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Profitability of Bottle Gourd Production in Three Districts of Bangladesh

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Abstract

This paper attempts to analyze the profitability of bottle gourd cultivation in three districts namely Mymensingh, Rajshahi and Comilla in Bangladesh. The study also highlights input use efficiency and farmers problems. Farmer's production efficiency has been analyzed by using net farm income, benefit cost ratio (BCR) considering variable and total cost of production and Cobb-Douglas production function. Primary data were collected from bottle gourd farmers using pretested semi-structured questionnaire from May to July, 2014. The results show that total costs of bottle gourd are highest in Rajshahi (Tk. 378,171.1) compared to Mymensingh and Comilla while net farm incomes are highest in Comilla (Tk. 121,227.1) than that of other districts. The results indicate that bottle gourd productions are profitable in the three districts. Cobb-Douglas production function showed that per hectare yield of bottle gourd was significantly influenced by the use of urea, triple super phosphate, Muriate of potash, Zinc, cow dung, and pesticides. Low prices of bottle gourd ranked first problem for all areas. Correlation analysis indicates that numbers of agricultural training, numbers of extension contact and years of farming experience are significantly and negatively correlated with problem confrontation. Department of Agricultural Extension should pay more assistance to the farmers, providing more training on disease, insects and pastes identification and control.

Keywords: *Bottle gourd, cost, revenue, Cobb-Douglas production function, Bangladesh*

Introduction

Bangladesh is a densely populated country and population density is 1,222 people live in per square kilometer. The growth rate of population in the year 2015 is 1.37 percent and the projected population is 163.08 million in the year 2017 and 165.21 million in the year 2018. The projected population will be 218.65 million in the year 2051 (Statistical Pocket Book of Bangladesh, 2016). So, it is necessary to increase food production to meet the demand of the increasing population. Rice is the staple food of this country; government also tries to give incentives for diversification of food and government wants to increase vegetables production. Moreover, farmer's who are engaged in the production of vegetables often earn higher incomes than those engaged in the production of cereal crops alone (Weinberger and Lumpkin, 2005). "Vegetable 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 vegetable can be grown within a crop season" (Akter et al., 2011). Vegetable production and per hectare yield of vegetables have increased in the recent years. According to Yearbook of Agricultural Statistics of Bangladesh, 2011, total areas of vegetable production were 356.6 thousand hectares with an average yield of 8.1 ton/ hectare in 2008-2009 whereas total area of vegetable production was 367.6 thousand hectares with an average yield of 8.34 ton/hectare in 2010-2011.

Bottle gourd is an important and popular vegetable in Bangladesh which is consumed throughout the year. In Bangladesh bottle gourd used as curry and its leaves and stem also used as vegetables. "Bottle gourd is a moderate source of

vitamin C (100 gm of raw fruit provides 10 mg or about 17% of RDA). In addition, the vegetable is also a moderate source of thiamin, niacin (vitamin B-3), pantothenic acid (vitamin B-5), pyridoxine (vitamin B-6) and minerals such as calcium, iron, zinc, potassium, manganese and magnesium (Akter, 2014)".

There are few research about bottle gourd carried out in Bangladesh. Akter (2014) used tabular analysis, BCR and Cobb-Douglas production function. She found in Narayanganj district that gross cost per hectare of bottle gourd production was Tk. 153,261.2 and gross revenue per hectare was Tk. 340,197.0. Benefit cost ratio was found 2.2 which ensured that bottle gourd production was highly profitable. Cobb-Douglas production function showed that gross return per hectare of bottle gourd production was significantly influenced by the use of labor, power tiller, seed, fertilizer and manure, irrigation and insecticides. Hasan et al. (2014) selected Keranigonj upazila under Dhaka district and they used net return and BCR for profitability analysis. They found that total cost per hectare of bottle gourd was Tk. 412,713.0 and net return per hectare was Tk. 579,431.0. BCR consider variable cost was 2.83 and BCR consider total cost was 2.4. Lack of capital, low price of bottle gourd, high price of input, price fluctuation, disease, unavailability of input and lack of storage facilities were the major problems of farmers in the research area. Khayer, U., (2009) selected Mymensingh district and she used tabular analysis and Cobb-Douglas production function. She found that total cost per hectare was Tk. 104,840.0 and net revenue per hectare was Tk. 96,656.0. Functional analysis revealed that variation of bottle gourd yield was influenced by labor, animal power, cow dung, fertilizer and date of sowing. Lack of irrigation facilities, shortage of labor, high price of fertilizer and insecticide, unavailability of quality seed, low price of bottle gourd at harvest period, lack of storage facilities and inadequate of transportation facilities.

Previous researches were highlighted the profitability of bottle gourd production, input use efficiency and find out the major problems of bottle gourd production in different areas of Bangladesh. The present study not only emphasis on profitability of bottle gourd production but also establish the relationship between socioeconomic characteristics of farmers and problems faced by the farmers. This study carefully investigates the major problems of bottle gourd farmers and also ranks those problems which make this research identical. Moreover, this type of research was not previously done in the selected districts which are very essential to investigate. Finally the specific objectives of the study were (i) to assess the profitability of bottle gourd production at farm level, (ii) to determine the input- output relationship of bottle gourd production, (iii) to delineate the major problems of bottle gourd cultivation and make rank of those problems, and (iv) to evaluate the correlation between bottle gourd production problems and socioeconomic characteristics of the bottle gourd farmers.

Methodology

Three vegetable production districts, namely Mymensingh, Rajshahi and Comilla were selected as case study areas. These areas are the well-known vegetables production area in Bangladesh. In the year 2010-2011, total production area of summer vegetables were 7,467.6 and 6355.0 hectares in Mymensingh and Comilla, 12,131.9 hectares were cultivated in Rajshahi respectively. Total production area of winter vegetables in Mymensingh and Comilla were 5,546.1 and 10,119.0 hectares and 10,220.2 hectares were cultivated in Rajshahi (Yearbook of Agricultural Statistics of Bangladesh, 2011). The difference in production area conditions makes the research more suitable.

A total number of 87 farmers taking 27 from Mymensingh, 30 from Comilla, 30 from Rajshahi were randomly selected for interview. A semi-structured pre-tested interview schedule was used for collecting data and information from the bottle gourd farmers during May to July, 2014.

The revenues and costs of bottle gourd cultivation were calculated for four months. We used total variable cost, total fixed cost, total

cost, total revenues, gross farm income, net farm income, BCR over variable cost and total cost to calculate profitability. Total variable cost is the sum of seedling, power tiller, hired labor, fertilizer, pesticides, irrigation and bamboo cost. Fixed cost constituted by family labor cost, interest on operating capital and land rent. Total cost is the sum of total variable and fixed cost. Gross farm is the outcome from total variable cost deducted from total revenue. Net farm income is the result from total revenue minus total cost. BCR over variable cost is the ratio of total revenue and total variable cost and BCR over total cost is the ratio of total revenue and total cost.

The issue of fund is one of the main constraints, and also one of the important components of production costs in some farmers in Bangladesh. The interest rate of capital is an undeniable issue in the evaluation of profitability of vegetables. Bangladesh Bank interest rate for crop loan is about 11.0%. However, it is impossible for the farmers to get loan in this rate. In our survey, the average rate of interest for loan is 14.0% in the study area. So we considered interest rate as 14.0% for the profitability calculation.

Cobb-Douglas production function model was used to estimate the contribution of inputs to bottle gourd yield. The functional form of the Cobb-Douglas production function model is given below:

$$Y = AX_1^{b1}X_2^{b2} .....X_n^{bn}e^{ui}$$

The production function was converted to logarithmic form so that it could be solved by least square method i. e.

$$\ln Y = a + b_1 \ln X_1 + b_2 \ln X_2 \ \ldots\ldots\ldots\ldots\ldots + b_n \ln X_n + U_i$$

The empirical production function model is as follows:

$$\ln Y = a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + b_9 \ln X_{9+} b_{10} \ln X_{10} + b_{11} \ln X_{11} + b_{12} \ln X_{12} + U_i.$$

Where,

Y = Yield of bottle gourd (kg/ha), X_1 = Labor (man-days /ha), X_2 = tillage (no./ha), X_3 = Seed (kg/ha), X_4 = bamboo cost (Tk./ha), X_5 = cow dung (kg/ha), X_6 = Urea (kg/ha), X_7 = TSP (kg/ha), X_8 = MoP (kg/ha), X_9 = Zn (kg/ha), X_{10} = DAP (kg/ha), X_{11} = pesticide (liter/ha), X_{12} = Irrigation (no. of operation/ha), a = Intercept, b_1, b_2, ……. b_{12} = Coefficients of the respective variables to be estimated, U_i = Error term.

Farmers were asked to give their opinion about the eight selected problems. The weights were given for each response. A four point rating scale was used to rank each problem. Among them, 0stands for no problem confrontation, 1 stand for low problem, 2 stands for medium problem and 3 stands for high problem. We got problem confrontation score by adding weights of responses of the problems. The problem confrontation score ranged from 0 to 24, where 0 indicating 'no problem' and 24 indicating 'highest problem'. Hossain and Miah (2011) used the Problem Confrontation Index (PCI) for rank the problems and we used this index.

The PCI was computed by using the following formula:

$$PCI = P_h \times 3 + P_m \times 2 + P_l \times 1 + P_n \times 0$$

Where,

PCI = Problem Confrontation Index

P_h= Percentage of farmers with "high problem"

P_m= Percentage of farmers with "moderate problem"

P_l= Percentage of farmers with "low problem"

P_n= Percentage of farmers with "no problem"

The PCI of individual problem could range from 0 to 300, where 0 indicating "no problem" and 300 indicating "high problem" confrontation. Moreover, Pearson's Correlation Coefficient (r) was used to ascertain the correlation between the diverse characteristics of the bottle gourd farmers and their problem confrontation.

Results and Discussion

Socioeconomic Profile of the Farmers

Table 1 shows the socio-economic profile of the sample farmers in the research areas. Farmer's average age is 48.0 in Rajshahi, which is highest among three districts. Farmer's average age is 44.2 years and farmer's average year of schooling is 5.3 in all areas. Farmer's wife average age and years of schooling are 372. and 4.2 respectively. Farmer's average total family member is 3.1 in the study area. Farmer's average homestead area and other land are 0.53 hectares in Comilla which is highest among three districts. Farmer's average homestead area and other land are 0.32 hectares. Farmer's average bottle gourd cultivation area is 0.1 hectares in Comilla which is highest while 0.052 hectares in Rajshahi which is lowest among three districts. On an average farmer gets one agricultural training. Farmer's total amount of loan is highest in Comilla (Tk. 15,633.3) and lowest in Mymensingh (Tk. 2,074.0). On an average farmer's have 10.9 years of farming experience. Farmer's income from other sources is Tk. 55,200.0 in Rajshahi which is highest, while Tk. 42,925.9 and Tk. 50,000.0 in Mymensingh and Comilla respectively.

Table 1: Socio-economic feature of the sample farmers

Particulars of the features	Observed range (min-max)	Mymensingh District (n= 27)	Rajshahi District (n=30)	Comilla District (n=30)	All areas (n=87)
1.Family member statistics					
Farmer age (years)	20.0-66.0	43.1	48.0	41.7	44.2
Farmer's years of schooling	2.0-10.0	4.8	5.0	6.2	5.3
Wife's age (years)	18.0-50.0	38.5	41.2	32.1	37.2
Wife's years of schooling	0-10.0	3.5	3.4	5.8	4.2
Total family members (no.)	2.0-6.0	2.9	3.1	3.4	3.1
2.Land use pattern (hectares)					
Homestead area and other lands	0.008-1.02	0.12	0.29	0.53	0.32
Bottle gourd cultivation area	0.04-0.20	0.09	0.052	0.1	0.08
3.Other social and economic characteristics					
No. of agricultural training (per year)	0-3.0	1.3	1.7	0.9	1.3
Total amount of loan (Tk.)	0-100000.0	2,074.0	13,933.3	15,633.3	10,546.8
Rate of interest (%)	0-15.0	3.1	5.2	5.2	4.5
No. of extension contact (per year)	0-3.0	1.1	1.8	1.1	1.3
Years of farming experience	1.0-25.0	12.4	13.0	7.5	10.9
Total income from other sources (Tk.)	0-320,000.0	42,925.9	55,200.0	50,000.0	49,375.0

Source: Household survey (2014)

Input Use Pattern of Bottle Gourd Cultivation

Table 2 shows the input use pattern of bottle gourd production in the study areas. On an average farmer use 6.2 kg seed per hectare in the study areas. In Rajshahi, farmers use 253.8 man days' family labor per hectare which is highest and farmers use 177.3 man days family labor in Mymensingh which is lowest among three districts. On an average farmers use 264.4 man days hired labor per hectare in their field. Farmers are use 641.7 kg urea per hectare in Comilla which is highest and 126.2 kg in Mymensingh which is lowest among three districts. Farmer's are use 113.6 kg Di-ammonium Phosphate (DAP) per hectare in Rajshahi which is highest and 16.5 kg in Comilla which is lowest among three districts. Farmer's are use 2,463.1 kg manure per hectare in Rajshahi which is highest and 693.6 kg in Comilla which is lowest among three districts. On an average farmers use 77.0 liters of pesticides per hectare in the study areas.

Table 2: Input use pattern of bottle gourd cultivation per hectare in the study areas

Inputs	Mymensingh *(n=27)*	Rajshahi *(n=30)*	Comilla *(n=30)*	All areas *(n=87)*
1.Seed (kg)	6.7	6.1	6.0	6.2
2.Power tiller (no.)	45.4	70.1	39.8	51.7
3.Labor (man-days)				
Family labor	177.3	253.8	189.1	206.7
Hired labor	259.5	261.5	272.2	264.4
4. Fertilizers (kg)				
Urea	126.2	527.3	641.7	431.7
Triple Super Phosphate(TSP)	79.2	67.4	55.9	67.5
Diammonium Phosphate (DAP)	55.5	113.6	16.5	61.8
Muriate of Potash (MoP)	26.3	35.1	30.5	30.6
Zinc Sulfate	10.9	7.9	2.9	7.2
Gypsum	0.4	1.3	0.3	0.6
Boric Acid	0.3	-	1.04	0.4
5. Manure (kg)	1,587.2	2,463.1	693.6	1,581.3
6. Pesticides (liter)	62.0	109.5	59.6	77.0
7. Irrigation (no.)	51.9	79.0	41.2	57.3

Source: Household survey (2014)

Profitability of Bottle Gourd Production

Table 3 shows the costs, yields and revenue of bottle gourd production in the study areas. Ploughing cost is Tk. 10,556.7 in Mymensingh, while Tk. 14,388.9 and Tk. 9,997.3 in Rajshahi and Comilla respectively. On an average, seed cost is Tk. 10,829.9 in the study areas. Fertilizer costs are highest in Rajshahi (Tk. 27,417.0) while Tk. 15,480.2 in Mymensingh which is lowest among three districts. Total variable costs are Tk. 273,445.5 in Rajshahi which is highest among three districts, while Tk. 216,412.3 and Tk. 216,122.1 in Mymensingh and Comilla respectively. On an average, interest on operating capital was Tk. 4,706.5 in the study areas. Total fixed cost is Tk. 104,725.6 in Rajshahi which is highest among three districts, while Tk. 81,641.0 and Tk. 96,822.2 in Mymensingh and Comilla respectively. Total cost is Tk. 378,171.1 in Rajshahi which is highest among three districts, while Tk. 298,053.3 and Tk. 312,944.3 in Mymensingh and Comilla respectively. On an average, bottle gourd yield is 22,969.8/ha in the study areas. Total revenues are Tk. 434,171.6 in Comilla which is highest while Tk. 385,618.5 in Mymensingh which is lowest among three districts. Gross farm income are Tk. 218,049.3 in Comilla while Tk. 169,206.0 and Tk. 141,289.1 in Mymensingh and Rajshahi respectively. Among the three districts, net farm incomes are highest in Comilla (Tk. 121,227.1). Two main reasons may be the cause of highest net farm income in Comilla. Among the three districts, total variable costs are lowest in Comilla. The second reason is farmer get highest price for bottle gourd in Comilla than other two districts. BCR (variable costs basis) is 1.7 in Mymensingh, while 1.5 and 2.0 in Rajshahi and Comilla respectively. BCR (total cost basis) is 1.2 in Mymensingh while 1.09 and 1.3 in Rajshahi and Comilla respectively. The result showed that bottle gourd production is profitable in the study area.

Input Output Relationship of Bottle Gourd Production

In order to determine the contribution of inputs like labor, tillage, seed, bamboo, fertilizers, insecticide and irrigation for bottle gourd, Cobb-Douglas production function was used. The estimated values of co-efficient and related statistics of Cobb-Douglas production function have been presented in table 4. The coefficient of Urea and TSP are positive and significant at 10%

level. If we increase 1% of Urea and TSP, keeping other inputs remaining constant would increase the yield of bottle gourd by 0.23% and 0.35% respectively. The coefficient of MoP and Zn are positive and significant at 5% level. If we increase 1% of MoP and Zn, keeping other inputs remaining constant would increase the yield of bottle gourd by 0.01% and 0.16% respectively. There is an opportunity to increase those inputs for increase bottle gourd yield. On the other hand, the coefficient of cow dung and pesticides are negative and significant at 10% level. If we increase 1% of cow dung and pesticides, keeping other inputs remaining constant would decrease the yield of bottle gourd by 0.13% and 0.19% respectively. That's means farmers are over use those inputs.

Table 3: Costs, yield and revenue of bottle gourd cultivation per hectare in the study areas

Costs, yields and revenue	Mymensingh *(n=27)*	Rajshahi *(n=30)*	Comilla *(n=30)*	All areas *(n=87)*
Costs (Tk./ha)				
Ploughing	10,556.7	14,388.9	9,997.3	11,647.6
Seeds	11,580.9	10,471.6	10,437.3	10,829.9
Hired labor	77,877.0	78,468.0	95,294.5	83,879.8
Fertilizers (Organic +chemical)	15,480.2	27,417.0	16,551.8	19,816.3
Stick to protect plant	68,195.5	87,251.7	64,139.2	73,195.4
Pesticides	7,439.8	12,132.6	6,970.0	8,847.4
Irrigation	25,282.2	43,315.7	12,732.0	27,109.9
Total variable cost	216,412.3	273,445.5	216,122.1	235,326.3
Family Labor	53,211.0	76,140.0	66,216.5	65,189.1
Interest on operating capital (four months)	4,328.2	5,468.9	4,322.4	4,706.5
Land rent (four months)	24,101.8	23,116.7	26,283.3	24,500.6
Total fixed cost	81,641.0	104,725.6	96,822.2	94,396.2
Total cost	298,053.3	378,171.1	312,944.3	32,9722.5
Yield (no./ha)	21,339.7	26,214.7	21,355.1	22,969.8
Revenue (Tk./ha)				
Revenue	384,114.6	411,570.7	431,373.6	409,019.6
Income from selling used bamboo	1,503.9	3,164.0	2,798.0	2,488.6
Total revenues	385,618.5	414,734.7	434,171.6	411,508.2
Gross farm income	169,206.0	141,289.1	218,049.3	176,181.9
Net farm income	87,564.9	36,563.5	121,227.1	81,785.7
BCR(variable cost basis)	1.7	1.5	2.0	1.7
BCR(total cost basis)	1.2	1.09	1.3	1.2

Source: Household survey (2014)

Notes: In Mymensingh, costs of seed (Tk.1,725.9/kg), power tiller (Tk. 232.2/tillage), labour (Tk.300/man-day), Irrigation (Tk. 486.2/operation), bottle gourd price (Tk. 18/kg). In Rajshahi, costs of seed (Tk.1,716.6/kg), power tiller (Tk. 205.0/tillage), labor (Tk.300/man-day), bottle gourd price (Tk. 15.7/kg). In Comilla, costs of seed (Tk.1,736.6/kg), power tiller (Tk.251.0/tillage), labor (Tk. 350/man-day), bottle gourd price (Tk. 20.2/kg). Urea (Tk. 16/kg), TSP (Tk. 22/kg), MoP (Tk. 16/kg), DAP (Tk. 30/kg), Zinc Sulfate (Tk. 150/kg), Gypsum (Tk. 21/kg), Boric acid (Tk. 150/kg), Manure (Tk. 5,000/ton). In all areas, average costs of seed (Tk. 1,726.3), power tiller (Tk. 229.4), labor (Tk. 316.6/man-day), bottle gourd price (Tk. 17.9/kg)

The value of the coefficient of determination (R^2) is 0.45, which indicated that around 45% of the variation in yield was explained by the independent variables included in the model. The value of F is 5.05 which is significant at 1% level.

Table 4: Estimated coefficients and their related statistics of production function for bottle gourd

Explanatory variables	Coefficient	P value
Intercept	5.55***	0
Labor (X_1)	0.48	0.29
Tillage(X_2)	0.28	0.22
Seed(X_3)	0.04	0.11
bamboo cost(X_4)	-0.06	0.14
Cow dung(X_5)	-0.13*	0.08
Urea(X_6)	0.23*	0.07
TSP(X_7)	0.35*	0.08
MoP(X_8)	0.01**	0.05
Zn(X_9)	0.16**	0.04
DAP(X_{10})	0**	0.02
Pesticide(X_{11})	-0.19*	0.10
Irrigation(X_{12})	-0.08	0.12
R^2	0.45	
F value	5.05***	

Source: Household survey, 2014.
Notes: $***p \leq 0.01$, $**p \leq 0.05$, $*p \leq 0.1$

Major Obstacles of Bottle Gourd Production

The farmers are asked to mention the extent of problems they confronted in bottle gourd production and then farmer's problems were ranked. Problem confrontation Index (PCI) is computed to rank each problem. Table 5 reveals that low prices of bottle gourd ranked first in the rank order with highest PCI-232.1 in the study areas. Lack of capital ranked second in the rank order with PCI-205.7. Price fluctuation is the third rank order problem with PCI-191.9. According to rank order, other problems were disease damage, high prices of inputs, lack of storage facilities, unavailability of inputs, and insect damage.

Table 5: Major constrains of bottle gourd production

Items of problems	All areas *(n=87)*					
	Percentage of farmers				PCI	Rank order
	No	Low	Moderate	High		
Low prices of bottle gourd	10.34	1.14	34.48	54.02	232.16	1
Lack of capital	25.28	1.14	16.09	57.47	205.73	2
Price fluctuation	26.43	0	28.73	44.82	191.92	3
Disease damage	20.68	50.57	27.58	0	105.73	4
High prices of inputs	45.97	20.68	20.68	12.64	99.96	5
Lack of storage facilities	31.03	43.67	24.13	1.14	95.35	6
Unavailability of inputs	67.81	27.58	3.44	1.14	35.6	7
Insect damage	85.05	6.89	8.04	0	22.97	8

Source: Household survey (2014)

Correlation between Characteristics of Farmers and their Problem Confrontation

Relationship between farmers' diverse characteristics and their faced problem confrontation in cultivating bottle gourd has been computed by running correlation test. The results are presented in the Table 6.

Table 6: Correlation between diverse characteristics of farmers and their problem confrontation

Focus Variable	Particulars	All areas *(n=87)*	
		r	p value
Problem confronted by the bottle gourd farmers	1. Family member statistics		
	Farmer's age (year)	-0.11	0.28
	Farmer's year of schooling	-0.13	0.21
	Wife's age (year)	-0.05	0.63
	Wife's year of schooling	0.15	0.15
	Total family members (no.)	0.16	0.12
	2. Land use pattern (hectares)		
	Homestead area and other lands	-0.06	0.55
	Bottle gourd cultivated area	-0.06	0.57
	3. Other social and economic characteristics		
	No. of agricultural training (life time)	-0.53***	0
	Total amount of loan (Tk.)	-0.07	0.48
	Rate of interest (%)	0.02	0.83
	No. of extension contact (per year)	-0.40***	0
	Farming experience (year)	-0.28***	0
	Total income from other sources (Tk.)	0.06	0.56

Source: Household survey, 2014.
Notes:$***p \leq 0.01$, $**p \leq 0.05$, $*p \leq 0.1$

Data presented in Table 6 shows the correlation among the diverse characteristics of the bottle gourd farmers and their problem confrontation for bottle gourd production in the study areas. The correlation (r= -0.53) between number of agricultural training and problem confrontation is negative and significant at 1% level. If farmers get more agricultural training, they faced fewer problems. The correlation (r = -0.40) between farmers numbers of extension contact and problem confrontation is negative and significant at 1% level. If farmers consult more with extension workers about their problems, they faced fewer problems. The correlation (r= -0.28) between farmer's years of farming experience and problem confrontation is negative and significant at 1% level. Farmers having many years of farming experience faced fewer problems.

Conclusions

Bottle gourd production was profitable in the study areas, although farmers were faced different problems. Cobb-Douglas production function showed that farmers are under used of Urea, Triple Super Phosphate, Muriate of Potash and Zinc and there is an opportunity for the farmers to use those inputs to increase production. Conversely, farmers are over used cow dung and pesticides which reduce production. Low price of bottle gourd is the first rank order problem and the capital shortage is the second rank order problem in the study areas. Present study finds that more agricultural training, extension contact and farming experience help to reduce farmer's problems. DAE may provide more training about disease and paste control for the vegetable farmers. Fruitful results may come, if DAE increase their extension contact with the farmers and DAE may arrange more field demonstration to solve farmer's problem.

References

Akter, H. 2014. An economic analysis of bottle gourd production in a selected area of Narayanganj district, M.S. thesis, Department of Agricultural Economics, Sher-e-Bangla Agricultural University, Dhaka.

Akter, S., M.S. Islam and M.S. Rahman. 2011. An economic analysis of winter vegetables production in some selected areas of Narsingdi district. *Journal of the Bangladesh Agricultural University*, 9(2): 241-246.

BBS. 2016. *Statistical Pocketbook of Bangladesh* 2016. Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning, Dhaka, pp. 116-129.

Hasan, M. R., B. Hu and M.A. Islam. 2014. Profitability of important summer vegetables in Keranigonj upazila of Bangladesh, *Journal of the Bangladesh Agricultural University*. 12(1):111-118.

Hossain, M.S. and M.A.M. Miah. 2011. Poor farmer's problem confrontation in using manure towards integrated plant nutrition system. *Bangladesh Journal of Extension Education*, 23 (1&2):139-147.

Khayer, U. 2009. Comparative economic analysis of bean and bottle gourd production in selected areas of Mymensingh district, unpublished master's thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Weinberger, K. and C.A. Genova II. 2005. Vegetable production in Bangladesh: Commercialization and rural livelihoods, Technical Bulletin no. 33. Taiwan: AVRDC-The World Vegetable Centre.

Yearbook of Agricultural Statistics of Bangladesh. 2011. Ministry of planning, Government of the People's Republic of Bangladesh, Dhaka, pp.4-154.