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An economic analysis of winter vegetables production in some selected areas of Narsingdi district

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Abstract

The present study was designed to assess the comparative profitability of selected winter vegetables: namely tomato, cauliflower and cabbage. In total, 90 farmers (30 each growing tomato, cauliflower and cabbage) were randomly selected from two villages under Shibpur Upazila in Narsingdi district. Both tabular and quantitative analyses were done to achieve the major objectives of the study. The major findings of the study revealed that production of all the selected vegetables were profitable. The per hectare gross cost of production of tomato, cauliflower and cabbage were Tk. 118000, 116977 and 120522, respectively and the corresponding gross returns were Tk. 217020, 210000 and 220000, respectively. The per hectare net returns of producing tomato, cauliflower and cabbage were Tk. 97000, 93023 and 99478, respectively. In other words, all the selected winter vegetables were highly profitable to the farmers. However, the farmers earned the highest profit from cabbage. The revenue type Cobb-Douglas production function analysis indicated that per hectare gross returns were significantly influenced by the use of human labour, tillage, seeds, fertilizers, irrigation and insecticides. These factors were directly or jointly responsible for influencing the per hectare gross returns of tomato, cauliflower and cabbage. The study reported some problems and constraints which are related to production and marketing of these vegetables. Based on the findings of the study, some recommendations were made to improve cultural and management practices for selected winter vegetables farming with a view to increase the income and employment opportunities of the farmers.

Keywords: Winter vegetables, Production costs, Returns and Profitability

Introduction

Vegetables sub-sector plays an important role for development of Bangladesh. Vegetables are a herbaceous plant whose fruits, seeds, roots, tubers, leaves etc., are used as food. Nearly 100 different types of vegetables comprising both of local and foreign origins are grown in Bangladesh. Vegetable is important for nutrition, economy and food security. Vegetables can be identified as a significant one for this economy for its noteworthy contribution in raising the foreign exchange earnings and occupies an important position among the items exported from Bangladesh. Vegetables contribute 3.2% of the agricultural Gross Domestic Product (BBS, 2009). Bangladesh earned US $ 41.11 million from export of agricultural products in 2003-2004, which contributed 0.54% to total export earnings (BER, 2008).

As a developing country, Bangladesh is adequately suffering from the problems of poverty, unemployment and malnutrition. Vegetable sub-sector can play important role to solve these problems in the shortest possible time. The importance of vegetable can be realized from two stand points such as, economic point of view and nutritional point of view. It creates a great opportunity of employment for the large number of unemployed women of Bangladesh.

Vegetables compared to other food items provide low cost nutrition source. It can be produced even small amount of land and also in homestead area. It can be grown within a short time period and more than one crop can be grown within a crop season. There are a large number of vegetables having different varieties, which can be grown throughout the year. However, the largest numbers of vegetables are grown in the winter season. Vegetables are generally labour intensive crops and thus offer a considerable promise for generating increased rural employment opportunities. Climate and soil of Bangladesh is very much suitable for growing vegetables round the year.

A good number of studies (Ahmed, 2001; Akhter, 2006; Chowdhury, 1996; Hossain, 1997; Islam, 2000; Mowla, 1998; Sultana, 2005; Naher, 1998) were also being conducted which are related to costs and returns of different vegetables including tomato, cauliflower and cabbage. However, very few economic studies have so far been reported in Shibpur Upazila of Narsingdi district where vegetables are being grown in abundance. The present study would have important information regarding vegetables production in Shibpur Upazila of Narsingdi district. The present study aims to assess the comparative profitability of the selected winter vegetables production.

Materials and Methods

Due to limitation of time and resources, a small area with uniform topographical and ecological characteristics was considered as study area. Keeping in mind the main objective, two villages namely Vogorcandi and Chorsujapur of Putia Bazar Union under Shibpur upazila in Narsingdi district were purposively selected for the study. Survey method was applied to collect the data and the study period was July to September, 2009. In total 90 samples were randomly selected (30 from each vegetable). Data were collected by comprehensive interview schedules. In this study, simple profit equation was used for calculating profitability of the said vegetables. The profit function is as follows:

$\Pi = \sum P1iQ1i - TC$

Where, P1i= Price of main product
Q1i= Quantity of main products
TC= Total Cost

Simple statistical techniques as well as Cobb-Douglas production function were used to process and analyze the data to achieve the goals of the study.

Specific model is as follows

Seven variables were hypothesized to explain the production of selected winter vegetables. The Cobb-Douglas production function analysis was used to determine the effect of these inputs. The model was specified comprehensively in such way that it can specify adequately the production process of the vegetables.

The selected Cobb-Douglas production function model (Gujarati, 2003), in its stochastic form may be expressed as:

$$Y_i = aX_{1i}^{b_1} X_{2i}^{b_2} X_{3i}^{b_3} X_{4i}^{b_4} X_{5i}^{b_5} X_{6i}^{b_6} X_{7i}^{b_7} e^{u_i}$$

The function was linearized by transforming it into the following double log or log-linear form i.e.

$$\ln Y_i = \ln a + b_1 \ln X_{1i} + b_2 \ln X_{2i} + b_3 \ln X_{3i} + b_4 \ln X_{4i} + b_5 \ln X_{5i} + b_6 \ln X_{6i} + b_7 \ln X_{7i} + u_i$$

Where

Y = Gross return (Tk./ha);
X_1= Human labour cost (Tk./ha);
X_2 = Tillage cost (Tk./ha);
X_3 = 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);
i = l, 2, 3, ... n

$b_1, b_2, ... b_7$ = Regression co-efficient to be estimated and u_i = Error term.

Results and Discussion

Profitability of vegetables production

In order to determine the cost of purchased inputs, prevailing market price was used and for that of home supplied inputs the opportunity cost considered. The bank rate of 8 percent per annum was used to determine the opportunity cost of operating capital. In the production process human labour was the most important factor. On an average per hectare human labour required for tomato, cauliflower and cabbage were 511, 445 and 467 man-days, respectively. The per hectare costs of human labour for tomato, cauliflower and cabbage were Tk. 61320, 53400 and 56040, respectively, which covered 51.96, 45.65 and 46.51% of the total cost respectively.

Table 1. Operation wise per hectare human labour cost (Tk.) of different enterprises

Items of cost	Tomato (Tk../ha)	Cauliflower (Tk../ha)	Cabbage (Tk../ha)
Land preparation	6600	6720	7200
Seedling transplanting	6000	5160	6000
Weeding and mulching	19200	11040	18840
Fertilizer, manure and insecticide applications	10080	9360	9000
Irrigation	3840	2880	4200
Harvesting and carrying	15600	18240	10800
Total	61320	53400	56040

Animal labour was used mainly for preparing land. For tomato, cauliflower and cabbage cultivation, the cost of animal power were Tk. 1800, 1440 and 1620, respectively. In the study areas, farmers also used power tiller. The per hectare power tiller cost for tomato, cauliflower and cabbage were Tk. 5880, Tk. 4500 and Tk. 6000 covering 4.98, 3.85 and 4.98 percent of total cost, respectively. The per hectare seedling costs for tomato, cauliflower and cabbage were Tk. 5250, Tk. 14350 and Tk. 15600, respectively. The cost of seed constituted 4.45, 12.27 and 12.94% of total cost of tomato, cauliflower and cabbage production, respectively.

Fertilizer is a major requirement of tomato, cauliflower and cabbage production. In the study areas, farmers mainly used four types of fertilizer namely Urea, TSP, MP and Gypsum. The per hectare cost of these fertilizers were calculated at Tk. 18021, Tk. 18790 and Tk. 155110 which shared 15.90, 16.05 and 12.53% of total cost for tomato, cauliflower and cabbage, respectively. Per hectare cost of manure amounted to be Tk. 6350, 5660 and 5880 for tomato, cauliflower and cabbage production. The per hectare cost of irrigation water amounted to Tk. 4500, Tk. 5000 and Tk. 5500 for tomato, cauliflower and cabbage production, which represented 3.81, 4.27 and 4.56 percent of their respective total cost, respectively.

Table 2. Per hectare costs and returns of different enterprises

Items	Tomato (Tk../ha)	Cauliflower (Tk../ha)	Cabbage (Tk../ha)
A. Gross Return			
Main product	217020	210000	220000
B. Variable cost			
Hired labour	33120	27600	28440
Total labour	61320	53400	56040
Animal labour	1800	1440	1620
Power tiller	5880	4500	6000
Seeds	5250	14350	15600
Fertilizer			
Urea	4800	4560	4440
TSP	7600	6400	6000
MP	5040	7200	4320
Gypsum	581	630	350
Cowdung	5250	5000	5000
Oil cake	1100	660	880
Irrigation charge	4500	5000	5500
Insecticides	4800	3100	4000
Total	79721	80440	82150
C. Fixed cost			
Land use cost	9000	9675	9675
Family labour	28200	25800	27600
Interest on operating capital	1079	1062	1097
Total	38279	36537	38372
D. Gross cost (B+C)	118000	116977	120522

Source: Field survey, 2009

Per hectare cost of insecticides amounted Tk. 4800, 3100 and 4000 for tomato, cauliflower and cabbage production, which occupied 4.10, 2.65 and 3.32 percent of their respective total cost. The land use cost per hectare was Tk. 9000 for tomato production and Tk. 9675 for cauliflower and Tk. 9675 for cabbage production. Land use cost covered 7.63, 8.27 and 8.03% of total cost of tomato, cauliflower and cabbage production, respectively. Per hectare interest on operating capital was Tk. 1079, Tk. 1062 and Tk. 1097, for tomato, cauliflower and cabbage production, respectively.

Table 3. Per hectare costs and returns of producing tomato cauliflower and cabbage

Particulars	Tomato	Cauliflower	Cabbage
Average yield	18085 kg	21000 pieces	22000 pieces
Per unit price (Tk..)	12	10	10
Gross return (Tk.)	217020	210000	220000
Gross cost (Tk.)	118000	116977	120522
Gross margin (Tk.)	107079	103760	110250
Net return (Tk.)	97000	93023	99478
BCR (Undiscounted)	1.82	1.79	1.83

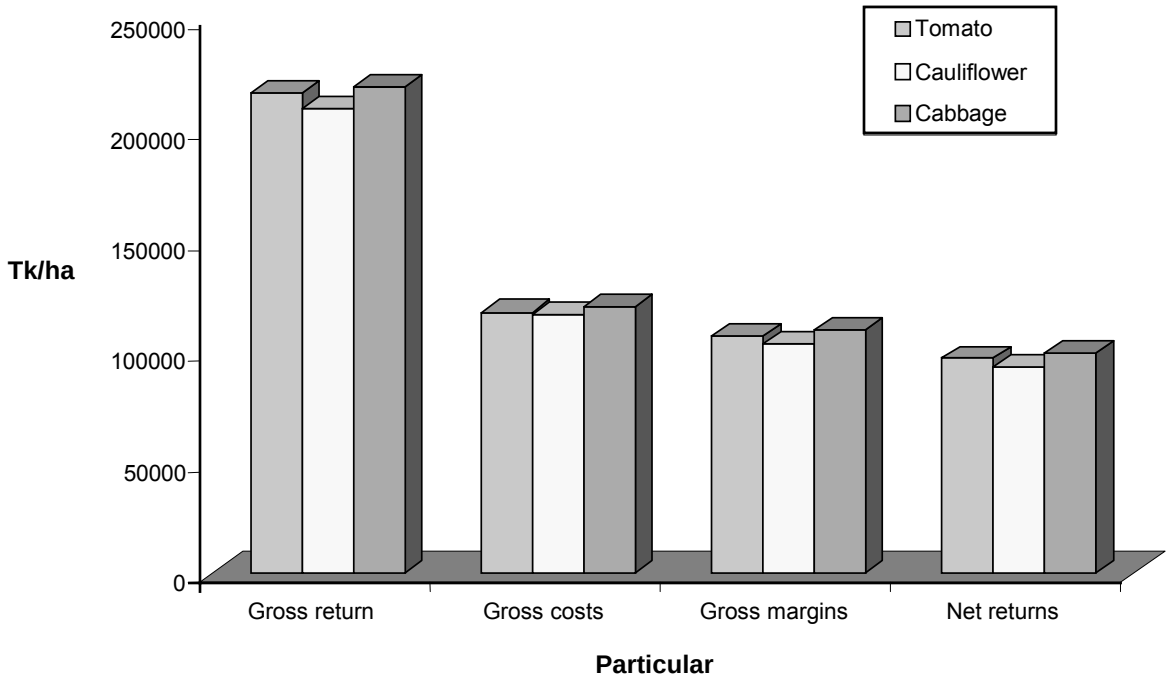

Fig. 1. Gross returns, gross cost, gross margin and net return of tomato, cauliflower and cabbage production

Per hectare variable cost of tomato, cauliflower and cabbage production was estimated at Tk. 79721, Tk. 80440 and Tk. 82150, respectively and their corresponding fixed cost was Tk. 38279, Tk. 36537 and Tk. 38372, respectively. Per hectare gross cost of tomato, cauliflower and cabbage production was Tk. 118000, Tk. 116977 and Tk. 120522, respectively. Per hectare gross margin of selected vegetables was Tk. 107079, Tk. 103760 and Tk. 110250. Per hectare net return of tomato, cauliflower and cabbage production was Tk. 97000, Tk. 93023 and Tk. 99478, respectively. Undiscounted benefit cost ratio of tomato, cauliflower and cabbage production per hectare came out to be 1.82, 1.79 and 1.83 respectively.

Factors affecting gross return of vegetables production

Cobb-Douglas Production Function model was applied on the basis of the best-fit and significant effects of resources on gross returns. For all the enterprises seven explanatory variables were taken into account to explain variations in production. Some of the key variables are explained below.

Human labour cost (X_1): It is observed from the Cobb-Douglas production function that the production co-efficient of human labour cost of cauliflower production was significant at one percent level of significance. It implies that one percent increase of human labour, keeping other factors constant, would increase the gross return by 0.354 percent (Table 4).

Tillage cost (X_2): The coefficient of tillage cost of cauliflower production was 0.30 with a positive sign. It was significant at one percent probability level which implies that one percent increase of tillage cost of cauliflower production, keeping other factors constant, would lead to an increase in the gross return by 0.30 percent (Table 4).

Tillage cost (X_2): The magnitude of the regression coefficient of tillage cost for cabbage was 0.568 with a positive sign. This coefficient was significant at one percent probability level. It implies that one percent increase of tillage cost of cabbage production, keeping other factors constant, would lead to an increase in the gross return by 0.568 percent (Table 4).

Seedling cost (X_3): The magnitude of the regression coefficient of seedling cost for cabbage was 0.19 with a negative sign. This coefficient was significant at one percent probability level. It implies that one percent increase of seedling cost of cabbage production, keeping other factors constant, would lead to a decrease in the gross return by 0.19 percent (Table 4).

Fertilizer cost (X_4): The regression coefficient of fertilizer cost for cabbage was 0.091. It was positive and was significant at one percent probability level. This indicates that an increase in one percent of fertilizer cost of cabbage production, remaining other factors constant, would result in an increase in the gross return by 0.091 percent (Table 4).

Manure cost (X_5): The regression coefficient of manure cost of tomato production was 1.068 (Table 4). This coefficient was significant at one percent level of significance. It implies that one percent increase of manure cost, keeping other factors constant, would lead to an increase in the gross return by 1.068 percent.

Table 4. Estimated values of coefficients and related statistics of some vegetables production

Explanatory variables	Tomato		Cauliflower		Cabbage	
	Estimated coefficient	Std. Error	Estimated coefficient	Std. Error	Estimated coefficient	Std. Error
Constant	3.095	1.446	2.345	0.927	3.053	0.479
Human labour (X_1)	0.227	0.158	0.354***	0.092	0.088**	0.043
Tillage cost(X_2)	0.021	0.239	0.300***	0.098	0.568***	0.126
Seedling cost(X_3)	0.031	0.088	0.174*	0.088	-0.19***	0.065
Fertilizer cost (X_4)	0.074	0.084	-0.30**	0.135	0.091***	0.033
Manure cost (X_5)	1.068***	0.307	-0.04	0.076	0.12	0.116
Irrigation cost (X_6)	-0.644*	0.353	0.086	0.081	-0.05	0.059
Insecticide cost (X_7)	-0.206	0.224	-0.01	0.031	0.041	0.026
R^2	0.877	-	0.79	-	0.89	-
F-value	22.459***	-	11.278***	-	26.285***	-
Returns to scale ($\sum b_i$)	0.571	-	0.564	-	0.668	-

Source: Field survey (2009).
Note: *** Significant at 1 percent level
** Significant at 5 percent level
* Significant at 10 percent level

The coefficients of multiple determinations, R^2 were 0.87, 0.79 and 0.89 in case of tomato, cauliflower and cabbage production function respectively. These indicated that 87%, 79% and 89% of the variation of output of tomato, cauliflower and cabbage were explained by the explanatory variables included in the models. The F-values (22.459, 11.278 and 26.265) of the equation were significant at one percent probability level, which indicated good fit of the 3 models. The summations of the estimated coefficient were 0.571, 0.654 and 0.668 which implied decreasing returns to scale and the enterprises were operating in the second stage of production functions of tomato, cauliflower and cabbage respectively.

In the study areas selected winter vegetable farmers faced various types of problems like, lack of capital, inadequate supply of good quality seeds, unavailability and high price of insecticides, high prices of fertilizers, loss of production due to theft, inadequate storage facilities, lack of marketing facilities, lack of price information of the market, etc.

Conclusion and Recommendations

All the selected vegetables were found to be profitable but cabbage was relatively more profitable than those of tomato and cauliflower. Per hectare yield and gross returns of cabbage were higher than those of tomato and cauliflower. Moreover, gross margin as well as net return of cabbage was higher than those of tomato and cauliflower. There are remarkable variations in input use particularly manure, human labour, tillage, fertilizer, etc. and other practices in the study areas. Most of the farmers did not follow the recommended doses of input use except human labour, tillage, fertilizer and manure. In addition to that farmers need good quality seed to grow better vegetables. Go and NGO can take care of it. Finally, government should come forward to address the problems and constraints of the vegetables farmers and try to solve those in time.

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