Cost and Return Analysis of Tomato Cultivation in Three Different Districts of Bangladesh

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Abstract: This paper attempts to analyze the costs, return and production problems of tomato in three districts namely Gazipur, Rangpur and Cumilla in Bangladesh. It is necessary to enunciate that through purposive sampling technique, the data were collected from 225 tomato cultivators of Cumilla and Rangpur districts. Human labour, fertiliser, bamboo sticks, thread, seeds and seedlings, ploughing, irrigation, insecticides and pesticides, hormone, etc. are all necessary for the production of tomatoes. Transport expenses must be taken into account as well. Together, the aforementioned elements were taken into account to estimate the cost of tomato production. Every data set was subjected to statistical and economic analysis, with validated outcomes via a series of tables. Numerous issues affect farmers, and this study sheds insight on this situation. The findings showed that the total cost was highest in Gazipur (Tk.333,800/ha) than that of Rangpur (Tk. 304,600/ha) and Cumilla (Tk.282,670/ha). Gross returns from tomato in Cumilla and Rangpur were Tk. 234,942/acre and Tk. 212,213/acre respectively. The net returns were found higher in Gazipur (Tk. 206,200/ha) than that of Rangpur (Tk. 135,400/ha) and Cumilla (Tk. 97,330/ha). Based on overall costs, the Gazipur, Rangpur and Cumilla districts' benefit cost ratios for tomato production per hectare were determined to be 1.60,1.40 and 1.30, respectively. The most notable limitations in were the high cost of inputs, the absence of storage facilities, price fluctuations, and damage from insects and diseases.

Key words: Cost and return, Cost of production, Tomato cultivation, Benefit cost ratio (BCR), Bangladesh

I. Introduction

Tomato (Solanum lycopersicum) is a widely cultivated vegetable globally, renowned for its nutritional value and culinary versatility. In Bangladesh, tomato production plays a significant role in the agricultural economy, contributing to both domestic consumption and export markets. However, the profitability of tomato cultivation can vary across different regions due to factors such as climate, soil conditions, market dynamics, and production practices. In recent years, there has been an increase in vegetable production and yield per acre. The overall area of vegetable production was 8,81 thousand acres with a per acre output of 3,283 kg in the year 2008-2009, whereas the total area of vegetable production was 3,378 kg in the year 2010-2011, according to the Yearbook of Agricultural Statistics of Bangladesh, 2011. Tomato is an important vegetable which is consumed all the year round. Tomatoes are classified into two categories according to its production season. These are rabi tomato and summer tomato. Tomatoes are produced all the year round but its peak season during December to March. In the year 2011-2012, total production of tomato is 255 thousand metric tons (BBS, 2012).

Bangladesh has conducted very little tomato-related research. In the Jamalpur region, Zaman et al. (2006) investigated the summer tomato's potential for production. They conducted a profitability study using net return and BCR. They discovered that the research area's BCR was 3.2 and the net return, or profit, was Tk. 690,464 for one hectare. The acceptance and financial viability of an enhanced tomato variety in Bangladesh's Chittagong region were examined by Mohiuddin et al. in 2007. They employ the Cobb-Douglas production model and the tabular technique.

They discovered that the farmers of enhanced tomato adopters were dealing with a number of issues, including a lack of high-quality seed, unfavorable weather, and high-quality insecticide and fertilizer for tomato growing. One of the main issues facing tomato growers was said to be the high cost of inputs. Karim et al. (2009) studied profitability of summer BARI Hybrid tomato cultivation in Jessore district of Bangladesh. They used net return and BCR for profitability analysis. They found that yield of BARI hybrid tomato was 32.7 t/ha. BCR was found 4.19 on full cost basis and 5.09 on cash cost basis. They found that high price of input, insect and disease attack were reportedly the major problems for tomato production.

Haque et al. (2012) investigated the BARI winter tomato's uptake and financial viability in several Bangladeshi districts. It was discovered that the Raton and BARI hybrid tomato-5 variety yielded more profits than its rival crops, mustard, lentil, and potato. They look into various issues that farmers face. The main obstacles to BARI tomato growing were insect and disease infestation, lack of technical expertise, lack of storage facilities, and the unavailability of BARI tomato variety seed at the appropriate period. A study by Shiblee et al. (2012) examined the financial viability of a few crops that BARI prescribed. They discovered that their research area's BCR was greater than two and that tomato growing was profitable. In certain parts of Bangladesh, Khatun et al. (2012) conducted research on the assessment of tomato post-harvest loss. The focus of the current investigation is profitability of tomato production while also demonstrating the connection between socioeconomic traits and issues tomato growers face. This study thoroughly examines the main issues with tomatoes. The present study has emphasized not only the costs and returns of

tomato production but also established the relationship between socioeconomic characteristics and problems faced by the tomato farmers.

The specific objectives of the paper are as follows:1. To determine the socio-economic characteristics of tomato growers. 2. To determine the efficient level of input use for tomato cultivation. 3. To assess the cost and return of tomato cultivation. 4. To identify the major constraints for profitable tomato cultivation.

II. Methodology

Gazipur, Rangpur and Cumilla district were purposively selected for the study because they are renowned for tomato cultivation in Bangladesh.. A total number of 225 tomato producers were selected randomly for primary data collection. A semi-structured pre-tested interview schedule was used for collecting data and information from the tomato farmers during November to February in 2021.

A random sampling technique was applied for selecting sample. Through random sampling 225 farmers were selected for the study. Among them, 75 farmers were from Gazipur, 75 farmers were from Rangpur and 75 farmers were from Cumilla. The study is involved in collection of data both from the primary and secondary sources. Primary data were collected by the personal interview with the respondents. The secondary sources include govt. publications, annual reports on tomato cultivation, seminar papers, journals, published and unpublished theses, and topic related various books, BBS, web site etc. Tabular and simple statistical methods were used to analyze the collected data. The collected data were analyzed as per objective of the study.

Analytical Technique

The revenues and costs of tomato cultivation were calculated for three to four months. We used total variable cost, total fixed cost, total cost, total revenues, gross farm income to calculate profitability. Total variable cost is the sum of labour cost, organic and chemical fertilizer cost, seed cost, bamboo cost, tractor/power tiller cost, pesticides cost, irrigation cost. Gross value of production is outcome of tomato yield multiplied by tomato price per hectare. Net farm income is calculated from total revenue deducted from total cost. BCR is the result of gross value of production divided by total cost of tomato production.

Total variable cost= Labor cost + Ploughing cost + Chemical fertilizer cost + Manure Cost +Seed and seedling cost + Irrigation cost + Pesticide and insecticide cost+ Bamboo Stick and thread cost+ Hormone cost+ Transportation cost.

Total cost = Total variable cost + Total fixed cost

Gross Margin= Total return - Total variable cost

Net Return = Total return- Total cost

Benefit cost ratio (Total cost basis) =Gross return/Total cost

III. Results and Discussion

Socioeconomic profile of the respondent farmers

Table 1 shows the socio-economic feature of the sample farmers. Farmer's average age is 45years and farmer's average year of schooling is 6 in all areas. Farmer's average total family member is 4 in the study area. Farmer's average homestead area is 0.1 hectares in Gazipur which is highest among three districts. Farmer's average own cultivated land is 0.28 hectares in Gazipur which is highest among three districts. Farmer's average vegetable cultivation area is 0.2 hectares in Cumilla which is highest while 0.06 hectares in Rangpur which is lowest among three districts. On an average farmer gets 2 agricultural training. On an average farmer's have 12 years of farming experience.

Table 1: Socio –economic features of sample farmers

Parameter	Gazipur (n=75)	Rangpur (n=75)	Cumilla (n=75)	All (n=225)
1.Family member statistics				
Family age (years)	40	45	50	45
Family education (years of schooling)	6	6	6	6
Total family members(no)	4	4	4	4
2.Use of land pattern (hectres)				
Pond area	0.001	0.008	0.02	0.009
Cultivated land	0.28	0.27	0.25	0.26
Homestead area	0.1	0.04	0.05	0.06

Vegetable cultivation area	0.08	0.06	0.2	0.11
3.Others				
No. of agricultural training (lifetime)	2	2	2	2
Years of farming experience	10	15	11	12

Source: Household survey 2022

Input use pattern of tomato cultivation in the study areas

Table 2 shows the input use pattern of tomato cultivation in the study areas. On an average farmer use 4 kg seed per hectare in the study areas. In Cumilla, farmers use 230 man days' family labor per hectare which is highest and farmers use 146 man days family labor in Gazipur which is lowest among three districts. On an average farmers use 198 man days hired labor per hectare in their field. Farmer's use 1100 kg urea per hectare in Gazipur which is highest and 780 kg in Cumilla which is lowest among three districts .Farmer's use 230 kg Muriate of Potash per hectare in Rangpur which is highest and 198 kg in Cumilla which is lowest among three districts. Farmer's use 1,700 kg manure per hectare in Gazipur which is highest and 1080 kg in Cumilla which is lowest among three districts. On an average farmers use 63 liters of pesticides in the study areas.

Table 2: Per hectare level of input use pattern for tomato cultivation

Inputs	Gazipur	Rangpur	Cumilla	All
1.Human labor (man-days)				
Family	146	203	230	193
Hired	153	210	230	198
2.Seed (kg/ha)	4	4	4	4
3.Power tiller (no.)	63	65	67	65
4.Fertilizers (kg)				
Urea	1100	1050	780	976
Triple super phosphate(TSP)	750	780	740	756
Muriate of Potash (MoP)	226	230	198	218
Diammonium Phosphate (DAP)	105	57	50	71
Zinc sulfate	75	65	48	63
Gypsum	7	6	2	5
5.Manure(kg)	1700	1650	1080	1476
6.Pesticide(litre)	65	78	47	63

Source: Household survey 2022

Costs of the Tomato Cultivation in the Study Area

Table 3 shows the costs of tomato cultivation in the study area. Ploughing cost is Tk. 15,100 in Gazipur, while Tk. 12,600 and Tk. 10,500 in Rangpur and Cumilla respectively. On an average, seed cost is Tk. 5,100 in the study areas. Among the three districts, fertilizer costs is highest in Gazipur (Tk. 63,500) while Tk. 59,600 and Tk. 49,000 in Rangpur and Cumilla respectively. Total variable costs are Tk. 237,900 in Gazipur which is highest among three districts, while Tk. 213,100 and Tk. 196,100 in Rangpur and Cumilla respectively. On an average interest on operating capital was Tk. 4,790 in the study areas. Total fixed cost is Tk. 95,900 in Gazipur which is highest among three districts, while Tk. 91,500 and Tk. 86,570 in Rangpur and Cumilla respectively. Total cost is Tk. 333,800 in Gazipur which is highest among three districts, while Tk. 304,600 and Tk. 282,670 in Rangpur and Cumilla respectively.

Table 3. Per hectare costs of different inputs used in tomato production (Tk.) in study areas

Parameters	Gazipur	Rangpur	Cumilla	All
Variable Costs (Tk/ha)				
Hired labour	73000	65000	68000	68666
Seeds	4600	5200	5500	5100
Manure	3300	3500	4000	3600
Fertilizer(Organic + Chemical)	63500	59600	49000	57366
Ploughing	15100	12600	10500	12733
Irrigation	13500	12800	11900	12733
Bamboo stick and thread	55400	45800	40500	47233
Pesticides	9500	8600	6700	8266
Total variable cost	237900	213100	196100	215697
Family labour	65000	59500	58350	60950
Interest on operating capital (four months)	5400	4400	4570	4790
Land rent ((four months)	25500	27600	23650	25583
Total fixed costs	95900	91500	86570	91323
Total cost	333800	304600	282670	307020

Source: Household survey 2022

Profitability of Tomato Cultivation

Table 4 indicates the average gross return, gross margin and net return of tomato for Gazipur, Cumilla and Rangpur districts. On an average yield for Gazipur was 45ton/ha, for Rangpur was 40ton/ha and for Cumilla was 38 ton/ha. Gross return per hectare were Tk. 540,000 ,Tk. 440,000 and 380,000 in Gazipur, Rangpur and Cumilla respectively. Gross margin per hectare were Tk.302,000, Tk. 226,900 and Tk. 164,303 for Gazipur,Rangpur and Cumilla respectively. Among the three districts, net return per hectare was high in Gazipur (Tk. 206,200) than that the others. BCR based on the total cost was 1.60,1.40 and 1.30 for Gazipur, Rangpur and Cumilla respectively. BCR was greater than one in the study area indicating that growing of tomato is a profitable. The findings of the study have revealed that overall farmers of the study area are getting good profits from tomato production.

Table 4. Per hectare profitability of producing tomato in study areas

Parameters	Gazipur	Rangpur	Cumilla
Yield (Ton/ha)	45	40	38
Price (tk/kg)	12	11	10
Gross return (Tk/hectre)	540000	440000	380000
Gross costs (Tk.)	333800	304600	282670
Gross margin (Tk/ha)	302100	226900	164303
Net return (tk/ha)	206200	135400	97330
Benefit cost ratio	1.6	1.4	1.3

Source: Field survey 2022

Major Constraints for Profitable Tomato Cultivation

Without a question, growing tomatoes has the potential to be financially successful, but there are many obstacles in the way of their desired production. Table 5 showed that the most evident barriers to tomato production are high input costs, a lack of storage

facilities, price volatility, and damage from insects and diseases. Furthermore, the research area's tomato growers claim that their biggest challenges include delayed seed delivery, insufficient funding, and a lack of government assistance.

Table 5. Problems faced by the tomato farmers.

Problems	Gazipur		Rangpur		Cumilla	
	No of respondents (n=75)	Percent (%)	No of respondents (n=75	Percent (%)	No of respondents (n=75)	Percent (%)
High price of input	50	66.66	55	73.3	55	73.33
Lack of storage facilities	45	60	60	80	30	40
Insect and disease damage	55	73.33	57	76	60	80
Price fluctuation	48	64	45	60	55	73.33
Lack of capital	45	60	50	66.66	48	64
Lack of training	50	66.66	60	80	50	66.66

Source: Field survey 2022

IV. Conclusions and Policy Recommendations

This paper has carefully evaluated the profitability and future prospects of tomato production in addition to the challenges faced by farmers. It is evident that the study area's tomato production is quite profitable. However, a number of issues, including high input costs, a lack of storage facilities, price fluctuations, damage from insects and diseases, a lack of timely seed supply, a lack of money, and a lack of government support, are listed as the main roadblocks to tomato cultivation in the study area. Therefore, in order to boost tomato growers' income and job prospects, it is advised that storage facilities, efficient extension services, effective policies, and input availability be guaranteed. Furthermore, the government's oversight and assistance in advancing the growth of vegetable products must be expanded. To top it all off, our tomato producers' financial situation would have much improved and tomato yield and production would have skyrocketed had contemporary inputs and production technology been accessible sooner. Ideally, if the challenges and issues that face our farmers in general and tomato farmers in particular are resolved, a lot more people will be inclined to come and grow tomatoes, which will not only provide us with the necessary calories and vitamins but also contribute a lot to our national economy.

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