Comparative Economics of Bean and Bottle Gourd Production in Some Selected Areas of Bangladesh

Ummul Khayer

MS student, Department of Agricultural Economics

Bangladesh Agricultural University

Mymensingh-2202, Bangladesh.

E-mail: anne.ummul@yahoo.com

Sharmin Akhter (Corresponding author)

Lecturer, Department of Development and Poverty Studies,

Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh.

E-mail: sharmin_bau15@yahoo.com,

Cell:. +88-01723779156

Ripon Kumar Mondal

Lecturer, Department of Agricultural Economics,

Sher-e-Bangla Agricultural University, Dhaka-1207,Bangladesh.

Email: rkumar.ga@gmail.com

Abstract

The present study was designed with a view to analyse the comparative economic aspect of selected vegetables such as bean and bottle gourd production. The findings of the study revealed that the production of selected vegetables were profitable. The per hectare total cost of production of bottle gourd and bean were Tk.105344 and Tk.104840 respectively and the corresponding gross incomes were Tk.200200 and Tk.174500 accordingly. The estimated net return of producing bottle gourd and bean were Tk.96656 and Tk.69660 successively. The results indicate that bottle gourd farmers received the highest gross return and net return compared to bean producers. Functional analysis revealed that the variation of yield was greatly influenced by the human labour, animal labour, cowdung, fertilizers and date of sowing. These factors were directly or jointly responsible for the variation of vegetable yields. The study also revealed that the vegetable farmers faced various types of problems, such as lack of irrigation facilities, shortage of human labour, high price of fertilizers and insecticides, non-availability of quality seeds, etc.

Key words: Profitability, Returns to scale, Resource use efficiency, Net return.

1. Introduction

Agriculture is the foundation of Bangladesh economy and rice is the main food item for the people of the country. Rice alone cannot solve the demand for balanced diet. Nutritional deficiency is a very serious problem for the people of Bangladesh today. Vegetables provide dietary fiber necessary for digestion and health and combating malnutrition, curing nutritional disorders and diseases like anemia, blindness, scurvy, goiter, etc. including physical and mental growth and help increase efficiency of labour and span of working life, which eventually influence the economic potentials of the nation. The problems of malnutrition and ill health can be reduced to a great extent by taking leafy and green fleshy vegetables like bean and bottle gourd which supply sufficient amounts of carbohydrate, vitamins, minerals and protein in the human diet. The vegetables which are generally grown during October to March in Bangladesh have been termed as winter vegetables. The present study has been conducted on two winter vegetables, namely bean and bottle gourd. *Leguminous crops* like beans play a vital role to meet up our protein requirement. Beans contain 20-30% protein on a dry weight basis which is nearly three times than that in most cereals. In Bangladesh total land area under

bean cultivation is 15385 hectares and the production is 83,000 metric tons during 2006-2007(BBS,2008). It also contains appreciable amounts of thiamin, riboflavin, niacin, vitamin C, and iron (0.1, 0.06, 0.7, 9.0, and 4 1.7 mg/100 gm respectively (Rehana,2006). Protein deficiency is a severe problem in Bangladesh where 77% of the population is suffering from insufficient protein intake. Unavailability is the major constraint of consumption, and the availability of protein rich food like bean seeds may be increased by improving post harvest management (Rehana,2006). Green bottle gourds are used as curry. Its leaves and tender stem are also used as delicious and nutritious vegetables. It is reported as an easily digestible vegetable which keeps the body cool and prevents constipation. Hundred grams of edible protein of bottle gourd contains about 96 gm water, 1.10 gm protein, 26 gm calcium, 10 gm phosphorus, 0.6 gm fibre, 0.3mg niacine, 0.6 gm minerals and 0.10 gm fats. It's early production ensures a handsome price for the commercial growers. Leafs and soft stem of bottle gourd are very nutritious and delicious vegetable (Mawla, 1998). The present study has been undertaken to analyse and compare the relative profitability of bean and bottle gourd production. Thus the results of the analysis are likely to be helpful to farmers as well as policy makers in providing information for taking appropriate production decisions of these crops. This study may help extension wokers to learn the various problems of the selected winter vegetables growers, so that they can equip themselves with adequate knowledge for giving solution to the farmers. The general objectives of this study were to assess the comparative profitability between bean and bottle gourd production. However the following specific objectives were spelled ou

i) To document the socioeconomic profile of selected farm households.
ii) To compare the costs and returns of bean and bottle gourd production.
iii) To determine the factors influencing bean and bottle gourd production.
iv) To identify the major problems associated with production and marketing of the bean and bottle gourd production.

2. Materials and Methods:

Two villages from two upazila were selected from Mymensingh district. Total number of 60 vegetable farmers, taking 30 farmers for bean and 30 farmers for bottle gourd, were randomly selected. Data were collected by using a pre-tested interview schedule by the researchers during the month of July 2009 to September 2009. In order to arrive at a meaningful conclusion, tabular technique and statistical analysis were employed. To explore the relationship between production and input used, Cobb-Douglas production function was used because of the log linear (Cobb-Douglas) model proved superior on theoretical and econometric grounds. Thus the Cobb- Douglas model was accepted. Finally, double log functional form was chosen on the basis of better results obtained from it. The functional form of the estimated regression will be discussed latter. Tabular technique is a well known and widely used technique to show the results of farm management study because it is simple, convenient and very easy to understand. Per hectare net return of selected vegetables were calculated by using the following algebraic on presented below. To determine the net returns of bottle gourd and bean production the following equation was used in the present study:

$$\pi = P_y Y - \sum_{i=1}^{n} \left(P_{xi}.X_i \right) - TFC$$

Where,

π = Net return (Tk/ha)

P_y = Per unit price of the product (Tk/kg)

Y = Quantity of the product per hectare (kg)

P_{xi} = Per unit prices of ith inputs (Tk)

X_i = Quantity of the ith inputs per hectare (kg)

TFC = Total fixed cost (Tk)

i = 1,2,3….n (number of inputs)

The specification of the Cobb-Douglas production function model was as follows:

$$Y_i = \alpha X_{1i}^{\beta_1} X_{2i}^{\beta_2} X_{3i}^{\beta_3} X_{4i}^{\beta_4} X_{5i}^{\beta_5} X_{6i}^{\beta_6} X_{7i}^{\beta_7} e^{ui}$$

By taking log in both sides the Cobb-Douglas production function was transformed into the following logarithmic form because it could be solved by the ordinary least squares(OLS) method.

$$\ln Y_i = \ln \alpha + \beta_1 \ln X_{1i} + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + \beta_4 \ln X_{4i} + \beta_5 \ln X_{5i} + \beta_6 \ln X_{6i} + \beta_7 \ln X_{7i} + u_i$$

Where,

Y= Gross return (Tk/ha)

a= Constant or Intercept

X_i = Human labour cost (Tk/ha)

X_2 = Animal labour (Tk/ha)

X_3 = Seed/ Seedling cost (Tk/ha)

X_4= Fertilizer cost (Tk/ha)

X_5 = Manure cost (Tk/ha)

X_6 = Irrigation cost (Tk/ha)

X_7 = Insecticides cost (Tk/ha)

β_1, β_2 β_3 = Coefficient of respective variables: In = Natural logarithm

ln = Natural logarithm

i = 1,2,3,….,n

e = Base of natural logarithm

u_i = Error term.

3. Results and Discussion

Profitability of Bean and Bottle gourd production

The per hectare total cost of human labour was Tk. 50,880 for bottle gourd production and per hectare total cost of human labour was Tk. 49440 for bean production. The animal labour costs for bottle gourd and bean production were Tk. 1530 and Tk. 1275, per hectare, respectively, which shared 1.42 and 1.43 percent of total cost, respectively. The power tiller costs for bottle gourd and bean production were Tk. 3500 and Tk. 3000, per hectare, respectively, which shared 3.32 and 2.86 percent of total cost, respectively. The total cost of seeds for bottle gourd was Tk 3250, which shared 3.08 percent of total cost. In case of bean cultivation, cost of seeds was Tk 1200, which shared 1.14 percent of total cost. Farmers used urea, TSP, MP and gypsum. All the fertilizers were purchased. Fertilizer costs were estimated according as the cash price paid. Market prices of urea, TSP, MP and gypsum were Tk. 12, 40, 34, and 8per kg respectively. It was found that most of the farmers used cowdung as manure in producing vegetables (bottle gourd and bean). The cost of cowdung was Tk. 0.50/kg. From Table3.2, it can be seen that per hectare cost of manure was Tk. 5750 and Tk. 5625 for producing bottle gourd and bean respectively. Per hectare cost of irrigation water was Tk. 8000 for bottle gourd, and Tk. 7000 for bean which *represented* 7.59 percent and 6.67 *percent* of their respective total cost (Table 3.2) The cost of insecticides amounted to Tk. 3500 per hectare for bottle gourd and Tk. 3000 for bean production, which occupied 3.32 and 2.86 percent of their respective total cost (Table 3.2). Cost of fence and Mancha amounted to Tk. 9972 and Tk. 6075 per hectare for bottle gourd and bean production, which occupied 9.46 percent and 5.79 percent of their respective total cost (Table 3. 2). The summation of the costs of variable inputs gave the total variable costs which were Tk. 94400 and 84840 per hectare for bottle gourd and bean production respectively. Fixed costs are the amounts spent

by the firm on fixed inputs in the short run. These costs remain unchanged even if the output of the firm is nil. The land use cost per hectare was Tk. 10,000 for bottlegourd and Tk. 20000 for Bean production. Land use cost covered 9.49 and 19.07 percent of total cost of bottle gourd and bean production respectively (Table 3.2). Table 2 shows that per hectare gross cost for producing bottle gourd and bean production were Tk. 105344 and Tk. 104840 respectively. The average per hectare gross returns were Tk. 202800 and Tk. 174500 for bottle gourd and bean production respectively. Per hectare net return from bottle gourd was Tk. 96656, from bean was Tk. 69660. This study shows that bottle gourd production is more profitable than bean production. Average return to each Taka spent in production is a vital criterion for measuring the profitability of growing any enterprises. In this study BCR is the ratio of gross return to gross cost. In case of producing bottle gourd BCR was 1.91 and BCR was 1.66 in case of producing bean. In determining the comparative profitability of bottle gourd and bean it was found that per hectare yield, cost and net return of bottle gourd were higher than those of bean. The cost of production of bottle gourd and bean per hectare were estimated at Taka 105,344 and 104,840 respectively. Table 3.2 also shows that per hectare gross return from bottle gourd and bean were Tk 202000 and Tk. 174500 respectively. The per hectare yield was highest for bottle gourd as well as the net return per hectare was also the highest for bottle gourd. The per hectare net return of bottle gourd and bean were amounted to Tk. 96656 and Tk. 69660 respectively. Benefit cost ratio was higher in bottle gourd than bean. Considering cost, benefit cost ratio comprised 1.91 and 1.66 for bottle gourd and bean respectively. The above discussion it is evident that bottle gourd cultivation is relatively profitable than bean cultivation.

4. Factors Affecting the Production of Selected Vegetables

The focus of the present segment is to make a functional analysis of different categories in the framework of production function analysis. Seven variables were considered for the variation of the production of selected winter vegetables. Cobb-Douglas production function model was used to determine the effects of individual input used for selected vegetables production and economic returns. The estimated coefficients and related statistics of Cobb-Douglas production function of Bottle Gourd and Bean are shown in table 4. The regression coefficient of human labour, draft power, cost of seed, and cost of fertilizer were positive and significant for both the Bottle Gourd and Bean production. The impact of the variables such as cost of manure, cost of irrigation and cost of insecticide were insignificant for both Bottle Gourd and Bean production of which cost of manure shows the negative effect on production. The coefficient of human labour cost for bottle gourd and bean production were significant at 1 percent level which indicates that one percent increase in human labour cost, keeping other factors constant, would increase the gross return by 0.24 and 0.25 percent respectively.

One percent increase in draft power cost would result in an increase gross return by 0.11 percent for both bottle gourd and bean production. Similarly the gross return of bottle gourd and bean will increase by 0.10 and 0.12 percent respectively for one percent increase in seed cost. Costs of fertilizer were significant at five percent level for bottle gourd production but it was highly significant at one percent level for bean production. The value indicates that a one percent increase in the cost of fertilizer will lead to an increase in gross return by 0.20 and .023 percent for bottle gourd and bean production respectively. About 89 percent and 88 percent of the variations in gross return were explained by the explanatory variables included in the model for bottle guard and bean production respectively. The F values of two equations were highly significant at one percent level which implies that all the explanatory variables included in the model were important for explaining the variation in gross return of bottle gourd and bean production.

Returns to Scale

The summation of all the regression coefficients of the estimated production function of bottle gourd and bean production were 0.676 and 0.709 respectively (Table 4). This implies that the production function exhibits decreasing returns to scale. That is, the farmers were operating their Bottle Gourd and bean farming in the second stage of production function. In this case, if all the variables specified in the production function were increased by one percent, gross return would increase by 0.676 and 0.709 percent for bottle gourd and bean production respectively.

Concluding remarks

It could cautiously be concluded from the above discussion that the cultivation of bottle gourd and bean was profitable at farm level. However, the cultivation of bottle gourd was more profitable than bean. Nevertheless, the cultivation of bean would also help farmers to increase their net returns. The present national yield level of bottle gourd and bean can be raised further by using recommended package of production practices. The gap between the national yield and average on station and on farm yield should be minimized by adopting the existing package of production technologies at farm level.

REFERENCES

BBS (2008). *Statistical Yearbook of Bangladesh,* Bangladesh Bureau of Statistics, Government of the people's Republic of Bangladesh, Dhaka.

FAO (1994). *Production Yearbook,* Food and Agricultural Organization. Rome, Italy.

GOB (2000). *Bangladesh Economic Review.* Economic Division. Ministry of Finance, Government of the 'People's Republic of Bangladesh, Dhaka.

GOB (2007). *Bangladesh Economic Review.* Economic Division Ministry of Finance, Government of the People's Republic of Bangladesh, Dhaka.

INFS (1980). *Nutrient contents of Bangladesh lbod.* Institute of Nutrition and Food Science, University of Dhaka, Bangladesh.

Mawla, M.G. (1998). An economic analysis of some selected winter vegetables in a selected area of Norsingdi district. Bangladesh Agricultural University, Mymensingh.

Rehana, M.J. (2006). Effects of phosphorous and mulching on the growth and yield of french bean. M. S. thesis, Department of Horticulture, Bangladesh Agricultural University, Mymensingh.

.

Table 3.1. Per hectare cost for bottle gourd and bean production in the study area

Items of cost	Total labour (Person-days)		Total cost (Tk)		Percentage of total	
	Bottle gourd	**Bean**	**Bottle gourd**	**Bean**	**Bottle gourd**	**Bean**
Land preparation	43	54	5 160	6 480	10.14	13.10
Sowing/Transplanting	20	40	2 400	4 800	4.72	9.71
Weeding and mulching	140	82	16 800	9 840	33.01	19.90
Fertilizer, manure and insecticide applications	77	50	9 240	6 000	18.16	12.13
Irrigation	18	18	2 160	2 160	4.24	4.36
Harvesting and carrying	86	143	10 320	17 160	20.28	34.71
Other (Fencing and Mancha making, guarding, etc.)	40	25	4 800	3 000	9.43	6.06
Total cost	424	412	50 880	49 440	100	100

Source: Field Survey,2009

Table 3. 2. Costs and return of bottle gourd production at farm level

Items	Unit	Quantity (piece)		Price per unit(tk)		Total value/cost(tk)		Percent of return/gross cost	
		Bottle gourd	Bean	Bottle gourd	Bean	Bottle gourd	Bean	Bottle gourd	Bean
A .Gross Return									
Main Product	Piece	10 000	8 650	20	20	20 000	173 000		
By product						2 000	1 500		
Total						20 2000	174 500	100	100
B.Variable Products									
Human Labour	Person-Day	424	412	120	120	50 880	49 440	48.29	47.15
Animal labour	Pair-Day	15	15	100	100	1 500	1 500	1.42	1.43
Power tiller						3 500	3 000	3.32	2.86
Seeds	Kg	0.5	2	6500	600	3 250	1 200	3.08	1.14
Urea	Kg	350	260	12	12	4 200	3 120	3.99	2.97
TSP	Kg	30	45	40	40	1 200	1 800	1.13	1.71
MP	Kg	72	60	34	34	2 448	2 040	2.32	1.94
Gypsum	Kg	25	25	8	8	200	200	0.18	0.19
Cowdung	Kg	11500	11250	0.5	0.5	5 750	5 625	5.45	5.36
Irrigation charge	Tk					8 000	7 000	7.59	6.67
Insecticides	Tk					3 500	3 000	3.32	2.86
Fence and Mancha	Tk					9 972	6 075	9.46	5.79
Interest on OC	Tk					944	840	0.89	0.80
Total	Tk					95 344	84 840		
C. Fixed cost									
Land Use	Tk					10 000	20 000	9.49	19.07
Total						10 000	20 000		
D. Gross cost (B+C)						105 344	104 840	100	100
E. Gross Margin (A-B)						75 144	89 660		
F. Net Return (A-D)						96 656	89 660		
G. BCR (Undiscounted)						1.91	1.66		

Source: Field Survey,2009

Table 4 :Estimated values of the coefficients and related statistics of cobb-douglas production function of bottle gourd and bean

Exploratory variables	Bottle Gourd		Bean	
	Values of coefficients	t-value	Values of coefficients	t-value
Intercepts	5.733		5.466	
Human labour (X_1)	0.243**	3.418	0.246**	3.337
Draft power (X_2)	0.108*	2.196	0.109*	2.144
Seed cost (X_3)	0.101*	2.224	0.125*	2.604
Fertilizer cost (X_4)	0.209*	2.582	0.235**	2.823
Manure cost (X_5)	-0.043	-0.659	-0.023	-0.353
Irrigation cost (X_6)	0.055	1.761	0.005	1.317
Insecticides cost(X_7)	0.003	0.170	0.012	0.578
R^2	0.889		0.882	
F-value	25.087**		23.551**	
Return to scale	0.676		0.709	
Sample size	30		30	

** Significant at 1 percent level * Significant at 5 percent level

Source: Field survey 2009