ANALYSIS OF CULTIVATION OF BANANA  
CULTIVARS SABRI AND SAGAR IN SOME AREAS OF  
NARSINGDI DISTRICT**

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**Abstract**

An attempt was made to investigate the input use pattern, profitability and factors affecting the banana cultivation. A total of 60 banana growing farmers taking each 30 *Sabri* and 30 *Sagar* growers were selected from Narsingdi district for collecting data using a pre-tested interview schedule during mid-September to mid-October, 2019. The study revealed that farmers used almost all types of inputs like human labour, organic and inorganic fertilizers, pesticides, and irrigation water in banana cultivation. The cultivations of both *Sabri* and *Sagar* variety were highly profitable at farm level since the net returns (Tk.4,29,280/ha and Tk.2,73,995/ha) and BCRs (2.66 and 2.05) were very high. The coefficients of production function revealed that banana sucker, land preparation and Muriate of Potash (MoP) fertilizer positively influenced the yield of *Sabri* variety banana, whereas only MoP influenced the yield of *Sagar* variety. The major problems of banana cultivation were lacking of skilled labour, attack of diseases, and high price of fertilizers.

Keywords: Banana, profitability, Cobb-Douglas production function, problems

**Introduction**

Banana is a very popular and famous fruit of Bangladesh. It is available throughout the year and the consumption rate is higher than any other fruits in Bangladesh. Banana is grown all over the country, but some districts are famous for its cultivation. Its cultivation plays a vital role in providing nutrition, extra income, and employment in Bangladesh (Kamal *et al.*, 2014). Banana is a rich source of carbohydrate, potassium, phosphorus, calcium, and magnesium and having plenty of vitamins particularly vitamin B (Hossain, 2014).

In spite of decreasing the area of its cultivation, the production and yield of banana were increased at the growth rate of 0.56 and 1.48% (Table 1) respectively due to the adoption of improved varieties along with management technologies.

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**Table 1. Growth rates of area production and yields of banana, 2010-19**

Particular	Mean	CV (%)	Growth rate (%)
Area (ha)	49162	5.02	-0.92*
Production (ton)	791425	3.34	0.56
Yield (t/ha)	16.13	5.05	1.48***

Source: Author's calculation using various issues of BBS (2010, 2013, 2016, 2019)

There are many varieties of banana are available in Bangladesh. Among them, Sabri, Sagar, Chini-champa, and Champa are very popular. Major banana growing districts are Narsingdi, Gazipur, Rangpur, Bogura, Natore, Pabna, Noakhali, Faridpur, and Khulna (Mukul and Rahman, 2013). Traditionally, Narsingdi district is famous for banana production and banana of this district has high demand all over Bangladesh. In 2018-19, the area and production of banana in Narsingdi was 1581 ha and 26824 tons, respectively (BBS, 2020). So, it is necessary to investigate the profitability of banana production in this district. Up until now, several researches (Hossain, 2000; Ahmed, 2005; Kamal *et al.*, 2014; Hossain, 2014; Kamal *et al.*, 2015; Samadder *et al.*, 2017) conducted with different aspects of banana production in Bangladesh. However, none of the research work has been conducted on the profitability of Sabri and Sagar banana production in Narsingdi district. Considering the existing research gap, the present study was conducted with the following specific objectives:

1. To estimate the profitability of the production of *Sabri* and *Sagar* variety of banana.
2. To identify different factors affecting banana production at farm level, and
3. To explore the problems of banana cultivation in the study areas.

### Materials and Methods

**Sampling design and sample size:** Multi-stage sampling procedure was adopted to select sample farmers. In the first stage of sampling, a famous banana producing district namely Narsingdi was purposively selected. After consultation with the local personnel of Department of Agricultural Extension (DAE), two unions namely Shilmandi and Charnagardi of Narsingdi Sadar Upazila were purposively selected for field survey. Therefore, *Sagar* and *Sabri* varieties of banana were chosen for the study. Then a complete list of the *Sagar* (312) and *Sabri* (272) growing farmers in the selected unions was prepared for selecting sample farmers. Finally, a total of 60 farmers taking 30 *Sagar* variety (9.62% of the total sample) and 30 *Sabri* variety (11.03% of total sample) were randomly selected from the list.

**Data collection:** A structured interview schedule was prepared based on the objectives of the study. Then the instrument was finalized after pre-testing it at

the farm level. Finally, field level data were collected by using this pre-tested interview schedule during mid-September to mid-October, 2019.

**Analytical technique:** Both descriptive statistics and functional analysis were used for analyzing the collected data. Descriptive statistics such as mean, frequency distribution, percentage, etc. were used for calculating the profitability of banana production, whereas functional analysis was done for showing input-output relationship of banana production. The budgetary model was used to estimate the gross revenue and total cost of production. The difference between two estimates gives a measure of net income.

Cobb-Douglas production function was used to estimate the effects of different inputs on banana production. The specification of Cobb-Douglas production functions as follows:

$$Y = a x_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5} x_6^{b_6} x_7^{b_7} x_8^{b_8} x_9^{b_9} x_{10}^{b_{10}} x_{11}^{b_{11}} x_{12}^{b_{12}} x_{13}^{b_{13}} e^{u_i}$$

By taking log on both sides Cobb-Douglas production functions written as

$$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + b_9 \ln X_9 + b_{10} \ln X_{10} + b_{11} \ln X_{11} + b_{12} \ln X_{12} + b_{13} \ln X_{13} + U_i$$

Where,

Y = Banana production (dozens per hectare)

X<sub>1</sub> = labour (man-day/ha)

X<sub>2</sub> = Sucker (No./ha)

X<sub>3</sub> = Power tiller (Tk./ha)

X<sub>4</sub> = Irrigation (Tk./ha)

X<sub>5</sub> = Urea (kg/ha)

X<sub>6</sub> = TSP (kg/ha)

X<sub>7</sub> = MoP (kg/ha)

X<sub>8</sub> = Zinc (kg/ha)

X<sub>9</sub> = Gypsum (kg/ha)

X<sub>10</sub> = Cow dung (kg/ha)

X<sub>11</sub> = Organic fertilizer (kg/ha)

X<sub>12</sub> = Insecticide (Tk/ha)

X<sub>13</sub> = Fungicide (Tk/ha), and

U<sub>i</sub> = Error term

## Results and Discussion

### Cost of Banana Cultivation

The average costs of banana production were Tk. 2,41,723 and Tk. 2,42,619 per hectare, respectively for *Sabri* and *Sagar* variety in the study areas. The cost of

*Sagar* variety production was slightly higher than the cost of *Sabri* variety production which was mainly due to the use of higher amounts of inorganic fertilizers. The shares of variable cost and fixed cost were ranged from 58.5% to 59.2% and 40.8% to 41.5%, respectively for cultivating *Sabri* and *Sagar* variety of banana. Among fixed cost, land use was the highest cost item that shared about 29.6% to 30.2% of the total cost followed by family labour (10.6% to 12.0%). In both varieties cultivation, the highest variable cost was incurred for organic fertilizers (11.2-16.2% of the total cost) followed by stacking material or bamboo pole (13.8-14.3%), hired labour (7.3-7.4%) and banana sucker (3.7-4.3%). The other important variable costs were for inorganic fertilizers namely Urea, TSP and MoP which shared about 2.9 to 4.8% of the total cost (Table 2).

**Table 2. Cost of banana cultivation per hectare in the study areas**

Items	Unit	Sabri variety ( <i>n</i> =30)			Sagar variety ( <i>n</i> =30)		
		Quantity	Price (Tk/unit)	Cost (Tk.)	Quantity	Price (Tk/unit)	Cost (Tk.)
<b>A. Fixed cost</b>	Tk.	--	--	<b>117765</b>	--	--	<b>116027</b>
Family labour	Manday	92.6	500	46300	85.5	500	42750
Land use cost	ha	1	71465	71465	1	73277	73277
<b>B. Variable cost</b>	Tk.	--	--	<b>141308</b>	--	--	<b>143692</b>
Hired labour	Manday	35.3	500	17650	36.1	500	18050
Sucker	No.	1474.2	7.1	10467	1472.4	6.1	8982
Ploughing	No.	5.8	288	1670	4.4	300.3	1321
Irrigation	No.	12.4	270.7	3357	13.3	246.3	3276
Fertilizers							
<i>Urea</i>	kg	422.5	16.5	6971	701.9	16.5	11581
<i>TSP</i>	kg	375.2	22	8254	497.8	22	10952
<i>MoP</i>	kg	421.1	18	7580	542.2	18	9760
<i>Zinc</i>	kg	6.5	130	845	16.7	130	2171
<i>Gypsum</i>	kg	64.2	30	1926	186.5	30	5595
Cow dung	kg	197.6	2.5	494	1156.8	2.1	2429
Manures (kg)	kg	2461.8	16	39389	1697.1	16	27154
Insecticides	No.	12.1	277.3	3355	12.4	298.7	3704
Fungicides	No.	2.6	274.7	714	3.4	280	952
Bamboo pole	No.	172.6	200	34520	167.9	200	33580
Interest on OC (@6%)	Tk.	--	--	4116	--	--	4185
<b>C. Total cost (A+B)</b>	Tk.	--	--	<b>259073</b>	--	--	<b>259719</b>

Source: Field survey, 2019

### **Profitability of Banana Cultivation**

Banana is reported to be a profitable crop in the study areas. The average gross income and net income from *Sabri* banana production were estimated at Tk.6,88,353 and Tk.4,29,280 respectively. Again, the average gross income and net income from *Sagar* variety production were estimated at Tk. 5,33,714 and Tk. 2,73,995 respectively. The gross return was much higher for *Sabri* variety compared to *Sagar* variety due to the lower cost of production, higher yield and higher selling price of banana (Table 2). The rate of return (BCR) scenario also reveals that banana production is highly remunerative in the study areas. The average rates of returns (BCRs) of *Sabri* and *Sagar* variety were 2.66 and 2.05 on total cost basis, respectively. The BCR of *Sabri* variety of banana is much higher than the rate computed for *Sagar* variety. The results of the present study are quite comparable with the previous studies conducted by Mukul and Rahman (2013), Samadder et al., (2017), and Islam et al. (2018).

The average costs of production per dozen of *Sabri* and *Sagar* variety of banana were estimated at Tk. 22.42 and 26.50 respectively. Again, the corresponding average net returns were Tk. 37.15 and Tk. 27.96 respectively for a dozen of *Sabri* and *Sagar* variety of banana cultivation (Table 3).

### **Factors Affecting Banana Cultivation**

Table 4 shows the input-output relationship of *Sabri* and *Sagar* variety of banana production in the study areas. Cobb-Douglas production function was used to identify the factors affecting banana production in the study areas. Among the eleven variables included in the model, three variables namely banana sucker, land preparation and MoP fertilizer showed significant effect on the productivity of *Sabri* variety of banana. On the other side, only the use of MoP fertilizer showed significant positive impact of the productivity of *Sagar* variety of banana. However, the results show that the coefficients of sucker, land preparation, and MoP fertilizer were positive and significant at 5%, 10% and 1% levels, respectively. It indicates that if we increase 1% in the number of sucker, land tillage, and use of MoP, remaining other inputs constant, this would increase the yield of *Sabri* banana by 0.29%, 0.06%, and 0.31%, respectively. On the other hand, the coefficient of MoP is positive and significant at 5% level for *Sagar* banana production. If we increase the use of MoP by 1%, remaining other inputs constant, this would increase the yield of *Sagar* variety of banana by 0.14%. Mukul and Rahman (2013) found that the cost of land preparation, cost of sucker, and cost of pesticides positively influenced the banana production and the cost of human labour is negatively influenced the banana production.

**Table 3. Profitability of banana cultivation per hectare**

Items	Sabri variety ( <i>n</i> =30)		Sagar variety ( <i>n</i> =30)	
	Quantity	Amount (Tk/ha)	Quantity	Amount (Tk/ha)
<b>A. Profitability (Tk/ha)</b>				
1. Total variable cost		141308		143692
2. Total fixed cost		117765		116027
3. Total cost (1+2)		259073		259719
4. Gross return		<b>688353</b>		<b>533714</b>
Revenue from banana	11556 dozen	686426	9801 dozen	532194
Revenue from sucker	264 No.	1927	200 No.	1520
5. Gross margin (4-1)		547045		390022
6. Net return (4-3)	-	429280		273995
7. Benefit cost ratio (BCR)				
Based on total cost		2.66		2.05
Based on cash cost		4.87		3.71
<b>B. Profitability (Tk/dozen)</b>				
		Amount (Tk/dozen)		Amount (Tk/dozen)
Cost of production		22.42		26.50
Total return		59.57		54.46
Net return		37.15		27.96

**Note:** Price of banana (Tk/dozan) = Tk. 59.4 (Sabri) & Tk.54.3 (Sagar); Sucker price (Tk/No.)= Tk. 7.3 (Sabri) & 7.6 (Sagar)

### Problems of Banana Cultivation

Table 5 shows the major problems of cultivating *Sabri* and *Sagar* variety of banana in the study areas. Banana cultivation needs plenty of skilled labour in performing land preparation, planting sucker, manure and fertilizer application, pesticides application and staking the plants. Due to creating a huge opportunity of doing off-farm activities, skilled labour seems to be unavailable in the study areas. However, lack of skilled labour was opined to be the first ranked problem for banana production. On the other side, attack of diseases was the first ranked problem for *Sagar* variety banana production. Due to the price of some inorganic fertilizers (e.g. Zinc, MoP, gypsum) *Sabri* banana producers identified as the second-most important problem, whereas it was 4<sup>th</sup> ranked problem for *Sagar* variety production. Hands-on training on improved production and crop protection technology is very much important for increasing the productivity and profitability of crops. But most banana

producers could not get such training on banana production. Hence, about 67% of the producers of both banana varieties mentioned that this is one of the crucial problems of banana cultivation. The other important problems encountered by banana producers were lack of quality sucker, high transportation cost, and lack of family labour.

**Table 4. Factors affecting the productivity of banana in the study areas**

Explanatory variable	Sabri variety (n=30)		Sagar variety (n=30)	
	Coefficient	P-value	Coefficient	P-value
Intercept	5.25	0.002	7.61	0.014
Human labour (X <sub>1</sub> )	0.32	0.17	-0.06	0.61
Sucker (X <sub>2</sub> )	0.29**	0.02	0.08	0.81
Land preparation (X <sub>3</sub> )	0.06*	0.09	0.007	0.71
Irrigation (X <sub>4</sub> )	0.08	0.34	0.04	0.30
Urea (X <sub>5</sub> )	0.17	0.19	-0.004	0.97
TSP (X <sub>6</sub> )	0.02	0.78	0.03	0.70
MoP (X <sub>7</sub> )	0.31***	0.01	0.14**	0.02
Zinc (X <sub>8</sub> )	0.01	0.49	-0.03	0.54
Gypsum (X <sub>9</sub> )	-0.02	0.39	-0.03	0.67
Cow dung (X <sub>10</sub> )	-0.002	0.88	0.02	0.31
Organic fertilizer (X <sub>11</sub> )	-0.003	0.97	0.05	0.20
Insecticides (X <sub>12</sub> )	-0.05	0.28	-0.001	0.97
Fungicides (X <sub>13</sub> )	-0.004	0.87	0.01	0.60
R <sup>2</sup>	0.91	-	0.75	-
F-value	11.29***	-	3.20***	-

Note: \*\*\* Level of significance  $p < 0.01$ ; \*\*Level of significance  $p < 0.05$ ; and \*Level of significance  $p < 0.10$

Early studies also identified different problems of banana cultivation in their studies. As for example, Mukul and Rahman (2013) identified labour unavailability and lack of fertilizer and pesticides as the major problems of banana production. Kamal et al., (2014) stated that the high price of fertilizers and insecticides, and low price of banana as the major problems of banana production. Samadder et al., (2017) pointed out different problems such as lack of labour, low output price, high price of inputs, lack of quality sucker, and lack of storage facilities for banana cultivation.

**Table 5. Problems of banana cultivation at farm level**

Constraints	Sabri variety (n = 30)		Sagar variety (n = 30)	
	% responses	Rank order	% responses	Rank order
Lack of skilled labour	86.7	1	77.7	2
Higher price of fertilizers*	73.3	2	59.3	4
Lack of training facility	66.7	3	66.7	3
Disease infestation	37.5	4	83.3	1
Lack of quality sucker	23.3	5	33.3	5
Higher transportation cost	26.7	6	26.7	6
Lack of family labour	11.7	7	13.7	7

Note: \* Urea price was not so much high in the study areas

Farmers responded more than one answer

Source: Field survey, 2019

### Conclusions

The findings of the study reveals that the banana producing farmers use almost all typical inputs including organic and inorganic fertilizers, pesticides, irrigation and human labour. The productions of both *Sabri* and *Sagar* variety of banana found highly profitable at farm level since the net return and BCR are very high. The number of sucker, land preparation with power tiller and use of MoP fertilizer positively influence the yield of *Sabri* variety of banana, whereas only the use of MoP fertilizer influences the yield of *Sagar* variety of banana. The major problems of banana cultivation were identified as the lack of skilled labour, disease infestation, and higher price of fertilizers.

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