

Profitability of Cauliflower and Bean Production in Bangladesh -A Case Study in Three Districts

M. R. Hasan¹, A. A. Mutatisse², E. Nakamoto³ and H. Bai⁴

Abstract

This paper attempts to analyze examine the revenues and costs of bean and cauliflower in three districts namely, Mymensingh, Comilla and Rajshahi in Bangladesh. Primary data were collected from farm household survey by using pretested semi-structured questionnaire from May to July, 2014. Farmer's production efficiency is analyzed by using net farm incomes and BCR taking into account the variable and total cost. The results show that total cost of bean is higher in Comilla than Mymensingh while net farm income is higher in Mymensingh than Comilla. On the other hand, total cost of cauliflower is higher in Comilla than Rajshahi while net farm income is higher in Rajshahi than Comilla. The results indicate that cauliflower and bean productions are profitable in the case study areas. The Problem Confrontation Index (PCI) was applied to rank each problem faced by the farmers. Correlation analysis indicates that farmer's age, education, number of agricultural training, numbers of extension contact and farmer's homestead area are significantly and negatively correlated with problem confrontation. Extension services should pay more assistance to the farmers, providing more training on disease, insects and pests identification and control. Department of agricultural extension (DAE) may provide some training to the farmers about storage of vegetables and the knowledge about basic marketing tactics to sell their product.

Keywords: Vegetable, revenue, cost, benefit cost ratio (BCR), Bangladesh

Introduction

Bangladesh is a densely populated country. The population is about 160 million in 2016 (BBS website) and the growth rate is 1.2 percent in 2014 (The World Bank). Food production needs to increase to fulfill the demand of the increasing population. Although rice is the staple food of this country, government also tries to give incentives for vegetable production, which is very important in improving the diversification of food and farmer's revenue because vegetables are an important source of cash income for almost all farmers. An person consume 166.1g vegetables per capita per day (HIES, 2010) while desirable intake of 100g leafy and 200g non-leafy vegetables per capita per day for healthy life (BIRDEM, 2013). Historically different types of vegetables are grown in Bangladesh, categorized into two

types, summer and winter vegetables. The major winter vegetables are rabi brinjal, rabi pumpkin, cauliflower, cabbage, water gourd, tomato, radish, beans and carrot and the summer vegetables mainly included teal gourd, kharif pumpkin, kharif brinjal, pointed gourd, lady's finger, ribbed gourd and bitter gourd. There are evidences that vegetable production and per acre yield of vegetables have increased in the recent years. According to Yearbook of Agricultural Statistics of Bangladesh, 2011, Total areas of vegetable production was 881 thousand acres and per acre yield 3,283 kg in the year 2008-2009 whereas total area of vegetable production was 908 thousand acres and per acre yield of vegetable production was 3,378 kg in the year 2010-2011. However, there are few studies on vegetables production is carried out in

¹Sher-e-Bangla Agricultural University; ²Graduate School of Agriculture, Ehime University; ³The United Graduate School of Agricultural Sciences, Ehime University; and ⁴Faculty of Agriculture, Ehime University, corresponding author: M. R. Hasan (rashidul_prince@yahoo.com).

Bangladesh (Monayem et al., 1998; Haque et al., 2007; Hasan et al., 2007; Khan et al., 2009; Khayer, 2009; Mamun et al., 2010; Hoq et al., 2010, Hasan et al., 2014), but no one emphasis on the relationship between socioeconomic characteristics and problems faced by the vegetables growers. Therefore, the specific objectives of the study are as follows:

1. To analyze the profitability of bean and cauliflower production
2. To identify the crucial problems for the farmer and make rank of those problems.
3. To establish the relationship between vegetables production problems with socioeconomic characteristics of the vegetables growers.

Methodology

We selected three vegetable production districts, Mymensingh, Comilla and Rajshahi 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 15,697 and 18,445 acres in Comilla and Mymensingh, 29,966 acres were cultivated in Rajshahi respectively. Total production area of winter vegetables in Comilla and Rajshahi were 24,994 and 13,699 acres and 25,244 acres were cultivated in Rajshahi (Yearbook of Agricultural Statistics of Bangladesh, 2011). The difference in production

conditions makes the comparative study more suitable. The soil in Comilla is alluvial and most of the farmlands are medium to high, while Rajshahi covers both and varies from sandy loam to loam, and the most in Mymensingh is salty to clay and low content of organic matter (Yearbook of Agricultural Statistics of Bangladesh, 2011).

A total number of 102 farmers were purposively selected in the study area and they were interviewed through a semi-structured questionnaire from May to July, 2014, as presented in Table 1.

Table 1 The distribution of sample farmers in different districts unit: households

Vegetables	Comilla	Mymensingh	Rajshahi	Total
Bean	24	24	n/a	48
Cauliflower	33	n/a	21	54
Total	57	24	21	102

Note: "n/a" denotes not applicable.

Revenues and costs of vegetables were calculated for four month production season. The following indices were used to calculate the profitability of the vegetables:

- Total variable cost = Seed and seedling cost + Power tiller cost + Hired labor cost + Fertilizer cost + Pesticides cost + Irrigation cost + Bamboo cost.

- Total cost = Family labor cost + Total variable cost + Interest on operating capital + Land rent.
- Gross farm income = Total revenue - Total variable cost
- Net farm income = Total revenue - Total cost

- Benefit cost ratio (Variable cost basis)

$$= \frac{\text{Total revenue}}{\text{Total variable cost}}$$
- Benefit cost ratio (Total cost basis)

$$= \frac{\text{Total revenue}}{\text{Total cost}}$$

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 therefore becomes an undeniable issue in the evaluation of profitability of vegetables. Bangladesh Bank interest rate for crop loan is about 11%. However it is impossible for the farmers to get loan in this rate. According to 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. The Bangladesh Bureau of Statistics (BBS) and Yearbook of Agricultural Statistics of Bangladesh were considered as secondary data source.

Four point rating scale was used to rank each problem. The vegetable grower farmers were asked to give their opinion about the eight selected problems. The weights were given for each response. Weights 0, 1, 2 and 3 stand for no problem confrontation, low problem confrontation, medium problem confrontation and high problem confrontation respectively. By

adding weights of responses of the problems, we get problem confrontation score. The problem confrontation score range from 0 to 24, where 0 indicating 'no problem' and 24 indicating 'highest problem'. Hossain and Miah (2011) used Problem Confrontation Index (PCI) and we used this for rank the problems. Problem Confrontation Index was computed by using the following formula:

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

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 Problem Confrontation Index 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 vegetables farmers and their problem confrontation for different districts.

Results and Discussion

Salient features of the farmers in the study area: In this section, we analyze farmer's family member statistics, land use pattern and other social and economic characteristics for different districts.

Statistics about bean farmers: Table 2 illustrates the features of the interviewed bean farmers in Comilla and Mymensingh.

Total family member in Comilla is 3.7 persons, which is near to national average of 4.4 (BBS, 2012), whereas Rajshahi farmers family is consisted with 3.2 persons. The maximum and minimum years of schooling are 16.0 and 2.0 in Comilla, and 7.0 and 1.0 in Mymensingh, respectively. On the average, farmers have

0.053 hectares of owned cultivated land in Comilla, 0.103 hectares in Mymensingh, which are smaller than national average of 0.51 hectares (BBS, 2012). The average vegetable cultivation area is 0.051 hectares in Comilla, and 0.083 hectares in Mymensingh. Farmers get more agricultural training in Mymensingh (2.0) than Comilla (1.5) per year. Farmers of Comilla get more loans (BDT 15,380) than farmers in Mymensingh (BDT 9,809). The rate of interest for credit is comparatively higher in Mymensingh (14.0%) than Comilla (13.2%). Usually farmers face different

kinds of problems during the period of bean cultivation and they contact with extension workers. Farmers of Comilla contact more with extension worker (1.4) than Mymensingh (1.1) per year, while farmers of Mymensingh have more years of farming experience (22.2) than the farmers (17.2) of Comilla. In addition, farmers have different kind of incomes rather than agricultural incomes. The farmers of Comilla have more incomes from other sources than Mymensingh, suggesting that farmers in this district are not necessary only relying on agricultural incomes.

Table 2 Characteristics about bean farmers

Particulars	Comilla district (n=24)				Mymensingh District (n=24)			
	Max.	Min.	Mean	S.D.	Max.	Min.	Mean	S.D.
1. Family member statistics								
Farmer age (years)	59.0	26.0	42.5	8.7	65.0	20.0	46.0	12.2
Farmer education (years)	16.0	2.0	5.3	3.5	7.0	1.0	3.5	1.5
Wife's age (years)	48.0	22.0	35.9	48.0	61.0	18.0	40.7	11.4
Wife's education (years)	8.0	1.0	3.7	1.8	4.0	1.0	1.5	0.9
Total family members (no.)	6.0	2.0	3.7	0.9	4.0	2.0	3.2	0.5
2. Land use pattern (hectares)								
Homestead area	0.242	0.02	0.053	0.044	0.283	0.02	0.103	0.070
Pond area	0.040	0.0	0.009	0.012	0.080	0.0	0.007	0.020
Own cultivated land	0.728	0.12	0.262	0.152	1.012	0.0	0.307	0.259
Fallow land	0.040	0.0	0.003	0.009	0.607	0.0	0.073	0.134
Rented in land	0.283	0.0	0.028	0.065	0.647	0.0	0.062	0.156
Rented out land	0.121	0.0	0.005	0.024	0.283	0.0	0.032	0.086
Leased in land	0.283	0.0	0.016	0.058	0.202	0.0	0.017	0.057
Leased out land	0.161	0.0	0.006	0.033	0.0	0.0	0.0	0.0
Vegetable cultivation area	0.121	0.02	0.051	0.020	0.161	0.028	0.083	0.044
3. Other social and economic characteristics								
No. of agricultural training (per year)	5.0	0.0	1.5	1.6	8.0	0.0	2.0	2.3
Total amount of loan (BDT)	60,000	12,000	37,181	15,380	30,000	3,000	16,000	9,809
Rate of interest (%)	15.0	10.0	13.2	1.8	15.0	12.0	14.0	1.2
No. of extension contact (per year)	3.0	0.0	1.4	0.9	5.0	0.0	1.1	1.3
Years of farming experience	35.0	6.0	17.2	8.3	50.0	5.0	22.2	11.9
Total income from other sources (BDT)	200,000	0.0	73,696	59164	160,000	0.0	34,771	46,866

Source: Farmers' household survey, 2014

Statistics about cauliflower farmers: The table 3 shows the situation of cauliflower farmers in Comilla and Rajshahi. Farmers in Comilla are more elder (42.5 years) than Rajshahi (38.4 years). Farmers of both districts have same years of maximum (10.0) and minimum (2.0) education. Standard deviation (S.D.), maximum and minimum of variables indicates that there is a wide difference among the farmers and areas, as well as an uneven distribution. Total family members in Comilla are 3.8 persons whereas farmers in Rajshahi have fewer family members (3.4). Farmers' owned cultivated land is 0.081 hectares in Comilla, almost the same with Rajshahi. The average vegetable cultivation area is 0.091 hectares in Comilla and 0.08 hectares in Rajshahi. Farmers get equal number of maximum agricultural training in

both districts. Because of the shortage of capital, farmers borrow money from different sources, banks, NGOs, money lenders, friends and relatives and so on. Total amount of loan is much higher in Comilla (BDT 21,500) than Rajshahi (BDT 10,000). Almost same rates of interest of loan are observed in both districts. Farmers contact local extension worker about 0.7-1.0 times for solving their problems. Farmers have more than five years of farming experience in both districts. It is also observed that farmers have different other sources of income from service, fisheries, business, labor and rickshaw pulling.

Table 3 Information about cauliflower farmers

Particulars	Comilla district (n=24)				Mymensingh District (n=24)			
	Max.	Min.	Mean	S.D.	Max.	Min.	Mean	S.D.
1. Family member statistics								
Farmer age (years)	65.0	24.0	42.5	9.5	55.0	25.0	38.4	8.7
Farmer education (years)	10.0	2.0	5.8	2.1	10.0	2.0	6.1	2.4
Wife's age (years)	58.0	19.0	34.0	8.4	45.0	20.0	29.8	7.1
Wife's education (years)	10.0	3.0	5.9	2.0	10.0	2.0	5.3	1.6
Total family members (no.)	6.0	2.0	3.8	1.0	5.0	1.0	3.4	1.0
2. Land use pattern (hectares)								
Homestead area	0.161	0.052	0.081	0.023	0.133	0.024	0.079	0.023
Pond area	0.121	0.0	0.022	0.031	0.121	0.0	0.022	0.033
Own cultivated land	0.566	0.0	0.275	0.117	1.295	0.0	0.320	0.260
Fallow land	0.242	0.0	0.007	0.042	0.202	0.0	0.014	0.048
Rented in land	0.202	0.0	0.029	0.06	0.404	0.0	0.034	0.098
Rented out land	0.202	0.0	0.011	0.044	0.202	0.0	0.009	0.441
Leased in land	0.121	0.0	0.009	0.028	0.121	0.0	0.017	0.035
Leased out land	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vegetable cultivation area	0.161	0.052	0.091	0.021	0.141	0.040	0.080	0.025
3. Other social and economic characteristics								
No. of agricultural training (per year)	3.0	0.0	0.4	0.9	3.0	0.0	1.0	1.1
Total amount of loan (BDT)	50,000	10,000	21,500	12,746	20,000	3,000	10,000	5,447
Rate of interest (%)	16.0	14.0	14.6	0.7	15.0	14.0	14.5	0.5
No. of extension contact (per year)	3.0	0.0	1.0	1.0	3.0	0.0	0.7	0.9
Years of farming experience	12.0	1.0	5.3	2.4	18.0	1.0	5.8	4.4
Total income from other sources (BDT)	245,000	0.0	249,375	52,895	180,000	0.0	25,650	55,275

Source: Farmers' household survey, 2014.

Costs of bean production: The Table 4 shows the costs of bean production in Comilla and Mymensingh. The variable cost is composited by seed and seedling, power tiller, labor, fertilizers, manure, pesticides, irrigation and bamboo costs. Labor cost is crucial, accounting for 37.3% of total cost in Mymensingh while it is 42.7% in Comilla district. Fertilizer cost is 17.8% in Mymensingh, higher than Comilla (15.3%). Farmers of Comilla use more manure than Mymensingh, mainly included by cow dung. Farmers of Comilla use more pesticides than Mymensingh. The cost of

irrigation is 7.3% in Comilla almost the same with Mymensingh. Bamboo cost is higher in Comilla (15.7%) than Mymensingh (12.8%). Total variable cost is 70.7% of total cost in Mymensingh and 58.2% in Comilla. Land rents are comparatively high in Comilla, suggesting that the farmland is relatively scarce for cultivation in this district. Total cost per hectare in Comilla (BDT 226,123) is higher than Mymensingh (BDT 193,073). This may be one of the factors for more bean production in Mymensingh.

Table 4 Costs of bean production

Cost items (BDT/ha)	Mymensingh district (n=24)				Comilla district (n=24)			
	Price	Total quantity	Total cost (BDT)	%	Price	Total quantity	Total cost (BDT)	%
1. Seed or seedling	1,779.1	6.3	11,173	5.8	1,700.0	6.6	11,322	5.0
2. Power tiller	216.2	54.3	11,745	6.1	205.4	75.1	15,428	6.8
3. labor	-	-	72,156	37.3	-	-	96,477	42.7
Family labor	300.0	123.9	37,173	19.3	350.0	166.1	58,118	25.7
Hired labor	300.0	116.6	34,983	18.1	350.0	109.6	38,360	16.9
4. Fertilizers	-	-	34,330	17.8	-	-	34,496	15.3
Urea	16.0	819.2	13,108	6.8	16.0	840.3	13,445	5.9
Triple Super Phosphate	22.0	317.4	6,984	3.6	22.0	495.7	10,907	4.8
Diammonium Phosphate	30.0	6.8	206	0.1	30.0	80.5	2,415	1.1
Muriate of Potash	15.0	100.6	1,508	0.8	15.0	89.9	1,349	0.6
Zinc Sulfate	150.0	76.7	11,505	5.9	150.0	31.9	4,785	2.1
Gypsum	21.0	2.6	54	0.03	21.0	-	-	-
Boric Acid	150.0	6.4	965	0.5	150.0	10.6	1,595	0.7
5. Manure	5.0	237.8	1,189	0.6	5.0	478.8	2,394	1.1
6. Pesticides	113.3	40.7	4,619	2.4	135.4	89.1	12,067	5.3
7. Irrigation	274.5	50.3	13,831	7.2	232.5	71.5	16,623	7.3
8. Bamboo	-	-	24,616	12.8	-	-	35,487	15.7
9. Total Variable Cost	-	-	136,487	70.7	-	-	131,684	58.2
10. Interest (four months)	-	-	3,184	1.6	-	-	3,073	1.4
11. Land rent (BDT/ha/season)	-	-	16,229	8.4	-	-	33,250	14.7
12. Total Cost	-	-	193,073	100.0	-	-	226,123	100.0

Source: Farmer's household survey, 2014.

Notes:

1. BDT means Taka, which is the currency of Bangladesh and exchange rate for United States dollar to Bangladeshi Taka, 1 USD = 77.6 Taka (approximately). The exchange rate for Japanese yen to Bangladeshi Taka, 1 yen = 0.65 Taka (approximately).
2. Per unit seed and seedling cost is in BDT /kg and total quantity is in kilograms; per unit tilling cost is in BDT /tillage and total quantity is the total number of tillages.
3. Per unit labor cost is in BDT /man-day and per unit fertilizer cost is in BDT /kg; total quantity of labor is in man-days and total quantity of fertilizer is in kilograms; per unit manure cost is in BDT /kg and total quantity is in kilograms.
4. Per unit pesticide cost is in BDT /liter and total quantity is in liters, per unit irrigation cost is in BDT / irrigation and total quantity is the times of irrigations.

Profitability of bean production: The Table 5 shows the profitability of bean production in two districts. Vegetables production area in Mymensingh is 0.083 hectares while 0.051 hectares in Comilla. Total revenues per hectare are higher in Comilla (BDT 236,519) than Mymensingh (BDT 219,798). Gross farm incomes are higher in Comilla (BDT 104,836) than Mymensingh (BDT 83,311). Farmers in Comilla get high prices vegetables and middlemen of this area give high prices to

vegetable farmers. Consequently, net farm incomes are higher in Comilla (BDT 226,123) than Mymensingh (BDT 193,073). Benefit cost ratios on the basis of variable cost are 1.6 and 1.7 while benefit cost ratio on the basis of total cost are 1.1 and 1.0 in Mymensingh and Comilla respectively. It is obvious that bean production is profitable in both districts. Because of these, farmers are very interested in growing more beans in the two areas.

Table 5 Profitability of bean production

Particulars	Mymensingh district (n=24)	Comilla district (n=24)
Cultivation area (ha)	0.083	0.051
Total production (kg/ha)	10,089	10,722
Revenues (BDT/ha)	216,927	233,207
Income from selling used bamboo (BDT/ha)	2,870	3,311
Total Revenues (BDT/ha)	219,798	236,519
Total variable costs (BDT/ha)	136,487	131,683
Gross farm incomes (BDT/ha)	83,311	104,836
Total costs (BDT/ha)	193,073	226,123
Net farm incomes (BDT/ha)	26,724	10,395
BCR (Variable cost basis)	1.6	1.7
BCR (Total cost basis)	1.1	1.0

Source: Farmer's household survey, 2014.

Notes: In Mymensingh bean price/kg is BDT 21.5 while in Comilla price/kg is BDT 21.8

Costs of cauliflower production: The Table 6 presents the cost of cauliflower production in Rajshahi and Comilla. Cauliflower production costs include seed and seedling, power tiller, labor, fertilizer, manure, pesticides, irrigation, bamboo and land rent cost. Farmer spend 9.4 % of total cost for seed and seedling in Rajshahi, higher than Comilla (7.6 %). 6.1 % of total cost is used for irrigation in Mymensingh whereas 4.6 % in Comilla. Family labor is very important for cauliflower production, suggesting that farmers use more time in their field work. Rajshahi farmers use more labor in their land. The data also reveals that farmers spend almost same proportion of fertilizers in Rajshahi (7.0%) and Comilla (7.3%). Cow dung is very worthy for soil

and farmers use this in both regions. Farmers of Rajshahi use more pesticides for their vegetables. Irrigation cost is 4.9% of total cost in Rajshahi where as 4.6 % in Comilla district respectively. Land rent is comparatively higher in Comilla (BDT 31,635) than Rajshahi (BDT 22,894). The first reason for high land rent in Comilla is that, Comilla is very near to Dhaka. The second reason, land is very scarce because of increasing industrial use of land. Total costs per hectare of cauliflower production are higher in Comilla (BDT 196,975) than Rajshahi (BDT 189,125). The reasons for higher cost in Comilla in Compare to Rajshahi that, variable costs and land rent are comparatively high in Comilla.

Table 6 Costs of cauliflower production

Cost items (BDT/ha)	Mymensingh district (n=21)				Comilla district (n=36)			
	Price	Total quantity	Total cost (BDT)	%	Price	Total quantity	Total cost (BDT)	%
1. Seed or seedling	5,690.5	3.1	17,697	9.4	5606.1	2.7	15,136	7.6
2. Power tiller	234.3	48.8	11,434	6.1	248.2	36.9	9,158	4.6
3. labor	-	-	103,620	54.8	-	-	107,660	54.6
Family labor	300.0	218.6	65,580	34.7	350.0	158.7	55,545	28.2
Hired labor	300.0	126.8	38,040	20.1	350.0	148.9	52,115	24.5
4. Fertilizers	-	-	13,285	7.0	-	-	14,464	7.3
Urea	16.0	547.1	8,754	4.6	16.0	560.2	8,963	4.5
Triple Super Phosphate	22.0	98.0	2,156	1.1	22.0	147.5	3,245	1.6
Diammonium Phosphate	30.0	4.7	141	0.07	30.0	14.3	429	0.2
Muriate of Potash	15.0	70.3	1,055	0.6	15.0	80.5	1,208	0.6
Zinc Sulfate	150.0	5.2	780	0.4	150.0	3.4	510	0.2
Gypsum	21.0	1.2	25	0.01	21.0	0.2	4	0.002
Boric Acid	150.0	2.5	375	0.2	150.0	0.7	105	0.05
5. Manure	5	361.4	1,807	0.9	5.0	263.5	1,317	0.7
6. Pesticides	145.2	47.0	6,824	3.6	134.8	44.0	5,931	3.0
7. Irrigation	195.7	47.3	9,269	4.9	208.5	43.9	9,169	4.6
8. Total Variable Cost	-	-	98,356	52.0	-	-	107,292	54.5
9. Interest (four months)	-	-	2,295	1.2	-	-	2,503	1.2
10. Land rent (BDT/ha/season)	-	-	22,894	12.1	-	-	31,635	16.0
11. Total Cost	-	-	189,125	100.0	-	-	196,975	100.0

Source: Farmer's household survey, 2014.

Notes: 1. Per unit seed and seedling cost is in BDT /kg and total quantity is in kilograms; per unit tilling cost is in BDT /tillage and total quantity is the total number of tillage.

2. Per unit labor cost is in BDT /man-day and per unit fertilizer cost is in BDT /kg; total quantity of labor is in man-days and total quantity of fertilizer is in kilograms; per unit manure cost is in BDT /kg and total quantity is in kilograms.

3. Per unit pesticide cost is in BDT /liter and total quantity is in liters, per unit irrigation cost is in BDT / irrigation and total quantity is the times of irrigations.

Profitability of cauliflower production:

The Table 7 shows the profitability of cauliflower production in two districts. Vegetables production area in Rajshahi is 0.08 hectares whereas 0.091 hectares in Comilla district. Total production per hectare is higher in Comilla (19,353 pieces) than Rajshahi (17,932 pieces). Prices per piece of cauliflower are BDT 12.6 in Rajshahi and BDT 12.0 in Comilla. Revenues per hectare are BDT 225,946 in Rajshahi and BDT 232,243 in Comilla. Gross farm incomes are higher in Rajshahi (BDT 127,589) than Comilla (BDT

124,950). Similarly, net farm incomes are also higher in Rajshahi (BDT 36,820) than Comilla (BDT 35,267). Two main reasons are that farmer's total variable cost is low in Compare to Comilla. The second reason is farmer get high price for Cauliflower in Rajshahi than Comilla. Farmers of Rajshahi get more farm incomes from their vegetable production, which eventually encourages them to produce more vegetables. BCR on the basis of variable and total cost basis were 2.2 and 2.1 in Rajshahi respectively, while 2.1 and 1.1 in Comilla respectively.

Table 7 Profitability of cauliflower production

Particulars	Mymensingh district (n=21)	Comilla district (n=33)
Cultivation area (ha)	0.080	0.091
Total production (pieces/ha)	17,932	19,353
Total Revenue (BDT/ha)	225,946	232,243
Total variable cost (BDT/ha)	98,356	107,292
Gross farm income (BDT/ha)	127,589	124,950
Total cost (BDT/ha)	189,125	196,975
Net farm income (BDT/ha)	36,820	35,267
BCR (Variable cost basis)	2.2	2.1
BCR (Total cost basis)	1.1	1.1

Source: Farmer's household survey, 2014.

Notes: In Rajshahi price/piece of cauliflower is BDT 12.6 while in Comilla price/piece is BDT 12.0

Problems confronted by the farmers in bean production: The farmers are asked to mention the extent of problems they confronted in vegetable production and then farmer's problems are ranked. Problem Confrontation Index (PCI) is computed to rank each problem. The Table 8 reveals that low prices of vegetables ranked first in the rank order with highest PCI-237 in Mymensingh. Lack of capital ranked second in the rank order with PCI-229.1, which is also an important problem for the farmers. According to rank order, other problems

were price fluctuation, lack of storage facilities, high prices of inputs, disease damage, and insect damage. Unavailability of inputs was the lowest ranked in the rank order with PCI-49.9. In Mymensingh, lack of capital ranked first in the rank order with highest PCI-250. Low prices of vegetables ranked second in the rank order with PCI-225.1. Price fluctuation ranked third with PCI-216.8. According to rank order, other problems are high prices of inputs, disease damage, lack of storage facilities, insect damage and unavailability of inputs.

Table 8 Problems confronted by farmers in the bean production

Items of problems	Mymensingh District					Rank order
	Percentage of farmers				PCI	
	No (%)	Low (%)	Moderate (%)	High (%)		
Low prices of Vegetables	16.7	0	12.5	70.8	237.4	1
Lack of capital	16.7	0	20.8	62.5	229.1	2
Price Fluctuation	33.3	0	16.7	50.0	183.4	3
Lack of storage facilities	8.4	33.3	33.3	25.0	174.9	4
High prices of Inputs	41.7	0	8.3	50.0	166.0	5
Disease damage	20.8	50.0	16.7	12.5	120.9	6
Insect damage	66.7	16.7	12.5	4.1	54	7
Unavailability of inputs	58.4	33.3	8.3	0	49.9	8
Items of problems	Comilla District					Rank order
	Percentage of farmers					
	No (%)	Low (%)	Moderate (%)	High (%)		
Lack of capital	12.5	0	12.5	75	250	1
Low prices of Vegetables	20.8	0	12.5	66.7	225.1	2
Price Fluctuation	20.8	0	20.8	58.4	216.8	3
High prices of Inputs	29.1	0	8.4	62.5	204.3	4
Disease damage	16.7	58.3	16.7	8.3	116.6	5
Lack of storage facilities	66.7	16.7	8.3	8.3	58.2	6
Insect damage	87.6	4.1	4.1	4.1	24.6	7
Unavailability of inputs	91.6	4.2	4.2	0	12.6	8

Source: Farmer's household survey, 2014

Problems confronted by the farmers in cauliflower production:

Different problems of farmers were ranked in Rajshahi and Comilla in the Table 9. In Rajshahi, low prices of vegetables ranked first in the rank order with highest PCI-238.2. Farmers do not get their expected price by selling their vegetables. Price fluctuation ranked second with PCI-221.2. According to rank order, other problems are lack of capital, high prices of inputs, disease

damage, unavailability of inputs, lack of storage facilities and insect damage. In Comilla, same with Rajshahi, low prices of vegetables ranked first in the rank order with highest PCI-251.5. Price fluctuation ranked second in the rank order with PCI-221.2. Lack of capital ranked third with PCI-209. According to rank order, other problems are high prices of inputs, disease damage, unavailability of inputs, lack of storage facilities and insect damage.

Table 9 Problems confronted by farmers in the cauliflower production

Items of problems	Rajshahi District					Rank order
	Percentage of farmers				PCI	
	No (%)	Low (%)	Moderate (%)	High (%)		
Low prices of Vegetables	4.7	9.6	28.5	57.2	238.2	1
Disease damage	4.7	14.2	38.2	42.9	219.3	2
Lack of capital	19.0	0	28.6	52.4	214.4	3
High prices of Inputs	28.6	0	14.3	57.1	199.9	4
Price Fluctuation	38.2	0	19.0	42.8	166.4	5
Unavailability of inputs	19.0	38.2	42.8	0	123.8	6
Lack of storage facilities	52.3	4.8	28.6	14.3	104.9	7
Insect damage	66.7	19.1	9.5	4.7	52.2	8
Items of problems	Comilla District					Rank order
Percentage of farmers				PCI		
No (%)	Low (%)	Moderate (%)	High (%)			
Low prices of Vegetables	9.1	0	21.2	69.7	251.5	1
Price Fluctuation	21.2	0	15.2	63.6	221.2	2
Lack of capital	27.3	0	9.1	63.6	209	3
High prices of Inputs	27.3	0	12.2	60.6	206.2	4
Disease damage	12.1	24.2	48.5	15.2	166.8	5
Unavailability of inputs	12.1	54.5	33.4	0	121.3	6
Lack of storage facilities	39.4	15.1	36.3	9.2	115.3	7
Insect damage	63.6	27.2	9.2	0	45.6	8

Source: Farmer's household survey, 2014

Correlation between diverse characteristics of bean farmers and their problem confrontation:

Pearson's correlation coefficient(r) was used to ascertain the correlation between the diverse characteristics of the vegetables farmers and their problem confrontation for bean production (Table 10). In Comilla, for the case of bean production, there is a moderate negative correlation ($r = -0.41$) between farmer age and problem confrontation and significant at 5% level. The farmers of higher age confronted lower problem in

vegetable production. The farmer of higher age confronted lower problem in vegetable production. The correlation ($r = -0.58$) between number of extension contact and problem confrontation is negative and significant at 1% level. If the farmers visit more with the extension worker, they face lower problem. In Mymensingh, there is a moderate negative correlation ($r = -0.46$) between farmer education and problem confrontation, i.e. the farmer with higher level of education confronted lower problems. There is a moderate negative

correlation ($r = -0.65$) between farmers homestead area and problem confrontation. If farmers increase their vegetable

cultivation in homestead area, then they face fewer problems.

Table 10 Correlation among diverse characteristics of bean farmers and their problem confrontation

Particulars	Focus Variable	Comilla district (n=24)		Mymensingh district (n=24)	
		r	p value	r	p value
1. Family member statistics	Problem confronted by the vegetables farmers				
Farmer age (years)		-0.41**	0.04	0.20	0.32
Farmer education (years)		0.18	0.37	-0.46**	0.02
Wife's age (years)		0.12	0.56	0.23	0.26
Wife's education (years)		0.41**	0.04	0.13	0.53
Total family members (no.)		0.45**	0.02	0.07	0.72
2. Land use pattern (acres)					
Homestead area		-0.07	0.72	-0.65***	0.00
Pond area		0.26	0.21	-0.08	0.69
Own cultivated land		-0.14	0.50	-0.15	0.47
Fallow land		0.21	0.30	-0.09	0.66
Rented in land		-0.28	0.18	0.38	0.06
Rented out land		-0.16	0.44	-0.01	0.94
Leased in land		0.16	0.44	0.03	0.88
Leased out land		0.10	0.61	-	-
Vegetable cultivation area		-0.40**	0.04	-0.62***	0.00
3. Other social and economic characteristics					
No. of agricultural training (per year)		-0.28	0.18	-0.15	0.48
Total amount of loan (BDT)		0.28	0.17	0.02	0.92
Rate of interest (%)		0.23	0.23	0.15	0.47
No. of extension contact (per year)		-0.58***	0.002	-0.27	0.18
Years of farming experience		0.20	0.34	0.18	0.37
Total income from other sources (BDT)		0.17	0.41	0.20	0.33

Source: Farmer's household survey, 2014.

Notes: *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$

Correlation between diverse characteristics of cauliflower farmers and their problem confrontation: Table 11 shows the correlation between the diverse characteristics of the vegetables farmers and their problem confrontation for cauliflower production. In Comilla, the correlation ($r = -0.62$) between number of agricultural training and problem confrontation is negative and significant at 1% level. Farmers with more agricultural training faced fewer problems. The correlation ($r = -0.36$) between farmer's number of extension contact and problem

confrontation is negative and significant at 5% level. If farmers consult more with extension worker, they faced lower problems. In Rajshahi, the correlation ($r = -0.52$) between farmers education and problem confrontation is negative and significant at 1% level, i.e. the farmers with higher level of education confronted lower problems. The correlation ($r = -0.59$) between number of extension contact and problem confrontation is negative and significant at 1% level. If farmers increase the number of extension contact, then they face fewer problems.

Table 11 Correlation among diverse characteristics of cauliflower farmers vs. their problem confrontation

Particulars	Focus Variable	Comilla district (n=24)		Mymensingh district (n=24)	
		r	p value	r	p value
1.Family member statistics	Problem confronted by the vegetables farmers				
Farmer age (years)		0.25	0.15	-0.09	0.68
Farmer education (years)		0.45***	0.00	-0.52***	0.01
Wife's age (years)		0.18	0.30	0.03	0.88
Wife's education (years)		0.14	0.41	-0.02	0.90
Total family members (no.)		0.01	0.93	0.06	0.77
2.Land use pattern (acres)					
Homestead area		0.25	0.15	-0.19	0.40
Pond area		-0.11	0.51	-0.24	0.29
Own cultivated land		-0.10	0.55	-0.01	0.95
Fallow land		-0.03	0.83	0.22	0.33
Rented in land		-0.03	0.85	-0.16	0.46
Rented out land		0.20	0.24	0.21	0.34
Leased in land		-0.03	0.86	-0.30	0.17
Leased out land		-	-	-	-
Vegetable cultivation area		0.11	0.52	0.05	0.79
3. Other social and economic characteristics					
No. of agricultural training (per year)		-0.62***	0.00	0.21	0.35
Total amount of loan (BDT)		-0.11	0.51	-0.13	0.55
Rate of interest (%)		-0.22	0.20	0.05	0.81
No. of extension contact (per year)		-0.36***	0.03	-0.59***	0.00
Years of farming experience		0.55***	0.00	-0.32	0.15
Total income from other sources (BDT)		0.30	0.08	0.08	0.70

Source: Farmer's household survey, 2014.

Notes: ***p≤0.01, ** p≤0.05, *p≤0.1

Conclusion

This paper analyzed the profitability of bean (in Mymensingh and Comilla districts) and cauliflower (in Comilla and Rajshahi districts) production, and the main constraints were also examined. The results showed that vegetables production were profitable in the study area, although farmers were faced different kind of problems. According to Problem Confrontation Index, low prices of vegetables was the first rank order problems for bean production in Mymensingh and lack of capital was the first rank order problem in Comilla. Low price of vegetable was first ranked order problem both in Rajshahi and Comilla in case of cauliflower production. Low price of vegetables can be

solved by both creating more storage facilities and increasing the revenue of farmers to help them to creating their own facilities for storing vegetables. To solve the problem of capital shortage, government should take appropriate policy to ensure timely agricultural loan to farmers and strong monitoring to all banks for agricultural credit. The analysis from correlation coefficient indicate that farmer's age, education, number of agricultural training, numbers of extension contact and farmer's homestead area are significantly and negatively correlated with problem confrontation. Finally government support needs to continue for promoting the development of vegetable production.

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