

## PROFITABILITY ANALYSIS OF STRAWBERRY CULTIVATION IN SELECTED LOCATIONS OF BANGLADESH

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### Abstract

The study was conducted in strawberry growing areas namely, Joypurhat and Rajshahi districts to examine the profitability of strawberry cultivation in Bangladesh. A total of 100 strawberry growing farmers were randomly selected for this study. Descriptive statistics and Cobb-Douglas (profit) function were used to analyze data. In the farm level 63% of the farmers' cultivated strawberry in medium high land and majority of them mentioned the soil of their strawberry field was sandy loam (54%) and loam (35%). American Festival and Rabi-3 were found cultivating in the study areas. They performed some intercultural operations like weeding, spraying, and irrigating the crop. Per hectare cost of producing strawberry was estimated at Tk. 7, 30,811 and sapling cost was the major cost item which covered about 37% of total cost. Per hectare net return from strawberry cultivation were found Tk. 15, 57,355 and BCR was 3.13 which indicates strawberry cultivation is highly profitable. Farmers' experience had positive and cost of hired labour, sapling and chemicals had negative influence on the profitability from strawberry farming. From the results of SWOT analysis it is observed that though it has strength and opportunities of cultivation in Bangladesh, it also has some weaknesses and threats. If the shortcomings are overcome, it is possible to increase strawberry cultivation in Bangladesh.

Keywords: Strawberry, Profitability, Cobb-Douglas production function, SWOT analysis, Gross return, BCR.

### 1. Introduction

Strawberry (*Fragaria ananassa*) is one of the most popular berry fruits in the world. This fruit is widely popular for its characteristic like aroma, bright red color, juicy texture, and sweetness. It is consumed in large quantities, either fresh or processed as preserves, fruit juice, ice creams, milkshakes, jam, jelly, pickles, chocolates, biscuits, cake and flavored drinks. Strawberry has great dietetic value and is one of the potential sources of vitamin C. Each 100 g edible portion contains 89 g water, 0.07 g protein, 0.5 g fats, 8.4 g carbohydrates and 59 mg ascorbic acid (Afridi *et al.*, 2009).

Strawberry is grown in many countries of the world but it is cultivated extensively in USA, Italy, Japan, and Mexico (Afridi *et al.*, 2009). Strawberry is

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one of the top 10 agricultural crops in California with a fresh market of more than \$ 1 billion per year. So, there is a huge opportunity for marketing it around the world as well in Bangladesh because, recently it has been cultivating in Bangladesh and expanding its cultivation day by day. It could easily achieve self-reliance in strawberry production to save foreign exchange being spent every year in importing this costly fruit. This is because Bangladesh has milder winter compared to the United States, where strawberries are only grown during late spring. As a result, it hits the market early in the year, coinciding with a spike in the demand for winter fruits. The high popularity of the berry locally increases the prospects of rigorous market expansion. This prospect has attracted many potential investors, large and small. Strawberries have numerous health benefits as they are rich in nutrients. According to World Health Organisation (WHO), Bangladesh is a nutrient-deficient country and promoting the fruit will help overcome this deficiency, such as by reducing the risk of heart attacks, as studies suggest.

In Bangladesh, there are few studies on production technology, resource use efficiency, farmers' knowledge and post-harvest technology, of strawberry. Rahman (2011) accompanied a research on the production technology of strawberry in Bangladesh. Rahman (2012) conducted a research on characterization, production and postharvest technology of strawberry. Khatun *et al.* (2019) studied resource use efficiency analysis in strawberry production. They found that production inputs such as sapling and fertilizer had positive and labour and chemicals had negative and significant effect on outputs. Sapling, land and water were under-utilized and labour, cowdung, fertilizer and chemicals were over used. Mondal *et al.* (2016a) assessed Farmers' knowledge on strawberry cultivation. They observed that level of education, strawberry cultivation area, annual income from strawberry cultivation, extension contact, cultivation experience had significant positive relationship with their knowledge on strawberry cultivation and problem faced had significant negative relationship with their knowledge on strawberry cultivation. Mondal *et al.* (2016b) evaluated use of improved practices in strawberry cultivation. They found that annual income from strawberry cultivation and extension contact had significant positive relationship with their use of improved practices in strawberry cultivation and problem faced had significant negative relationship with their use of improved practices in strawberry cultivation. Bangladesh Agricultural Research Institute also conducted some research on the postharvest technology of strawberry. The reviews reveal that, as strawberry cultivation is new among the Bangladeshi farmers, no extensive study was found on the profitability analysis of strawberry cultivation in Bangladesh.

Therefore, it is very important to estimate the profitability of strawberry cultivation and its production technique. It is also important to evaluate the potentiality and acceptability of the strawberry cultivation on the farmers' field.

Keeping these in mind, this study was undertaken with the following specific objectives:

- i. To know the technology involved in strawberry cultivation at farm level;
- ii. To assess the financial profitability of strawberry cultivation;
- iii. To determine the factors that influence the profitability of strawberry cultivation and;
- iv. To find out the possibility of this crop cultivation through SWOT analysis.

## **2. Methodology**

### **2.1 Sampling technique and sample size**

Multistage sampling technique was followed to collect sample farmers for this study. At first, two districts namely Joypurhat and Rajshahi were selected on the basis of availability of strawberry farmer. In the second stage, concentrated strawberry growing upazila (Sadre upazila from Joypurhat and Charchat upazila from Rajshahi) were selected on the basis of area and production of strawberry in consultation with DAE personnel. Thirdly, 2-3 agricultural blocks were selected for selecting sample farmers. Finally, the samples were randomly selected from the complete list of strawberry farmers for interview. As 60 samples was appropriate for decision making in case of large population stated by Mari (2009) and Ali *et al.* (2017), a total of 100 strawberry growers taking 50 farmers from each district were selected for the study.

### **2.2 Data collection**

The study was mainly based on primary data that were collected through face to face interview using a pre-tested interview schedule which was conducted through field survey during the month of December 2016 to March, 2017.

### **2.3 Analytical technique**

The collected data were first edited and tabulated for analysis to fulfill the objectives of the study. Descriptive statistics such as averages and percentages were used in this study. SWOT analysis was also used to assess the potentialities of strawberry cultivation in Bangladesh.

#### ***Profitability analysis***

Both fixed cost and variable cost were taken into account in calculating cost of strawberry cultivation. Land use cost was calculated on the basis of per year existing lease value of land. Irrespective of strawberry varieties, the profitability of strawberry production was examined on the basis of gross return, gross

margin, net return and benefit cost ratio analysis by using the following profit function (Sujan *et al.*, 2017a):

$$\Pi = GR - TC$$

$$GR = \sum Q_m P_m + \sum Q_b P_b$$

$$TC = \sum X_i P_{xi} + IOC + TFC$$

Where,

$\pi$  = Net return (Tk. ha<sup>-1</sup>)

GR = Gross return (Tk. ha<sup>-1</sup>)

TC = Total Cost (Tk. ha<sup>-1</sup>)

$X_i$  = Quantity of the  $i^{\text{th}}$  inputs (kg ha<sup>-1</sup>)

$P_{xi}$  = Per unit price of  $i^{\text{th}}$  inputs (Tk. kg<sup>-1</sup>)

IOC = Interest on Operating Capital (Tk. ha<sup>-1</sup>)

TFC = Total fixed cost (Tk. ha<sup>-1</sup>)

$Q_m$  = Quantity of the main product (Kg ha<sup>-1</sup>)

$P_m$  = Average price of the main product (Tk. Kg<sup>-1</sup>)

$Q_b$  = Quantity of the by- product (kg ha<sup>-1</sup>)

$P_b$  = Average price of the by-product (Tk. Kg<sup>-1</sup>)

$i = 1, 2, 3, \dots, n$  (number of inputs).

#### ***Benefit-Cost Ratio (BCR) analysis***

This ratio was calculated by using the following formula (Sujan *et al.*, 2017b):

$$BCR = \frac{GR}{TC}$$

Where, GR = Gross return, TC = Total Cost

the decision rules are that, when

BCR > 1, the return from strawberry cultivation is economically satisfactory;

BCR < 1, the return from strawberry cultivation is not economically satisfactory;

and BCR = 1, there is economic breakeven point of strawberry production.

#### ***Model specification***

The functional analysis was carried out to identify the factors that influenced the profitability of the strawberry farmers. The Cobb-Douglas production function

model was employed following Gujarati and Porter (2008). The specification of the model is as follows:

$$Y = aX_i^{b_i} + e^{u_i} \dots\dots\dots (1)$$

Equation (1) is a non-linear equation. In order to make it linear, a natural logarithm is used on both sides as follows:

$$\ln Y = \ln a + b_i \ln X_i + U_i \dots\dots\dots (2)$$

Where,

$$Y = \text{Net return/Profit (Tk. ha}^{-1}\text{)};$$

$X_i$  = different socioeconomic variables such as age of the respondents (years), farm size (ha), strawberry cultivation experience (year) and farm-specific variables such as costs of sapling (Tk. ha<sup>-1</sup>), hired labour (Tk. ha<sup>-1</sup>), fertilizer (Tk. ha<sup>-1</sup>), irrigation (Tk. ha<sup>-1</sup>) and chemicals (insecticides, pesticides and fungicides, (Tk. ha<sup>-1</sup>);  $a$  = constant or intercept term;  $b_i$  = coefficients of the respective input variables to be estimated; and  $U_i$  = Error term.

Finally, the functional model was run using STATA 14.2.

### 3. Results and Discussion

#### 3.1 Technology involved in strawberry cultivation

##### *Soil and land type*

Land and soil are key inputs of better crop production. The land where rain water does not stay and loamy to sandy loam soil is suitable for strawberry cultivation (Azad *et al.*, 2019). In the farm level 63% of the farmers cultivated strawberry in medium high land. Majority of the farmers mentioned the soil of their strawberry field was sandy loam (54%) and loamy soil (35%). They also used high land (30%) and medium low land (7%). The soil type of the land was also sandy soil (7%) and clayey loam soil (4%) (Table1).

##### *Land preparation and Planting*

Before planting, the land should be ploughed several times and laddered well. Sapling should be planted in bed (Azad *et al.*, 2019). The farmers in the study areas ploughed 3 times followed by laddering of 2 times for land preparation of strawberry cultivation. They also made bed before planting. Strawberry is grown in Rabi season. In the case of Bangladeshi weather optimum time of planting is mid-September to mid-October, but it can also be planted in mid-November to mid-December (Azad *et al.*, 2019). Farmers in the study areas planted in mid-November to mid-December and followed the line method on raised bed.

**Variety used**

Two varieties of strawberry, namely ‘American Festival’ and ‘Rabi-3’ were found cultivating in the study areas. All the farmers of Joypurhat and 76% farmers of Rajshahi cultivated ‘American Festival’ and only 24% farmers of Rajshahi district cultivated ‘Rabi-3’ variety of strawberry (Table 1).

**Intercultural operation**

Farmers in the study areas performed some intercultural operations like weeding, spraying, and irrigating the crop. The average number of weeding, irrigation, and insecticide spraying per farm were 8.62, 9.64, and 24.32 times respectively (Table 1).

**Crop harvesting**

The harvesting time of strawberry in the study areas is started in the month of January and continued up to the month of March. During the whole season, farmers harvested strawberry about 40 to 70 times from their field.

**Table 1. Technology involved in strawberry cultivation in the study areas**

Particulars	Joypurhat	Rajshahi	All areas
Land and soil type (%):			
High land	24	36	30
Medium high land	66	60	63
Medium low land	10	4	7
Sandy soil	-	14	7
Clayey loam	4	4	4
Sandy loam	48	60	54
Loamy soil	48	22	35
2. Land preparation			
No. of ploughing	3	3	3
No. of laddering	2	2	2
3. Planting			
Time of planting	Mid November-mid December	First week of November-mid December	First week of November-mid December
Planting method	Line on raised-bed	Line on raised-bed	Line on raised-bed
4. Variety used			
American Festival	100	76	88
Rabi-3	-	24	12
5. Intercultural operation			
No. of weeding	9.04	8.2	8.62
No. of irrigation	9.82	9.46	9.64
No. of spraying	24.1	24.54	24.32
6. Crop harvesting			
Time of harvesting	January-March	January-March	January-March
No. of harvesting (times)	45-65	40-70	40-70

### 3.2 Cost and return of strawberry cultivation

#### *Inputs use pattern in strawberry cultivation*

Strawberry is highly perishable and hence a great deal of care is needed in handling as well as its marketing. So for its careful handling more labour is required. On an average 792 man-days of labour was required to cultivate one hectare of land. Farmers in the study areas used more family labour (427 man-days/ha) and a lot of women labour also worked in strawberry field (Table 2). On an average 34079 sapling was planted in one hectare of land. Application of nutrients in the form of fertilizer is one of the important factors that contribute to the yield of any crop. Farmers used both bio and chemical fertilizers. On an average they applied 12.16 t ha<sup>-1</sup> bio-fertilizer. Farmers in Joypurhat applied slightly higher amount of TSP, MoP and Boric acid than that of Rajshahi and the farmers of Rajshahi applied slightly higher amount of Zypsum and Zinc sulphate than that of Joypurhat district. Only the farmers of Rajshahi applied DAP (264 kg ha<sup>-1</sup>).

**Table 2. Input use pattern of strawberry cultivation**

Inputs	Joypurhat	Rajshahi	All areas
Human labour (man-day)	784	798	792
Family Labour (man-day)	422	431	427
Hired labour (man-day)	362	367	365
Sapling (no)	33605	34553	34079
Bio-fertilizer (ton)	17.72	6.50	12.16
Urea (kg)	167	167	167
TSP (kg)	311	299	305
MoP (kg)	270	267	269
DAP (kg)	-	264	264
Zypsum(kg)	138	151	144
Zinc Sulphate(kg)	16	17	17
Boric acid (kg)	22	15	19

#### *Cost of strawberry cultivation*

The cost of producing strawberry included different variable cost items like human labour, sapling, fertilizer, irrigation, chemicals etc. Both cash expenditure and imputed value of family supplied inputs (i.e. labour, land) were included in the analysis. Besides, interest on operating capital was also considered for the estimation of cost of strawberry production. The fixed cost of strawberry cultivation included cost of land use and family labour. The cost of land use was calculated on the basis of lease value of land. Per hectare total cost of strawberry

cultivation was estimated Tk. 730811 in which share of fixed cost was 21.81% and variable cost was 78.18% (Table 3). Highest share of total cost was sapling (36.64%). Human labour was the major cost item incurred in both areas, which covered about 32.47% of total cost. A large number of family labour (17.51% of total cost) was engaged in strawberry cultivation. Cost of fertilizer in Rajshahi (Tk. 33018 ha<sup>-1</sup>) was slightly higher than that of Joypurhat district (Tk. 23221 ha<sup>-1</sup>) due to using DAP and comparatively high amount of other fertilizers. Cost of irrigation was comparatively high in Rajshahi (Tk. 46130 ha<sup>-1</sup>).

**Table 3. Cost of strawberry cultivation**

Cost Items	Joypurhat		Rajshahi		All areas	
	(Tk.ha <sup>-1</sup> )	(%)	(Tk.ha <sup>-1</sup> )	(%)	(Tk.ha <sup>-1</sup> )	(%)
Cost of Land preparation	9502	1.31	9368	1.27	9435	1.29
Hired labour	108600	15.02	110100	14.90	109350	14.96
Cost of Sapling	230843	31.94	304623	41.23	267733	36.64
Cowdung	22924	3.17	10372	1.40	16711	2.29
Fertilizer	23221	3.21	33018	4.47	32720	4.48
Urea	2677	0.37	2758	0.37	2710	0.37
TSP	8295	1.15	9352	1.27	8823	1.21
MoP	4360	0.60	4432	0.60	4395	0.60
DAP	-	-	9146	1.24	9146	1.25
Zinc Sulphate	2996	0.41	3285	0.44	3131	0.43
Zypsum Cost	1411	0.20	1839	0.25	1610	0.22
Boric acid	3482	0.48	2206	0.30	2905	0.40
Cost of Irrigation	40871	5.65	46130	6.24	43501	5.95
Cost of chemicals (insecticides, pesticides and fungicides)	54308	7.51	52430	7.10	53369	7.30
Cost of Fencing	12174	1.68	6341	0.86	8639	1.18
Cost of Shading	56611	7.83	0	0.00	56611	7.75
IOC@ 6% for 4 months	5591	0.77	5724	0.77	5657	0.77
Total variable cost	564645	78.12	578106	78.25	571375	78.18
Family labour	126600	17.51	129300	17.50	127950	17.51
Land use cost	31586	4.37	31386	4.25	31486	4.31
Total fixed cost	158186	21.88	160686	21.75	159436	21.82
Total cost	722831	100	738792	100	730811	100



***Profitability of strawberry cultivation***

Average yield of strawberry was 20.80 t ha<sup>-1</sup>. Though yield difference in both the district, was not prominent, the variation of gross return was due to getting comparatively high price of strawberry in Rajshahi district. Average gross margin was found 17, 16,971 Tk. ha<sup>-1</sup>. Net return and BCR from strawberry cultivation were found 15, 57,355 Tk. ha<sup>-1</sup> and 3.13 respectively which indicates strawberry cultivation is highly profitable in the study areas (Table 4). Average cost of producing one kg of strawberry was Tk. 35.14 whereas; the selling price was found 104.56 Tk. kg<sup>-1</sup>.

**Table 4. Per hectare profitability of strawberry cultivation**

Particulars	Joypurhat	Rajshahi	All areas
A. Yield (t ha <sup>-1</sup> )	20.64	20.97	20.8
B. Price (Tk. Kg <sup>-1</sup> )	103.3	105.82	104.56
C. Gross return (Tk.)	2251806	2315359.4	2288166
D. Return from strawberry (Tk.)	2132112	2219045.4	2174848
E. Return from runner (Tk.)	119694	96314	113318
F. Total variable cost (Tk.)	564645	578106	571375
G. Gross margin (C-F)	1687161	1737253.4	1716791
H. Total fixed cost (Tk.)	158186	160686	159436
I. Total cost (F+H)	722831	738792	730811
J. Net return (C-I)	1528975	1576567.4	1557355
K. BCR (C/I)	3.12	3.13	3.13
L. Cost per kg (Tk.)	35.02	35.23	35.14

**3.3 Factors affecting profitability of strawberry cultivation**

The functional analysis reveals that among the independent variables, farmers experience in strawberry cultivation, cost of hired labour, sapling and chemicals had a significant influence on the level of profit earned from strawberry cultivation. The coefficient of experience is positive which implies that profitability from strawberry farming will be greater than before with the increase of farmers experience in strawberry cultivation. On the contrary, profitability is negatively related to the cost of hired labour, sapling and chemicals (insecticide, pesticide and fungicide), indicates that, an additional unit increase in these costs will lessen the profit from strawberry farming by the coefficient values associated with these variables (Table 5).

The value of the coefficient of determination ( $R^2$ ) was 0.622 which indicated that around 62% of the variation in output was explained by the independent variables included in the model (Table 5). The value of F was 3.38 which was significant

at 1% level indicates the good fit of the model. The total elasticity (sum of the partial elasticity -0.7051) showed decreasing returns to scale implies that when all other variables are held constant, a unit increase in one of them results in less than proportionate increase in net returns.

**Table 5. Estimated value of coefficients and related statistics of Cobb-Douglas (Profit) function**

Dependent Variable: LN NET RETURN			
Included observations: 100			
Variable	Coefficient	Std. Error	t-statistic
Age	-0.0469	0.1187	-0.40
Experience	0.1068**	0.0531	2.01
Farm size	0.0056	0.0470	0.12
Hired Labour	-0.1903**	0.0789	-2.41
Sapling	-0.2592***	.0705776	-3.67
Fertilizer	0.0694	0.1535	0.450
Irrigation	-0.1215	0.1027	-1.18
Chemicals	-.269**	0.1175	-2.29
Constant	21.004***	2.097	10.02
R-squared		0.622	
F-ratio		3.38***	
Returns to scale ( $\sum b_i$ )	-0.7051		

**Note:** \*\*\*, \*\* and \* indicate significant at 1% and 5% and 10% level respectively

### 3.4 Potentialities of strawberry cultivation in Bangladesh

SWOT analysis was used to assess the potentialities of strawberry cultivation in Bangladesh (Table 6). SWOT analysis is a strategic planning method used to evaluate the Strengths, Weaknesses, Opportunities and Threats involved in any venture (Kumar and Nain 2013).

#### Strengths:

From SWOT analysis it is observed that land of northern region is suitable for strawberry cultivation, Yield (20.80 ton/ ha) is comparatively higher than other crops, it is short duration crop (4 month), farmers received profit within 50 to 60 days after planting which were the advantage of strawberry cultivation over other crops. Besides these, since strawberry is a new crop in Bangladesh and it also a

tasty and attractive fruit, unemployed youths are encouraging to engage in its cultivation and marketing. Another important strength is, it fulfills the nutrition in off season (November to April) when most of the fruits are not available in Bangladesh (Ahmad and Uddin, 2012).

**Weaknesses:** Strawberry cultivation in Bangladesh has some weaknesses. Strawberry is comparatively highly perishable crops. Attack of insect and disease is more common which a noticeable weakness of strawberry cultivation is. Production cost (Tk. 622957/ha) is comparatively higher than other crops. Being a new crop in Bangladesh, farmers do not have adequate knowledge about its right cultivation method and its handling. Besides these, availability of quality sapling is also a major weakness of strawberry cultivation.

**Opportunities:** There is a great opportunity to cultivate strawberry in Bangladesh. Since strawberry is a seasonal crop and its shelf life is limited, it must be processed to keep the quality (Ocibisz and Mitek, 2007). There are also an increasing number of strawberry products (frozen fruits, concentrates, jam, juice, nectar, syrup, dairy products, etc.) available in the market. The colour intensity and stability are of relevance for processing companies (Gössinger *et al.*, 2009) and processing industries have strong demand for strawberry. The climate in the northern region of Bangladesh provides the optimum conditions for strawberry cultivation. The country can earn huge foreign currencies by exporting strawberry if the farmers are motivated for strawberry cultivation. Consumption pattern of Bangladeshi people has been changing (increased raw consumption) and there is abundant low cost labour. With the boom in strawberry cultivation, well-paying employment opportunities have been opened up for many farmers who were previously unemployed or had low income during early years of strawberry cultivation in Bangladesh. So there is a room for increasing production.

**Threats:** Due to climate change, duration of winter season is becoming short, due to fog plant is damaging and due to untimely raining fruits have been damaging which are the threats of strawberry cultivation. Bangladesh lacks the proper infrastructure for storing and freezing (e.g. warehousing and cold storage) required by this delicate fruit, which prevents the viability of mass production. At this stage the country is unable to compete with the international market, which is dominated by the United States. With high quality strawberries being produced in mid-sized economies such as Turkey, Spain and Mexico, there is barely any international demand for Bangladeshi strawberries. There is a lack of advanced machinery and tools for adaptation and cultivation that compromise productivity and quality. There is lack of technical knowledge for strawberry processing. These are all the threats of strawberry farming.

**Table 6. SWOT analysis of strawberry cultivation in Bangladesh**

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>• Land is suitable for strawberry cultivation</li> <li>• Yield is high</li> <li>• Short duration crop</li> <li>• Profit are reaped quickly as well</li> <li>• Low wage rate of labour (specially unemployed youth)</li> <li>• Demand is high</li> <li>• Ensure nutrition</li> </ul>	<ul style="list-style-type: none"> <li>• Highly perishable nature</li> <li>• Attack of insect and disease</li> <li>• Production cost is very high</li> <li>• Lack of knowledge about strawberry cultivation practices</li> <li>• Lack of quality sapling</li> <li>• High price of sapling</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>• There is strong demand in the processing industries.</li> <li>• The soil and climate in the northern region of Bangladesh provides the optimum conditions for strawberry cultivation.</li> <li>• The country can earn huge foreign currencies by exporting strawberry.</li> <li>• Consumption pattern has been changing (increased raw consumption)</li> <li>• Employment creation</li> <li>• Poverty reduction</li> </ul>	<ul style="list-style-type: none"> <li>• Duration of winter season is short</li> <li>• Damage of plant due to fog and fruits due to untimely raining</li> <li>• Lack of proper infrastructure for storing and freezing</li> <li>• Lack of international demand for Bangladeshi strawberries.</li> <li>• Lack of advanced machineries and tools for adaptation and cultivation that compromise productivity and quality.</li> <li>• Technical knowledge is very little for strawberry processing</li> </ul>

#### 4. Conclusions and Recommendations

##### 4.1. Conclusions

Farmers in the study areas cultivated strawberry in medium high land with sandy loam and loamy soil. They planted in mid-November to mid-December and followed the line method on raised bed. Mainly they cultivated American Festival and Rabi-3 variety of strawberry. They planted in mid-November to mid-December. They also performed some intercultural operations like weeding, spraying, and irrigating the crop. The harvesting time of strawberry started in the month of January and continued up to March. Strawberry is highly perishable and hence a great deal of care is needed in handling as well as its marketing. So for its careful handling more labour is required. Comparatively high cost involved in its cultivation providing higher return. Farmers experience in

strawberry cultivation, cost of hired labour, sapling and chemicals had a significant influence on the level of profit earned from strawberry cultivation. Though it has strength and opportunities of cultivation in Bangladesh, it also has some weaknesses and threats. If the shortcomings are overcome, Bangladesh can move towards mass production and cultivation of the fruit, thereby achieving economies of scale and making it a more profitable venture.

#### 4.2. Recommendations

Farmers in the study areas were cultivating strawberry without any type of training or technical knowledge about it. As a result, they faced some difficulties to produce and market it. To overcome these difficulties and extend its cultivation, training on production technology of strawberry should be arranged for the farmers. Strawberries have a short shelf life. Proper storage and freezing facilities can elongate the shelf life whereby the consumers can potentially buy strawberries throughout the year and post-harvest loss will be reduced. Good quality sapling in low cost should be made available to the farmers and for this academic and research institutions should work to innovate and help to attain genetic diversity in strawberries, which is one of the primary needs in the strawberry cultivation sector. Research institutions should undertake research to control insect and disease. As the production cost of strawberry is high, farmers need more capital. Financial institutes should take initiative to give special credit on strawberry cultivation. If done so, production of strawberry will be increased, import will be decreased and foreign currency will be saved. With a great potentiality, the sweet and attractive fruit will open a new horizon for farmers.

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