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A study on brinjal production in Jamalpur district through profitability analysis and factors affecting the production

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Abstract

The objectives of this research study are to identify and measure the impact of the factors on brinjal production and to calculate the profit of brinjal production. Primary data collection was carried out at three villages of Islampur Upazila under Jamalpur district. Cobb-Douglas production function was applied to determine the effects of inputs on brinjal production. Human labor, seed cost, MP cost and pesticides have significant impact on brinjal production. The most important factor for variation in costs as identified was human labor and chemical fertilizers cost. Net return and cash margin of brinjal production were BDT 303,358 and BDT 345,415 per ha, respectively while the profit per Kg was BDT 6.63.Thus, Brinjal is a highly profitable enterprise. This study also identified some problems faced by farmers for producing brinjal like insects affect, lack of capital, lack of quality seed, lack of storage facilities, marketing problems. Thus more research and extension service can be adopted to solve the problems in order to increase production and ensure the nutritional food value in Bangladesh.

Keywords: Brinjal, Factor and Profitability

Introduction

Bangladesh is one of the major horticultural countries in South Asia (Ali. 2000). Agriculture, including horticulture, is the largest single sector of the economy, accounting for about 13 percent of the country's GDP (BER, 2006). Brinjal (*Solanummelongena* L.) is an important vegetable for its commercial and nutritional value in the world as well as in Bangladesh. "Begoon" (Brinjal or Eggplant) is a very common and favorite vegetable in Bangladesh which has a link with the social, cultural and economic lives of rural people. Brinjal has been a staple vegetable in our diet since ancient times. Itis one of the major vegetables and its production ranks third among all vegetables in the world. It is grown all over the world, though there is a heavy concentration in Asia. China is the largest producer followed by India. China has a 60.67 per cent share of world production, while India's share stands at 25.70 per cent (Meherunnahar and Paul 2012). Vegetables in much of Asia and the Pacific region are grown by small-scale farmers who are unorganized and scattered in different locations (Shin, 2001), Although Bangladesh produced huge amount of brinjal it is only a fraction of the world's production. Brinjal is second most important vegetable in Bangladesh in terms of both, production area and yield, only surpassed by potatoes. In Bangladesh, over 1, 15,424 hectare of total cultivable land is devoted to brinjal cultivation (BBS, 2011).

It is cultivated in the agricultural fields as cash crop in the commercial vegetable growing areas and almost every rural household has few brinjal plants in the kitchen garden. In Bangladesh brinjal is classified into two categories in respect of production period. These are Rabi- brinjal and Kharif- brinjal. Though it is more or less available throughout the year, its peak supply comes during December to April. Brinjal grown in Bangladesh are of different varieties. They differ in size, shape and color as well. In Bangladesh, vegetables are grown on 2% of the available agricultural land and yield 4% of the produce. Brinjal is by far the major vegetable representing some 41% by weight of all vegetables produced, occupying 19% of the land used to cultivate them. Farmers are cultivated over the years due to higher profit, relatively fast growing capacity, low risk involvement, east technological adoption, etc (Rashid, 2002). Farmers are provided with an assured income and resource-poor consumers have access to a much-needed, nutritious vegetable, in the summer months when other vegetables are in short supply (Ferdous, 2007). Bangladesh is obtained the food sufficiency but the nutritional point of view, it has far away from achieve the safety and quality food production. Brinjal consists of almost 92.7 percent of water and is superior in terms of fiber, folic acid, manganese, thiamin, vitamin B6, magnesium and potassium contents to that of most other vegetables. It has no fat and supplies 25 calories per serving.

(Chadha and Kalloo, 1993). It is s profitable business as well as a nutritionally rich to serve the mass people. Thus, it needs to further analyze what factors are influenced to production of brinjal. In this regards, this research was carried out the following objectives:

i) To estimate the costs, returns and profitability of brinjal production; and
ii) To determine the factors affecting the economic returns of brinjal production

Materials and Methods

Location of study, sampling technique and sample size

Jamalpur is one of the most brinjal producing districts in Bangladesh where Islampur Upazila is most famous for its production and fulfill the demand within country and abroad. Islampur is a place of surplus brinjal producing areas in Bangladesh. The research on profitability and factor influence on the gross return on brinjal production in these particular places have not been conducted. Total 60 number of sample were selected from three villages of Islampur Upazila under Jamalpur district. Random sampling technique was applied for selecting the brinjal producers in the same areas.

To identify the factors affecting the gross return onbrinjal production, the Cobb-Douglas production function has used:

$\ln Y = \ln b_o + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8$

where, X_1 = Cost of human labor per hectare (Taka), X_2= Cost of seed/seedling per hectare(Taka), X_3= Cost of power tiller per hectare (Taka), X_4 = Cost of urea per hectare (Taka), X_5 = Cost of DAP per hectare (Taka), X_6 = Cost of MP per hectare (Taka), X_7 = Cost of irrigation per hectare(Taka), X_8 = Cost pesticide per hectare (Taka).
b_0= Intercept and b_1…….b_8= parameters

Cost and return analysis

Cost and return analysis considered variable cost and fixed cost. To achieve the objective of the study, simple tabular analysis was used to determine the profitability of brinjal growers. Following profit equation was used to assess the profitability of production.
Net return of brinjal producer

$\Pi = PF.QF — (TVC+TFC)$
Where,
π = Profit of brinjal producer per hectare per year
PF = Per unit price of brinjal, QF = Quantity of brinjal, TVC = Total variable cost, TFC = Total fixed cost

Cost of production was calculated by using the following formula

i) Operating capital was considered as the sum of total variable cost.
ii) Interest on operating capital = Operating capital* rate of interest* time consider (months)/(100*14*2), Interest rate =14%
iii) Total variable cost (Tk./ ha.) was the total cost of variable inputs
iv) Total fixed cost = Land use cost + interest on operating capital
v) Land use cost = As per lease value of the study areas in hectare.
vi) Total cost of production = Total variable cost (Tk/ha) + Total Fixed cost (Tk/ha)

Gross Return

Gross return was calculated simply by multiplying the total volume of output by its per unit of price in the harvesting period. The following equation was used to estimate gross return (GR):
$GR = P_b . Q_b$
Where,GR = Gross return from product, P_b =Price of Product, Q_b = Quantity of Product

Gross margin

Calculation of gross margin was done to have an estimate of the difference between total return and variable costs. The argument for using gross margin analysis is that the farmers are more interested to know their return over variable cost. The following equation was used to assess the gross margin

GM = TR — VC

Where,
GM=Gross Margin, TR=Total Return, VC=Variable Cost

Results and Discussion

Socio-economic characteristics of the farmers

The selected characteristics of the farmers are age, family size, farm size, education and land under brinjal cultivation. The majority (45%) of the farmers were middle aged as compared to 27 percent being young and 28 percent being old categories, respectively. Almost third-fourths (72%) of the farmers fell in the young to middle aged category. The average family sizes of marginal, small, medium and all sample farmers were 5.33, 4.00, 4.73 and 4.45,respectively.The majority (60 percent) of the brinjal farmers were illiterate and can sign only where as 23 percent were primary educated, 12 percent farmers were secondary educated and 5 percent were higher educated, respectively. About 80 percent are engaged in day laborer as main occupation. The farm sizes were varied from 0.04 to 2.92 hectares. The brinjal production was covered about 42.84 percent of total cultivable land in the study area.

Factors determinants of brinjal production

Estimated values of coefficients and related statistics of Cobb-Douglas production function model for brinjal production for all farmers presented below:

Human labor cost (X_1)

The regression co-efficient of human labor cost was 0.75and significant at 1% level. It implies that 1 percent increase in human labor cost, keeping other factors remaining constant, would result in an increase of return by 0. 75 percent (Table1).

Seed cost (X_2)

The regression co-efficient of seed cost was 0.065 which was significant at 1% level. The results of the analysis indicated that 1 percent increase in seed cost, keeping other factors constant would result in increase in the gross return by 0.06 percent for brinjal production. .

MOP cost (X_6)

The regression coefficient of MOP cost was 0.218and significant at 10% level which shows that one percent increase in MOP cost (x_6), keeping other factors constant, would result in an increase in the gross return by 0.218 percent.

Pesticides cost (X_8)

The regression co-efficient of Pesticides cost was -0.214 bears negative sign and significant at 5% level. It implies that an increase in one percent of Pesticides cost, remaining other factors constant, would result in a decrease in the gross return by 0.214 percent.

Power tiller (X_3), Urea (X_4), DAP (X_5) and Irrigation (X_7) costs were not significantly effect on gross return on brinjal production.

The co-efficient of multiple determinations (R^2)

The co-efficient of multiple determinations was 0. 0.968. It suggested that 96 percent of the variation in the gross returns was explained by the independent variables included in the model.

Table 1. Estimated values of coefficients and related statistics of Cobb-Douglas production function model for brinjal production for all farmers

Explanatory variables	Coefficient value	Standard deviation	t-value
Intercept/Constant	1.83	0.29	6.30
Human labor cost (X_1)	0.75***	0.07	10.64
Seed cost (X_2)	0.06***	0.03	2.05
Power tiller cost (X_3)	0.01	0.03	0.30
Urea cost (X_4)	-0.01	0.04	-0.25
DAP cost (X_5)	0.01	0.06	0.16
MP cost (X_6)	0.22**	0.10	2.06
Irrigation cost (X_7)	0.05	0.08	0.64
Pesticides cost (X_8)	-0.21**	0.10	-2.01
F-value	195.47		
R^2	0.86		
Returns to scale	0.877		

Note: ***= Significant at 1% level, **= Significant at 5% level, *=Significant at 10% level
Source: Author's estimation, 2015

Goodness of fit (F-value)

The F-value of brinjal production was 195.47andhighly significant at 1 percent level implying that all the included explanatory variables were important for explaining the variation in return of brinjal production.

Profitability of brinjal production

The method of calculation of individual cost-items is discussed below:

Cost of production

Human laborer was the most important input in the production processes of brinjal production. There were two types of human labor were used in brinjal production such as family labor and hired labor. Farmers were used often chemical fertilizers: Urea, TSP, MOP, DAP, Gypsum, Zink Sulphate for brinjal production. Most of the land was prepared by using manual human labor in the study area. A few number of the farmers used power tiller for land preparation. In the study area, farmers used purchased reserved seeds. Most of the sampled farmers in the study area used cow dung. The number of irrigation depends on soil type and economic condition of the farmers. The pesticide is a core input in brinjal production. Frequently farmers were practiced the pesticides without any consent of agricultural extension officer.

Table 2. Cost- return of brinjal production (Per hectare)

Items	Amount (Taka)
Variable cost	
Human Labor	71168.05
Power tiller	5189.51
Seeds	1146.74
Cow dung	2499.95
Fertilizers	38919.04
Pesticides	4927.21
Irrigation	7060.26
Interest on operating capital	4581.87
A. Total variable cost	135492.79
Fixed cost item	
Land use cost	9163.75
B. Total fixed cost	9163.75
C. Total cost(A+B)	144656.42
D. Gross return	461954.45
E. Gross Margin (D-A)	326461.76
E. Net return (D-C)	317297.97
BCR (undiscounted)	3.29

Source: Author's Estimation, 2015

Eight cost items: human labour, power tiller, seed, chemical fertilizers, cowdung, pesticides, interest on operating capital cost and land use cost are considered as variable and fixed cost for estimating the total cost. Human labor cost is the major cost items followed by fertilizers, land use cost, irrigation, power tiller, interest on operating capital, cowdung and seed. The farmer was average paid for human labor, chemical fertilizers, land use cost, irrigation, power tiller, interest on operating capital, cowdung, and seed by Taka71168.05, Taka 38919.04, Taka 9163.75, Taka 7060.26, Taka 5189.51, Taka4581.87, Taka 4581.87 and Taka 1146.74, respectively (Table 2).The per hectare of total variable cost, total fixed cost, total cost of brinjal production were Taka135492.79, Taka 9163.75, Taka 144656.42, respectively.

Gross return, gross margin, net return/profit and BCR

The average yield per hectare of brinjal for farmers was 45775.19 kg. The farm gate price was Taka10.00 per kg. Per hectare of gross return, gross margin, and net return/profit of brinjal production were Taka461954.45, Taka 326461.76 and Taka 317297.97 respectively (Table 2). Benefit cost ratio (BCR) is a relative measure, which is used to compare benefit per unit of cost. In the study, BCR of brinjal was calculated as a ratio of gross return and gross cost. Per hectare benefit cost ratio was estimated at 3.29. It is more than three times profitable enterprise on the basis of cost.

Conclusion

Brinjal is a nutritious vegetable as well as people have easy access to mitigate their demand on its round the year in Bangladesh. This research is to promise to find the factors effect on brinjal production and estimate the profitability of brinjal production at Islampur upazila of Jamalpur district. Islampur upazila of Jamalpur district is a famous for brinjal production since long time. The selected areas are typically remote areas of Jamalpur while the family size was 4.80, lion share of people are professionally dependent on agriculture and mostly farmers are illiterate. The research found that brinjal production is a profitable enterprise. Human labor, seed cost, MoP and pesticides cost are statistically significant effects on brinjal production. Costs of human labor and chemical fertilizers were occupied the major share of total cost of brinjal production. According to BCR calculation, the benefit of brinjal production at the sample area was three times more compare to the total cost. Though it is a profitable business, it could have more extended the business if the farmers are having close contact with the agricultural extension services, getting good marketing and transport facilities.

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