

Program Based Research Grant (PBRG) Sub-project Completion Report

Cost and Return Analysis of Selected Crops in Bangladesh

Coordinating Organization

Agricultural Economics & Rural Sociology Division
Bangladesh Agricultural Research Council



Project Implementation Unit
National Agricultural Technology Program-Phase II Project
Bangladesh Agricultural Research Council

New Airport Road, Farmgate, Dhaka-1215
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on

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in Bangladesh**

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Abbreviation and Acronyms

AERS	Agricultural Economics and Rural Sociology
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BCR	Benefit Cost Ratio
BINA	Bangladesh Institute of Nuclear Agriculture
BJMC	Bangladesh Jute Mills Corporation
CIF	Cost, Insurance and Freight
DAE	Department of Agriculture Extension
DAP	Diammonium Phosphate
DRC	Domestic Resource Cost
PBRG	Program Based Research Grant
FAO	Food and Agriculture Organisation
FOB	Freight On Board
GoB	Government of Bangladesh
Ha	Hectare
IFAD	International Fund for Agricultural Development
Kg	Kilogram
MoP	Muriate of Potash
MT	Metric Tonne
NATP	National Agricultural Technology Program
PIU	Project Implementation Unit
STW	Shallow Tube Well
TC	Total Cost
TFC	Total Fixed Cost
Tk.	Taka
TSP	Triple Super Phosphate
TVC	Total Variable Cost
WB	World Bank
WTO	World Trade Organization
Zn	Zinc

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Executive Summary

Cost-return data can serve as a means of understanding and assessing farm operations. This, in turn, can lead to better farm-level decisions and improved market efficiency and performance. Resource scarcity has led production economists to think about the reallocation of existing resources to have more output with a given level of input combinations or to produce a prescribed level of output with the minimum cost without changing the production technology. But there is a lack of information about the efficient use of inputs in crop production. Similarly, measurement of productive efficiency in agricultural production is an important issue because it gives pertinent information for making sound management decisions in resource allocation. Except for a few descriptive studies, econometric analysis has yet to be conducted to examine the production function for crops cultivation and its potential for future improvement. To formulate appropriate planning for the sustainable development of the agriculture sector, reliable data on crop production are urgently needed. The present study aimed to generate socioeconomic information on major agricultural crops' cultivation at farm level, which can be used by policy makers, researchers, and extension personnel to fill up the knowledge gap in the crop sector. The specific objectives of the study are as follows:

- i. to determine the level of input use and estimate the cost and return of selected crops cultivation at the farm level;
- ii. to estimate the economic returns and competitiveness of some selected crops in Bangladesh; and
- iii. to identify problems and opportunities related to crop cultivation at the farm level.

The sub-project was coordinated by Agricultural Economics and Rural Sociology Division, Bangladesh Agricultural Research Council, with two implementing parts: i. Agricultural Economics Division, Bangladesh Agricultural Research Institute, and ii. Agricultural Economics Division, Bangladesh Institute of Nuclear Agriculture. In addition to coordinating activities, AERS division, BARC acted as an implementing part for collecting data on jute cultivation. Accordingly, 900 sample jute farmers were interviewed in different study areas. Agricultural Economics Division, BARI, was responsible for data collection of 35 types of crops. Hence, a total of 14,490 sample farmers were interviewed from different areas around Bangladesh. Similarly, Agricultural Economics Division, BINA, collected data on three major oilseed crops mustard, groundnut, and sesame, from a total of 1,350 samples of oilseed farmers. Under the sub-project, altogether 39 types of crops were studied, including cereals, pulses, oilseeds, tuber crops, spices, vegetables, fruits, and fiber crops, and a total of 16,740 sample farmers were interviewed for the cost-return analysis.

Principal Investigators (PI) of the concerned organizations were responsible for implementing the project activities. The yearly progress of planned activities was reviewed in the workshop organized by the coordination component BARC at the end of each year. All concerned stakeholders, scientists, teachers, extension personnel, experts, policymakers, and media personnel were invited to attend the workshop.

Primary data were collected through extensive farm-survey in distinct regions of Bangladesh. The farm surveys were carried out for various crops by applying both multi-stage and random sampling techniques to select sample farm households for the purpose of collecting primary data and information. At the first stage, priority in the selection of study areas was specified to the intensity of area coverage by respective crops and regional differences in Agro-ecological zones. At stage two, for selecting the Upazilla, data on the cultivated area for the selected crops and total cropped area in each Upazilla under the district were collected from the district office of the Department of the Agricultural Extension (DAE). Then, the highest crop concentration Upazillas were selected for administering farm surveys for the selected crops. At the third stage, union and block-wise information for the specified crops and total cropped area of each union and block were taken from the Upazilla office of the DAE for selecting the union and block. The union and block were also selected based on the highest crop concentration for the selected crop. Finally, the sample farmers were selected randomly from the highest crop concentrated village. The per hectare profitability of growing crop from the viewpoints of individual farmers was calculated in terms of gross return, gross margin, and net return.

The performance of the financial and economic profitability of various crops, including an assessment of comparative advantage using domestic resource cost (DRC), is presented in the following sub-sequent sections in brief.

Key Findings

Fibre crop: As reported, farmers received a net return of Tk.30,672 on per hectare basis in Tossa jute, with a total cost of Tk.1,09,936. The benefit-cost ratio over the total cost basis was calculated at 1.28. Similarly, the net return for *Deshi* jute production was estimated at Tk.20,853 per hectare under farmers' conditions, with a total cost of production of Tk.94,974, and a computed benefit-cost ratio of 1.22 on a total cost basis. The cost of production per kilogram of Tossa and *Deshi* jute was Tk.46.28 and Tk.47.82, respectively. The value of domestic resource cost (DRC) for jute under export parity price was less than one (0.947), indicating that the crop has a comparative advantage in terms of the efficiency of domestic production for export promotion.

Cereals: Data was collected from two cereal crops, viz., wheat and maize, from various study locations around Bangladesh under BARI component. The analyses revealed that total cost of wheat cultivation was Tk.74,447 per hectare, with an average net return of Tk.19,313 per hectare. The benefit-cost ratio on a total cost basis was found to be 1.26. The cost of per kilogram wheat was Tk.17.88. For maize, the total cost of production and net return were Tk.1,10,119 and Tk.95,110 per hectare respectively. The benefit-cost ratio on a total cost basis was 1.86 and the per kilogram cost of production stood at Tk.10.05. The values of domestic resource cost (DRC) for wheat and maize under import parity prices were less than one (0.69 and 0.50, respectively), indicating that Bangladesh had a comparative advantage for both crops in terms of the efficiency of domestic production for import substitution.

Pulses: Under the component, data on two pulse crops, lentil and mungbean, was collected from various survey areas. Results revealed that, on average, the total cost of production of lentil and mungbean was Tk.52,744 and Tk.46,791 per hectare, respectively. The estimated net returns were Tk.33,409 for lentil and Tk.26,144 for mungbean, with a benefit-cost ratio of 1.63 and 1.56, respectively, on a total cost basis. The per kilogram production costs for lentil and mungbean were Tk. 37.14 and Tk. 36.58 respectively. DRC values were less than unity for both crops (0.62 for lentils and 0.63 for mungbean) implying that the country had a comparative advantage in these crops for import substitution.

Spices: Four spice crops onion, garlic, green chilli, and betal leaf were selected for survey under the component. Farmers received an average net return of Tk.1,30,179, Tk.1,57,163, Tk.1,56,348, and Tk.2,58,683 for onion, garlic, green chilli, and betal leaf per hectare, respectively. The per hectare total cost of production was estimated at Tk.1,74,171 for onion, Tk.2,20,637 for garlic, Tk.1,89,701 for green chilli, and Tk.9,52,567 for betal leaf production. The benefit-cost ratio over the total cost basis was calculated at 1.74 for onion, 1.71 for garlic, 1.83 for green chilli, and 1.27 for betal leaf. However, the per kg costs of production of onion, garlic, green chilli, and betal leaf were Tk.11.76, Tk.27.69, Tk.11.98, and Tk.98.00 respectively. DRC analysis implies that Bangladesh had a comparative advantage for import substitution since the values of DRC's are less than unity in producing onion, garlic, and green chilli (0.39, 0.27, and 0.12, respectively).

Tuber crops: Three tuber crops namely potato, sweet potato, and aroid were considered for analysing their profitabilities and comparative advantages under the project. Potato, sweet potato, and aroid had a total cost of production of Tk.2,30,357, Tk.1,43,396, and Tk.2,23,241 per hectare, respectively, resulting in an average net return of Tk.90,437, Tk.1,54,707, and Tk.2,17,385 per hectare respectively. On a total cost basis, the benefit-cost ratios for potato, sweet potato and aroid were estimated to be 1.39, 2.14, and 1.97, respectively. The entire cost of producing one kilogram of potato, sweet potato, and aroid required Tk.8.12, Tk.5.99, and Tk.6.45 respectively. Under export parity prices, all values of domestic resource cost (DRC) for potato and sweet potato were less than one (0.53 and 0.46, respectively), indicating that the country had a comparative advantage in terms of domestic production efficiency for export promotion for these crops.

Vegetables: A total of nine different Kharif vegetables, namely pointed gourd, okra, bitter gourd, cucumber, ash gourd, snake gourd, teasel gourd, ridge gourd, and sponge gourd, were selected in the study. The average total cost of production (per hectare) for pointed gourd was Tk.2,19,838, whereas it was Tk.2,02,642 for okra, Tk.2,26,384 for bitter gourd, Tk.1,99,633 for cucumber, Tk.2,19,741 for ash gourd, Tk.2,23,463 for snake gourd, Tk.2,19,741 for teasel gourd, Tk.2,09,555 for ridge gourd, and Tk.1,99,628 for sponge gourd. The net return was estimated at Tk.1,39,672 for pointed gourd, Tk.2,15,538 for okra, Tk.1,89,947 for bitter gourd, Tk.1,57,971 for cucumber, Tk.1,58,790 for ash gourd, Tk.1,88,058 for snake gourd, Tk.1,28,984 for teasel gourd, Tk.1,42,640 for ridge gourd, and Tk.1,29,251 for sponge gourd production. On a total cost basis, the calculated benefit-cost ratio for okra (2.07) was the highest among Kharif vegetables and the lowest for teasel gourd (1.59). Per kg production costs for all these Kharif vegetables ranged from Tk. 4.84 to Tk. 9.49. DRC values were found to be less than unity for studied vegetables, implying that the country had a comparative advantage in these vegetables for export promotion.

Under the study, data was collected from nine of the various Rabi vegetables, which were yard-long beans, brinjal, cauliflower, cabbage, tomato, country bean, pumpkin, bottle gourd, and red amaranth. The cost-return scenario revealed that the total cost of yard-long bean cultivation was Tk.2,33,274 per hectare, which was Tk.2,17,978 for brinjal, Tk.1,85,189 for cauliflower, Tk.1,82,592 for cabbage, Tk.2,01,311 for tomato, Tk.2,11,864 for country bean, Tk.1,47,489 for pumpkin, Tk.2,11,593 for bottle gourd, and Tk.1,32,931 for red amaranth. Vegetable farmers received net returns of Tk.1,62,159 from yard-long beans, Tk.1,40,212 from brinjal, Tk.1,32,852 from cauliflower, Tk.1,29,839 from cabbage, Tk.2,89,985 from tomato, Tk.2,36,292 from country beans, Tk.1,11,939 from pumpkin, Tk.1,33,433 from bottle gourd, and Tk.1,01,944 from red amaranth cultivation. Among the vegetables, the calculated benefit-cost ratio on a total cost basis was maximum (2.44) for tomato and minimum (1.63) for bottle gourd. The per kg cost of vegetable (Rabi) production ranged from Tk.4.95 to Tk.9.49 among these vegetables. The country had a comparative advantage for export promotion as DRC values for all rabi vegetables were less than unity, similar to kharif vegetables.

Fruits: Fruit crops under the study included banana, mango, guava, litchi, malta, and lemon. As reported, the total cost per hectare was estimated at Tk.2,73,923 in banana, Tk.2,12,262 in mango, Tk. 2,80,554 in guava, Tk.1,99,520 in litchi, Tk.3,82,548 in malta, and Tk.2,56,451 in lemon cultivation. The average net returns per hectare were estimated at Tk.3,26,803 in banana, Tk.3,57,308 in mango, Tk.2,56,560 in guava, Tk. 4,72,036 in litchi, Tk.7,41,577 in malta, and Tk.1,73,036 in lemon production. The benefit-cost ratio over the total cost was calculated at 2.19 for banana, 2.69 for mango, 1.92 for guava, 3.37 for litchi, 2.94 for malta, and 1.68 for lemon. The per kg cost of production was Tk. 6.56 for banana, Tk. 10.00 for mango, Tk. 5.67 for guava, Tk. 26.41 for litchi, Tk. 23.61 for malta, and Tk. 17.46 for lemon production.

Oilseed crops: Three important oil crops such as mustard, groundnut, and sesame were considered for analyzing the costs and returns of their farm level cultivation under BINA component. The overall cost scenario revealed that the total costs of production of mustard, groundnut, and sesame were Tk.51,394, Tk.83,490, and Tk.59,621 per hectare, respectively. The average net returns of the aforesaid crops were Tk.14,776, Tk.84,748, and Tk.30,423 per hectare respectively. The benefit-cost ratio over total cost was calculated at 1.29 for mustard, 2.01 for groundnut, and 1.51 for sesame. The analysis further revealed that the production of one kilogram mustard, groundnut, and sesame required Tk. 39.27, Tk.40.81, and Tk.44.47 respectively. Under import parity prices, all the values of domestic resource cost (DRC) for mustard, groundnut, and sesame were less than one (0.66, 0.35, and 0.29, respectively), indicating that the country had a comparative advantage in producing these oilseed crops for import substitution.

It is concluded that all the crops under study were found to be profitable, and fruits and vegetables were more profitable compared to other studied crops. Again, all the crops have a comparative advantage in domestic production for import substitution or export promotion. In spite of having profitable nature of all the crops, farmers faced some problems during their cultivations. Farmers mentioned seasonal price fluctuations, lack of quality seed, adulterated seed and fertilizer, insect and disease infestations, high wages, and labor shortages in harvesting time as major issues in the crop cultivation process. In order to improve

the crop production environment at the farm level, farmers are of the view that minimum prices should be fixed and necessary initiatives should be taken by the government to address low or unreasonable prices of crops as well as marketing problems. They also stated that necessary initiatives should be taken by DAE and agricultural research institutes to solve problems with insects and diseases in crop fields. They urged strengthening mechanization at the farm level to meet labor crisis situations. Other problems related to the availability of quality seed, removing adulterated seed and fertilizers from the market can be solved with proper initiatives by the government and concerned organizations like BADC. The farmers, in particular, and the country as a whole will definitely benefit if these problems are minimized or solved to some extent.

Keywords: Cost and return, Financial profitability, Economic profitability, DRC, Import parity, Export parity.

PBRG Sub-project Completion Report (PCR)

A. Sub-project Description

- 1. Title of the PBRG sub-project: Cost and Return Analysis of Selected Crops in Bangladesh**
- 2. Implementing organization (s):** Agricultural Economics and Rural Sociology Division, Bangladesh Agricultural Research Council, Farmgate, Dhaka 1215.
- 3. Name and full address with phone, cell and e-mail of Coordinator, Principal Investigators and Co-Investigators**

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4. Sub-project budget (Tk.):

4.1 Total: (in Tk. as approved): Tk.23199597

4.2 Latest Revised (if any): Tk.23182261

5. Duration of the sub-project:

5.1 Start date (based on LoA signed): February 28, 2018

5.2 End date: December 31, 2021

6. Background of the Sub-Project

Cost-return data can be used to better understand and evaluate farm operations of different agricultural products. As a result, better farm-level decisions may be made, and as such marketing efficiency and performance can be improved. Due to scarcity of resources, production economists have begun to consider reallocating existing resources to generate more output with a given level of input combinations or to generate a certain level of output at the lowest possible cost without modifying the production technique. However, there is an insufficiency of data on how to use inputs efficiently in crop production. Likewise,

analyzing productive efficiency in agricultural output is critical since it provides important information for making appropriate resource allocation decisions. Except for a few descriptive studies, econometric analysis is yet to be conducted to examine the production function for crops cultivation and its potential for future improvement. To formulate appropriate planning for the sustainable development of agriculture sector, reliable data on crop production are urgently needed. Hence, the study may be very worthwhile in providing necessary socioeconomic information about a variety of crops to all stakeholders in the crop production sector.

7. Sub-Project General Objective (s)

Generate socioeconomic information on crop cultivation practices in respect of production of agricultural commodities by using scarce resources which can be used by policy makers, researchers and extension personnel to fill up the knowledge gap in the crop sector.

8. Sub-Project Specific Objectives

- i. to determine the level of input use and estimate the cost and return of selected crops cultivation at farm level;
- ii. to estimate the economic returns and competitiveness of some selected crops in Bangladesh; and
- iii. to identify problems and opportunities related to crop cultivation at farm level.

9. Implementing Location (s)

The study locations were selected based on household surveys supplemented by secondary data and information. Based on BBS information (2017-19), major crops growing areas were selected for collecting farm level data/information for the Sub-project. The names of major crops and study areas are given in Table 9.1.

Table 9.1: Major crops and geographical coverage of the study areas

A. BARC Component

Crops	Proposed study areas		
	1 st Year	2 nd Year	3 rd Year
Jute:			
Tossa	Faridpur, Jamalpur and Pabna,	-	-
<i>Deshi</i>	-	Mymensingh, Rangpur and Sariatpur	-

B. BARI Component

Crops	Proposed study areas		
	1 st Year	2 nd Year	3 rd Year
Cereals:			
Wheat	Thakurgaon, Pabna, Faridpur	-	-
Maize	-	Dinajpur, Chuadanga, Manikganj	-
Pulses:			
Lentil	Natore, Rajshahi, Faridpur	-	-
Mungbean	Natore, Jhenaidha, Barishal	-	-
Spices:			
Chilli (Rabi)	Borga, Jamalpur, Bhola	-	-
Onion	Rajshahi, Pabna, Faridpur	-	-
Garlic	-	Natore, Pabna, Faridpur	-
Betel leaf	-	Chuadanga, Barishal, Gopalganj	-

Crops	Proposed study areas		
	1 st Year	2 nd Year	3 rd Year
Tuber crops:			
Potato	Rangpur, Cumilla, Munsigonj	-	-
Sweet potato	-	Kurigram, Cumilla, Noakhali	-
Aroid	Sherpur, Jashore, Cumilla	-	-
Vegetables:			
Kharif:			
Pointed gourd	Pabna, Jhenaidha, Jashore	-	-
Okra	Pabna, Tangail, Chattogram	-	-
Bitter gourd	-	Bogura, Jashore, Cumilla	-
Cucumber	-	Meherpur, Tangail, Chattogram	-
Ash gourd	-	Dhaka, Narshingdi, Cumilla	-
Snake gourd	-	Jashore, Narshingdi, Cumilla	-
Teasel gourd	-	Jashore, Rangpur, Cumilla	-
Ridge gourd	-	Jashore, Narshingdi, Cumilla	-
Sponge gourd	-	Jashore, Narshingdi, Cumilla	-
Yard long bean	-	Jashore, Narshingdi, Cumilla	-
Rabi:			
Brinjal	Rajshahi, Jamalpur, Jashore	-	-
Cauliflower	Chuadanga, Dinajpur, Chattogram	-	-
Cabbage	Chuadanga, Dinajpur, Chattogram	-	-
Tomato	-	Rajshahi, Dinajpur, Cumilla	-
Countrybean	-	Chattogram, Narsingdi, Jashore	-
Pumpkin	Jashore, Rangpur, Cumilla	-	-
Bottle gourd	Dhaka, Narsingdi, Cumilla	-	-
Red Amaranth	Jashore, Narsingdi, Cumilla	-	-
Fruits:			
Banana	Tangail, Jhenaidha, Narsingdi	-	-
Mango	Rajshahi, Chapai Nawabganj, Rangpur	-	-
Guava	-	Gazipur, Narsingdi, Rajshahi	-
Litchi	-	Dinajpur, Pabna, Rajshahi	-
Malta	-	Rajshahi, Chapai Nawabganj, Panchagor	-
Lemon	-	Gazipur, Narsingdi, Dhaka	-

B. BINA Component

Crops	Proposed study areas		
	1 st Year	2 nd Year	3 rd Year
Oilseeds :			
Mustard	Sirajgonj, Tangail, Jashore	-	-
Groundnut	-	Panchagor, Faridpur, Noakhali	-
Sesame	-	Jessore, Tangail and Pabna	-

10. Methodology in brief

The present study was coordinated by the Agricultural Economics & Rural Sociology Division (AERS) of BARC with collaboration of the Agricultural Economics Divisions of BARI and BINA. Principal Investigators (PI) of the concerned organizations were responsible for implementing the project activities. All selected crops were considered for cost-benefit analysis. Yearly progress of planned activities were reviewed in the workshop organized by coordination component BARC at the end of each year. All concerned stakeholders, scientists, teachers, extension personnel, experts, policy makers and media personnel were invited to attend the workshop.

10.1 Data sources: The study attempted to analyze the financial and economic profitability of the crop, including an assessment of comparative advantage using domestic resource cost (DRC). To assess the comparative profitability of the crop, a farm level survey was necessary for estimating the production cost and return.

10.1.1 Primary data source: Primary data for this study was required to analyze the financial and economic profitability of the crop produced at the farm level. Therefore, the primary data was collected through extensive farm-surveys in different districts/regions of Bangladesh. A total of 39 types of crops including cereals, pulses, oil seeds, tuber crops, spices, vegetables, fruit and fiber crops were considered in the project. Component based types of crops under study along with geographical coverage was demonstrated in Table 9.1. The qualitative data collection method focus group discussion (FGD) was also conducted to validate, enhance or improve the findings of the study. For each FGD, 20 to 30 farmers were selected to discuss specific crops satisfying the objectives of the study.

10.1.2 Secondary data source: The principal sources of secondary data were various issues of Yearbook of Agricultural Statistics in Bangladesh, Statistical Yearbook of Bangladesh, Bangladesh Economic Review, Department Agricultural Extension etc.

10.2 Survey design: Survey design is very important to accomplish the survey efficiently and accurately. The following steps were taken into consideration for conducting the farm level survey.

10.2.1 Selection technique of the study area: The survey districts were chosen based on the crop in different regions on the basis of specified characters viz. cropping intensity and ecological zone. Table 10.1 revealed information on study locations, sample size, and yearwise distribution of samples for data collection.

Table 10.1: Distribution of crops among study locations, sample size and year wise allocation of samples for data collection under different components

A. BARC Component

Crops name	Locations	Samples per crop/ locations	Total samples	Year wise allocation	
				1 st Year	2 nd Year
Fibre crops					
A. Jute (Tossa)	Faridpur, Jamalpur and Pabna	225	675	450	225
Total samples			675	450	225
B. Jute (Deshi)	Mymensingh, Rangpur and Shariatpur	75	225	-	225
Total samples			225	-	225
Total			900	450	450

B. BARI Component

Crops name	Locations	Samples per crop/ locations	Total samples	Year wise distribution	
				1 st Year	2 nd Year
A. Cereals					
1. Wheat	Thakurgao, Pabna and Faidpur	180	540	540	-
Total samples (Wheat)			540	540	-
2. Maize	Dinajpur, Chuadanga and Manikganj	180	540	-	540
Total samples (Maize)			540	-	540
Sub total – A			1080	540	540
B. Pulses					
1. Lentil	Natore, Jashore and Faridpur	180	540	540	-
Total samples (Lentil)			540	540	-
2. Mungbean	Natore, Patuakhali and Bhola	150	450	450	-
Total samples (Mungbean)			450	450	-
Sub total – B			990	990	-
C. Spices					
1. Chilli	Bogura, Jamalpur and Bhola	180	540	540	-
Total samples (Chilli)			540	540	
2. Onion	Rajshahi, Pabna and Faridpur	180	540	540	-
Total samples (Onion)			-	540	
3. Garlic	Natore, Pabna and Rajbari	180	540	-	540
Total samples (Garlic)			-	540	540
4. Betel leaf	Chuadanga, Barishal, Gopalganj	120	360	-	360
Total samples (Betel leaf)			360		
Sub total - C			-	1080	900
D. Tuber crops					
1. Potato	Rangpur, Cumilla and Munshiganj	180	540	540	-
Total samples (Potato)			-	540	-
2. Sweet Potato	Kurigram, Brahmanbaria and Noakhali	150	450	-	450
Total samples (Sweet potato)			-	450	450
3. Aroid	Sherpur, Jashore, Cumilla	120	360	360	-
Total samples (Aroid)			-	360	-
Sub total - D			-	1350	450
E.1. Vegetables – Kharif					
1. Point Gourd	Pabna, Jhenaidah and Jashore	120	360	360	-
Total samples (Point gourd)			360	360	-
2. Okra	Pabna, Tangail and Chattogram	120	360	360	-
Total samples (Okra)			360	360	-

Crops name	Locations	Samples per crop/ locations	Total samples	Year wise distribution	
				1 st Year	2 nd Year
A. Cereals					
1. Wheat	Thakurgao, Pabna and Faidpur	180	540	540	-
Total samples (Wheat)			540	540	-
2. Maize	Dinajpur, Chuadanga and Manikganj	180	540	-	540
Total samples (Maize)			540	-	540
Sub total – A			1080	540	540
B. Pulses					
1. Lentil	Natore, Jashore and Faridpur	180	540	540	-
Total samples (Lentil)			540	540	-
2. Mungbean	Natore, Patuakhali and Bhola	150	450	450	-
Total samples (Mungbean)			450	450	-
Sub total – B			990	990	-
C. Spices					
1. Chilli	Bogura, Jamalpur and Bhola	180	540	540	-
Total samples (Chilli)			540	540	-
2. Onion	Rajshahi, Pabna and Faridpur	180	540	540	-
Total samples (Onion)			-	540	540
3. Garlic	Natore, Pabna and Rajbari	180	540	-	540
Total samples (Garlic)			-	540	540
4. Betel leaf	Chuadanga, Barishal, Gopalganj	120	360	-	360
Total samples (Betel leaf)			360	-	360
Sub total - C			-	1980	1080
D. Tuber crops					
1. Potato	Rangpur, Cumilla and Munshiganj	180	540	540	-
Total samples (Potato)			-	540	-
2. Sweet Potato	Kurigram, Brahmanbaria and Noakhali	150	450	-	450
Total samples (Sweet potato)			-	450	450
3. Aroid	Sherpur, Jashore, Cumilla	120	360	360	-
Total samples (Aroid)			-	360	-
Sub total - D			-	1350	900
E.1. Vegetables – Kharif					
1. Point Gourd	Pabna, Jhenaidah and Jashore	120	360	360	-
Total samples (Point gourd)			360	360	-
2. Okra	Pabna, Tangail and Chattogram	120	360	360	-
Total samples (Okra)			360	360	-

Crops name	Locations	Samples per crop/ locations	Total samples	Year wise distribution	
				1 st Year	2 nd Year
3. Bitter Gourd	Jashore, Naogaon and Mymensingh	120	360	-	360
Total samples (Bitter gourd)			360	-	360
4. Cucumber	Meherpur, Mymensingh and Chattogram	120	360	-	360
Total samples (Cucumber)			360	-	360
5. Ash gourd	Dhaka, Narshingdi, Cumilla	120	360	360	-
Total samples (Ash gourd)			360	360	-
6. Snake gourd	Jashore, Narshingdi, Cumilla	120	360	-	360
Total samples (Snake gourd)			360	-	360
7. Teasel gourd	Jashore, Rangpur, Cumilla	120	360	-	360
Total samples (Teasel gourd)			360	-	360
8. Ridge gourd	Jashore, Narshingdi, Cumilla	120	360	-	360
Total samples (Ridge gourd)			360	-	360
9. Sponge gourd	Jashore, Narshingdi, Cumilla	120	360	-	360
Total samples (Sponge gourd)			360	-	360
10. Yard long bean	Jashore, Narshingdi, Cumilla	120	360	-	360
Total samples (Yard long bean)			360	-	360
Sub total – E.1.			3600	1080	2520
E.2. Vegetables – Rabi					
1. Brinjal	Rajshahi, Jamalpur and Jashore	150	450	450	-
Total samples (Brinjal)			450	450	-
2. Cauliflower	Dinajpur, Cumilla and Jashore	150	450	450	-
Total samples (Cauliflower)			450	450	-
3. Cabbage	Dinajpur, Cumilla and Jashore	120	360	360	-
Total samples (Cabbage)			360	360	-
4. Tomato	Rajshahi, Dinajpur and Cumilla	150	450	-	450
Total samples (Tomato)			450	-	450
5. Country Bean	Chattogram, Narsingdi and Jashore	150	450	-	450
Total samples (Country bean)			450	-	450
6. Pumpkin	Jashore, Rangpur, Cumilla	120	360	360	-
Total samples (Pumpkin)			360	360	-

Crops name	Locations	Samples per crop/ locations	Total samples	Year wise distribution	
				1 st Year	2 nd Year
7. Bottle gourd	Dhaka, Narsingdi, Cumilla	120	360	360	-
Total samples (Bottle gourd)			360	360	-
8. Red Amaranth	Jashore, Narsingdi, Cumilla	120	360	360	-
Total samples (Red Amaranth)			360	360	-
Sub total – E.2.			3240	2340	900
F. Fruits					
1. Banana	Tangail, Jhenaidah and Narsingdi	150	450	450	-
Total samples (Banana)			450	450	-
2. Mango	Rajshahi, Chapai Nawabganj, Rangpur	120	360	360	-
Total samples (Mango)			360	360	-
3. Guava	Gazipur, Narsingdi, Rajshahi	120	360	-	360
Total samples (Guava)			360	-	360
4. Litchi	Dinajpur, Pabna, Rajshahi	120	360	-	360
Total samples (Litchi)			360	-	360
5. Malta	Rajshahi, Chapai Nawabganj, Panchagor	120	360	-	360
Total samples (Malta)			360	-	360
6. Lemon	Gazipur, Narsingdi, Dhaka	120	360	-	360
Total samples (Lemon)			360	-	360
Sub total - F			2250	810	1440
Total (A+B+C+D+E.1.+E.2.+F):			14490	7740	6750

C. BINA Component

Crops name	Locations	Samples per crop/ locations	Total samples	Year wise distribution	
				1 st Year	2 nd Year
Oilseed crops					
1. Mustard	Sirajganj, Tangail and Jashore	180	540	540	-
Total samples (Mustard)			540	540	-
2. Groundnut	Panchogar, Faridpur and Noakhali	135	405	-	405
Total samples (Groundnut)			405	-	405
3. Sesame	Jashore, Tangail and Pabna	135	405	-	405
Total samples (Sesame)			405	-	405
Total			1350	540	810

10.2.2 Sampling design:

The farm survey for the crop was carried out by applying both multi-stages and random sampling techniques to select sample farm households for collecting primary data and information. At the first stage, priority in selection of study areas was specified based on the intensity of area coverage by the crop and regional differences in Agro-ecological zones. At stage two, for selecting the upazilla, the cultivated area for the crop and total cropped area of each upazilla under the district were collected from the district office of the Department of Agricultural Extension (DAE). Then, the highest crop concentration in an upazilla for the crop was selected based on the information of the DAE. At the third stage, union and block wise information for the crop and total cropped area of each union and block was taken from the upazilla office of the DAE for selecting the union and block. The union and block was also selected based on the highest crop concentration for the selected crop. Finally, the farmers were selected randomly from the highest crop concentrated village in the study area. The steps were as follows:



Data on total farm households in each village were obtained from the report of Agricultural Extension Office, which serves as the population for the present study. Sample size in the study area were measured by applying the following formula:

$$n = \frac{Nz^2p(1 - p)}{Nd^2 + z^2p(1 - p)}$$

Where,

n = sample size

N = total number of households

z = confidence level (at 95% level z = 1.96)

p = estimated population proportion (0.5, this maximizes the sample size)

d = error limit of 5% (0.05)

10.2.3 Survey team: A survey team was formed with scientists and trained enumerators to collect primary data with the assistance of DAE personnel. The Coordinator and PI's monitored data collection activities on a regular basis.

10.3 Analytical technique: Collected data was edited and scrutinized for analysis. Most appropriate, available and necessary descriptive methods, tools and techniques were used for data analysis.

10.3.1 Measurement of financial costs and returns: In this study, costs and returns analyses were done on both variable and total cost basis. The following equation (II) was used to assess the financial profitability in growing the crop.

$$\Pi = \sum_{i=1}^n P_i Q_i - TC = \sum_{i=1}^n P_i Q_i - (VC + FC) \text{-----(1)}$$

Where,

Π = Profit or value addition from crop production

Q_i = Quantity of crop of ith farmer (kg/ha)

P_i = Average price of crop obtained by the ith farmer (Tk/kg)

TC = Total cost incurred (Tk/ha)

VC = Variable cost (Tk/ha)

FC = Fixed cost (Tk/ha)

i = 1, 2, 3,, n

Per hectare profitability of growing the crop from the view points of individual farmer was measured in terms of gross return, gross margin and net return.

Gross return: Gross return was calculated by simply multiplying the total volume of output with its per unit of price in the harvesting period.

Gross margin: Gross margin calculation was done to have an estimate of the difference between total return and variable costs. The argument for using the gross margin analysis is that the farmers of Bangladesh are more interested to know their return over variable costs.

Net return: The analysis considered fixed cost (which included land rent and cost of family supplied labour (opportunity cost). Net margin was calculated by deducting all costs (Variable and Fixed) from gross return.

10.3.2 Measurement of economic costs and returns

10.3.2.1 Measures of comparative advantage:

Comparative advantage in the production of a given crop for a particular country is measured by comparing its border price with the social or economic opportunity costs of producing, processing, transporting, handling and marketing an incremental unit of commodity. The domestic resource cost (DRC) provides a measure of efficiency, with implications for the level of incentives offered to producers. Whether it is efficient for a country to produce a commodity as opposed to importing it, depends on the opportunity cost of domestic production relative to the value addition it creates in foreign currency.

The DRC is the ratio of the cost in domestic resources and non-traded inputs (valued at their shadow prices) of producing the commodity domestically to the net foreign exchange earned or saved by producing the goods/products domestically.

Formally DRC is defined as

$$\text{DRC} = \frac{\text{Cost of domestic resource and non-traded inputs for producing per unit of output}}{\text{Value of tradable output} - \text{Value of tradable inputs}}$$

$$\text{DRC} = \frac{\sum f_{ij} P_j^d}{U_i - \sum a_{ik} P_k^b} \text{----- (6)}$$

Where,

f_{ij} = Domestic resource and non-traded inputs j used for producing per unit commodity i ,

P_j^d = Price of non-traded intermediate inputs and domestic resource,

U_i = Border price of output i ,

a_{ik} = Amount of traded intermediate inputs for unit production of i , and

P_k^b = Border price of traded intermediate input

If $\text{DRC} < 1$, the economy saves foreign exchange by producing the crop domestically either for export or for imports substitution. This is because the opportunity cost of domestic resources and non-traded factors used in producing the good is less than the foreign exchange earned or saved. In contrast, if $\text{DRC} > 1$, domestic costs are in excess of foreign exchange costs or savings, indicating that the good should not be produced domestically and should be imported instead.

10.4 General assumption

10.4.1 Traded intermediate inputs:

There are commodities which are either imported or exported. In the case of Bangladesh, as stated earlier three types of chemical fertilizers viz., Urea, TSP and MoP were considered as traded intermediate inputs. Irrigation equipment and pesticides are also traded intermediate inputs, but detailed cost of production figures for irrigation equipment was not available. Since the cost of imported pesticide constituted minor proportion of input cost, the item was not taken into account in the estimation of cost of traded intermediate input costs. The cost of fertilizers was measured by border price (import parity) at farmers' level.

10.4.2 Non-traded intermediate inputs and domestic resources:

In Bangladesh, unskilled agricultural labour, mechanical/animal power, seed, manure, irrigation charge, insecticide/pesticide cost, interest on operating capital and land rent were generally considered as non-traded intermediate inputs and domestic resource because these components do not usually enter in the international market. Costs of human labour, mechanical/animal power, seed, manure, irrigation charge, insecticide/pesticide cost, interest on operating capital and land rent were collected from farm level through direct interview during 2018-2019. Opportunity cost of operating capital was calculated at a 6 percent rate of interest for the production period of the crop. The payments for non-traded intermediate inputs and domestic resources were also converted into per unit of output by adjusting yields. Methodologically, these items were valued at opportunity cost. In Bangladesh, the factor markets are fairly competitive; so payment for non-traded intermediate inputs and domestic resources fairly represented the opportunity cost of these resources.

10.5 Methodology for calculating border parity prices

10.5.1 Jute (export parity)

World price (f.o.b. Chattogram) of jute was obtained from FAOSTAT during 2017-2018. Border price measured at farmgate equaled world price less export handling, transportation cost, trading cost and interest on the operating capital for four months.

Export handling cost: This cost was the main cost of exporter excluding transportation cost which consisted of loading unloading, rope making, bale ticker, pressing charge, sacking pucca bale, export brokerage, commission to C&F agents, commission to BJMC, bill of lading, stamping, bank interest and insurance charge export handling costs etc. (Rashid, 2009).

Trading cost: Costs of all marketing intermediaries from farmer to exporters (Rashid, 2009).

10.5.2. Wheat and maize import parity: World price (c.i.f. Chattogram) of wheat and maize were obtained from FAOSTAT during 2017-2018. Border price of wheat and maize measured at producer level equaled c.i.f. price Chattogram plus import handling (3% of c.i.f. price) and transportation cost from Chattogram to Dhaka, domestic trading cost less costs from producers to wholesale market less interest cost for six months (to account for time difference).

Domestic trading cost: Domestic trading cost was mainly the cost of wholesalers which included labour, utilities, land rent etc. per tonne. This cost was obtained from Rashid (2009).

Cost from farmgate to wholesale: It was the cost of different market intermediaries from producer to wholesaler of wheat. This cost was also obtained from Rashid (2009).

10.5.3. Pulses (lentil, mungbean and chickpea) import parity: World price (c.i.f. Chattogram) of pulses was obtained from FAOSTAT during 2017-2018. Border price measured at mill gates equaled world price (c.i.f. Chattogram) plus import handling, transport, domestic trading less costs from mill gate to wholesale. Then milling cost is subtracted and after applying the conversion rate, cost from farmgate to wholesale and interest costs for six months was deducted to yield border price at farmgate. Milling rate was assumed at 85 per cent.

10.5.4. Spices (onion, garlic) import parity: World price (c.i.f. Chattogram) of spices was obtained from FAOSTAT during 2017-2018. Border price measured at producers' level was equal to world price plus import handling cost and transport cost less cost from farmers to wholesale level.

10.5.5. Tuber crops (potato, sweet potato) and vegetables (selected summer and winter vegetables) export parity: World price (f.o.b. Chattogram) of tuber crops and vegetables were obtained from FAOSTAT during 2017-2018. Border price measured at producers level was equal to world price less export handling, transportation and cost from farmgate to wholesale.

10.5.6. Mustard, Groundnut and Sesame import parity: World price (c.i.f. Chattogram) of mustard, groundnut and sesame were obtained from FAOSTAT during 2017-2018. Border price of mustard, groundnut and sesame measured at producer level equaled c.i.f. price Chattogram plus import handling (3%

of c.i.f. price) and transportation cost from Chattogram to Dhaka, domestic trading cost less costs from producers to wholesale market less interest cost for six months (to account for time difference).

Domestic trading cost: Domestic trading cost was mainly the cost of wholesalers which included labour, utilities, rent etc. per tonne. This cost was obtained from Rashid (2009).

Cost from farmgate to wholesale: It was the cost of different market intermediaries from producer to wholesaler of mustard, groundnut and sesame. This cost was also obtained from Rashid (2009).

10.5.7. Parity price of fertilizer_import parity: Parity prices of all three types of chemical fertilizers used in Bangladesh viz., Urea, TSP and MP were computed from their international prices to generate the time series.

10.5.7.1. Urea (import parity): World price was c.i.f. Chattogram which was equal to f.o.b. Northwest Europe plus ocean freight from Northwest Europe to Chattogram. The border price measured at farmgate represented the c.i.f. price Chattogram times official exchange rate plus domestic handling cost (from port to wholesale market to farmgate).

10.5.7.2. TSP (import parity): The world price was c.i.f. Chattogram which was equal to f.o.b. US Gulf plus Ocean freight from US Gulf to Chattogram. Border price at farmgate represented the world price (c.i.f. Chattogram) times official exchange rate plus domestic handling and cost from wholesale to farmgate.

10.5.7.3. MoP (import parity): The world price (c.i.f. Chattogram) was equal to f.o.b. Vancouver plus freight from Vancouver to Chattogram. Border price measured at farmgate represented the world price (c.i.f. Chattogram) times official exchange rate plus domestic handling cost and cost from wholesale to farmgate.

11. Results and Discussion

11.1 Introduction

The aim of analyzing costs and returns is to determine the amount of profit a producer is making from a particular commodity production within the given technology and investment. This is important information in deciding on whether to make an investment. The profitability of a commodity production crucially depends on its prices, cost of production, and availability of technology. Profitability depends on the costs involved in production and returns from these product. On the other hand, the amount of input use affects directly the cost involvement. So, it is worthwhile to know the existing technology in terms of agronomic practices and input use in the area. Therefore, a brief description about the cost items of the selected crops in the selected areas is presented here:

Land preparation: Land preparation included, ploughing, laddering, and other activities needed to make the soil suitable for plantation of seed. In the study areas, all the farmers ploughed their land with the help of power tiller and the number of ploughing varied from farm to farm.

Human labour: Human labour is one of the most important components for crop cultivation. Machine power could not replace human labour fully for cultivation till now in our country. Farmers used both family supplied and hired labour. Family labour includes the operator himself and other working member of the family, while the hired labour includes permanent hired labour, labour employed on monthly contract basis, casual labour and labour employed on the other contract basis.

Seed: Most of the farmers purchase seeds/seedlings in crop cultivation. Only a few farmers purchase seed from the local market and sow them to seed bed and after growing the seedling at a certain stage, they transplant it to the main crop land.

Cowdung and fertilizer: Cowdung is useful for increasing organic matter in the soil to eventually increase crop yields. On the other hand, proper use of fertilizer can enhance agricultural production largely and help to retain or improve soil fertility. The sample farmers used four kinds of chemical fertilizers namely: Urea, TSP, MoP and Gypsum in the survey plots.

Pesticide/insecticide: Mainly insecticide and fungicides were used by most of the sample farmers and applied those to survey plots with different rates. The cost of pesticide was computed based on the price that

the farmers have actually paid. Farmers used different pesticides such as, Somithion, Melathion, Ripcord, Redomil Gold, Dythen M- 45, Sandomil, etc.

Fence/Macha preparation: Macha preparation was one of the important activities for producing vegetables cultivation. Bamboo, rope, ware and jute stick were used for making fence/macha. The cost of bamboo was calculated following a straight-line method as the present value minus salvage value divided by the life of bamboo (total year). It is reported by the sample farmers that the life of bamboo is two years.

Irrigation: Almost all the farmers in the study areas used irrigation water in their plots from shallow tube well (STW). Very few farmers followed manual irrigation method for irrigation purpose.

Land rent: Land rent is one of the biggest fixed cost items for the production process. Rental value of land was estimated for the cropping period at the rate prevailing in the study areas. In this analysis, cropping period was considered as 4-6 months that varied from crop to crop. In case of fruits, it is considered as 12 months.

A. BARC Component

Fibre crop

11.2 Financial and economic profitability of Tossa jute

10.2.1 Pattern of input use for tossa jute cultivation: In the selected study areas, farmers used on an average 172 man-days per hectare of total human labour for tossa jute cultivation, which was 175 man-days for Faridpur district, 171 man-days for Pabna and 168 man-days for Jamalpur district respectively (Table 11.1). Farmers employed different level of inputs for tossa jute cultivation. Average seed rate was estimated at 7.26 kg per hectare. They applied Cowdung at the rate of 378 kg/ha in average. Among different chemical fertilizers, they applied Urea, TSP and MoP at the rate of 41, 29, 27 kgs per ha respectively, and also applied a very small amount of Gypsum and Zinc in tossa jute cultivation (Table 11.1).

Table 11.1: Level of different input use per hectare in Tossa jute cultivation

Particulars	Districts			All areas
	Faridpur	Pabna	Jamalpur	
Human labour (man-day)	175.00	171.00	168.00	172.00
Family	33.00	28.00	23.00	28.00
Hired	142.00	143.00	145.00	144.00
Seed (kg)	7.22	7.24	7.31	7.26
Cowdung (Kg)	328.16	507.06	300.06	378.42
Urea (kg)	50.74	33.65	39.52	41.30
TSP (kg)	41.89	28.61	15.25	28.58
MoP (kg)	33.68	25.94	20.84	26.82
Gypsum (kg)	2.33	1.78	2.14	2.08
Zinc (kg)	1.04	0.68	1.78	1.17

Source: Field Survey during 2018-19

11.2.2 Cost of Tossa jute cultivation: As revealed in the study, total variable cost of tossa jute cultivation was Tk. 79,416 per hectare which was 72% of total cost of production (Table 11.2). The highest cost item was hired labour i.e. Tk. 63,769 per hectare which accounted for about 58% of the total cost. Land use costs (Tk.16,998 per hectare) ranked second and accounting for over 15% of the total cost. The family labour cost was another major cost item with Tk.12,496 and accounted for over 11% of the total cost. For tossa jute cultivation, the total cost of production included variable costs and fixed costs. On an average, the total cost of production was estimated at Tk.1,09,936 per hectare, where fixed and variable costs were 28% and 72% respectively (Table 11.2).

Table 11.2: Per hectare cost of Tossa jute cultivation in the study areas**Figure in Tk.**

Particulars	Districts			All areas	%
	Faridpur	Pabna	Jamalpur		
<i>Variable Cost</i>					
Cost of land preparation	6660.23	5846.59	5660.79	6055.87	5.51
Seed	893.80	947.53	915.99	919.11	0.84
Cowdung (Purchased)	287.14	152.62	210.04	216.60	0.20
Urea	811.79	605.63	671.85	696.42	0.63
TSP	963.41	658.08	350.65	657.38	0.60
MoP	505.27	415.03	333.42	417.91	0.38
Gypsum	65.19	53.45	64.14	60.93	0.06
Zinc	83.20	64.40	163.76	103.85	0.09
Hired labor	63332.00	66496.00	61480.00	63769.17	58.01
Irrigation	3470.46	2588.40	1376.55	2478.47	2.25
Pesticides	1388.92	1366.31	1374.74	1376.66	1.25
Misc. items	1140.00	1080.00	1100.00	1070.67	1.01
Sub-total	79601.40	80273.76	73701.93	77859.03	70.82
Interest on operating capital (@ 6% for 4 months)	1592.03	1605.48	1474.04	1557.18	1.42
Total variable cost (TVC)	81193.43	81879.24	75175.97	79416.21	72.24
<i>Fixed Cost</i>					
Family labor	14718.00	13020.00	9752.00	12496.67	11.37
Land use cost	18128.72	17175.43	15691.13	16998.43	15.46
Cowdung (Family supplied)	861.42	1373.62	840.18	1025.07	0.93
Total fixed cost (TFC)	33708.14	31569.05	26283.31	30520.17	27.76
Total Cost (TC)	114901.57	113448.29	101459.28	109936.38	100.00

Source: Author's own calculations from field survey data during 2018-19

11.2.3 Financial profitability of Tossa jute: Average yield of tossa jute was 2375 kg per hectare with average price of about Tk. 51 per kg. The average gross return and gross margin were estimated to Tk.1,40,608 and Tk.61,192 per hectare respectively. Per hectare average net return was Tk.30,672 which was found to be highest in Faridpur (Tk. 35,423) followed by Pabna (Tk.28,870) and Jamalpur (Tk.27,722). BCR on total cost basis was found 1.77 which was more or less similar among the districts. It was estimated that, to produce one kilogram of Tossa jute producers incurred total cost of Tk. 46.28 (Table 11.3).

Table 11.3: Per hectare return in Tossa jute cultivation in the study areas**Figure in Tk.**

Particulars	Districts			All areas
	Faridpur	Pabna	Jamalpur	
Yield of Fibre (Kg/ha)	2490.26	2410.68	2223.00	2374.65
Yield of Jute Stick (Kg/ha)	5750.56	5392.37	5030.00	5390.98
Fibre price (Tk./kg)	52.56	51.23	49.40	51.06
Gross Return (GR)	150324.96	142318.51	129181.70	140608.39
Total variable cost (TVC)	81193.43	81879.24	75175.97	79416.21
Total fixed cost (TFC)	33708.14	31569.05	26283.31	30520.17
Total cost (TC)	114901.57	113448.29	101459.28	109936.38

Figure in Tk.

Particulars	Districts			All areas
	Faridpur	Pabna	Jamalpur	
Gross Margin (GM)	69131.53	60439.27	54005.73	61192.18
Net Return (NR)	35423.39	28870.22	27722.42	30672.01
BCR over TVC	1.85	1.74	1.72	1.77
BCR over TC	1.31	1.25	1.27	1.28
Cost of production (Tk./kg)	46.14	47.06	45.64	46.28

Source: Author's own calculations from field survey data during 2018-19

11.3 Financial and economic profitability of *Deshi* jute

11.3.1 Pattern of input use for *Deshi* jute cultivation: For *Deshi* jute cultivation, farmers used 157 man-days per hectare of total human labour on an average in the selected study areas, which was 160 man-days for Mymensingh district, 158 man-days for Rangpur and 153 man-days for Shariatpur district respectively (Table 11.4). Farmers employed different level of inputs for *Deshi* jute cultivation. Average seed rate was estimated at 8.83 kg per hectare. They applied Cowdung at the rate of 215 kg/ha on an average. Among different chemical fertilizers, they applied Urea, TSP and MoP at the rate of 29, 18, 16 kgs per ha respectively, and also applied a very small amount of Gypsum in *Deshi* jute cultivation (Table 11.4).

Table 11.4: Level of different input use per hectare in *Deshi* jute cultivation

Particulars	Districts			All
	Mymensingh	Shariatpur	Rangpur	
Human labour (man-day)	160.00	153.00	158.00	157.00
Family	30.00	25.00	23.00	26.00
Hired	130.00	128.00	135.00	131.00
Seed (kg)	8.60	8.78	9.12	8.83
Cowdung (kg)	210.12	148.84	286.34	215.10
Urea (kg)	32.74	23.89	30.14	28.92
TSP (kg)	26.08	11.7	15.38	17.72
MoP (kg)	20.62	10.67	16.62	15.97
Gypsum (kg)	1.45	1.23	1.33	1.34

Source: Field Survey during 2019-20

11.3.2 Cost of *Deshi* jute cultivation: The total variable cost of *Deshi* jute cultivation, as exposed in Table 11.5, was Tk. 67,631 per hectare, which was 71% of the total cost of production. Hired labour cost appeared as the highest cost item, which was Tk.57,473 per hectare and accounted for about 61% of the total cost. Land use cost (Tk.15,433 per hectare) and family labor cost (Tk.11,402 per hectare) came out as the second and third cost items accounting for 16 and 12 percent of the overall cost, respectively. Both variable and fixed costs associated with *Deshi* jute production are included in the total cost of production. The average total cost of production was estimated to Tk.94,974 per hectare, while the fixed cost shared 29% and variable cost shared 71% of the total costs of *Deshi* jute production.

Table 11.5: Per hectare cost of *Deshi* jute cultivation in the study areas

Figure in Tk.

Particulars	Districts			All areas	%
	Mymensingh	Shariatpur	Rangpur		
Variable Cost					
Cost of land preparation	5169.00	4615.00	5230.84	5004.95	5.27
Seed	966.90	719.96	875.52	854.13	0.90

Figure in Tk.

Particulars	Districts			All areas	%
	Mymensingh	Shariatpur	Rangpur		
Cowdung (Purchased)	126.06	113.19	197.57	145.61	0.15
Urea	556.58	406.13	512.38	491.70	0.52
TSP	599.84	269.10	353.74	407.56	0.43
MoP	329.92	170.72	265.92	255.52	0.27
Gypsum	40.60	34.44	37.24	37.43	0.04
Hired labor	56940.00	55808.00	59670.00	57472.67	60.51
Irrigation	430.11	531.28	549.30	503.56	0.53
Pesticides	537.16	560.89	677.91	591.99	0.62
Misc. Cost	623.00	510.00	487.00	540.00	0.57
Sub-total	66319.17	63738.71	68857.43	66305.10	69.81
Interest on Operating Capital (6% for 4 month)	1326.38	1274.77	1377.15	1326.10	1.40
Total variable cost	67645.55	65013.48	70234.58	67631.20	71.21
Fixed Cost					
Family labor	13140.00	10900.00	10166.00	11402.00	12.01
Land use cost	16000.00	15500.00	14800.00	15433.33	16.25
Cowdung (Fam. sup.)	504.30	357.14	661.44	507.63	0.53
Total fixed cost	29644.30	26757.14	25627.44	27342.96	28.79
Total Cost	97289.85	91770.62	95862.02	94974.16	100.00

Source: Author's own calculations from field survey data during 2019-20

11.3.3 Financial profitability of *Deshi* jute: It is evident in table 11.6 that, the average yield of *Deshi* jute was 1986 kg per hectare and the price was about Tk. 48 per kg. The gross return and gross margin generated in *Deshi* jute cultivation were Tk.1,15,827 and Tk. 48,196 per hectare respectively. On per hectare basis, the average net return was found at Tk. 20,853. Among different study areas, the maximum net return was found in Mymensingh (Tk.24,331), followed by Shariatpur (Tk.18,918) and Rangpur (Tk.19,302). The average BCR on a total cost basis was 1.22, while the highest BCR was for Mymensingh (1.25) and the lowest was in Rangpur (1.20). As revealed in the study, to produce one kilogram of *Deshi* jute, the total cost stood at Tk. 47.82 (Table 11.6).

Table 11.6: Per Hectare Return of *Deshi* jute cultivation in the study areas

Figure in Tk.

Particulars	Districts			All Areas
	Mymensingh	Shariatpur	Rangpur	
Yield of fibre (Kg/ha)	2068.66	1913.72	1976.44	1986.27
Yield of Jute stick (Kg/ha)	4716.54	4286.73	4605.10	4536.12
Fibre price (Tk./kg)	48.76	48.23	48.09	48.36
Gross Return (GR)	121620.64	110688.79	115171.29	115826.90
Total variable cost (TVC)	67645.55	65013.48	70234.58	67631.20
Total fixed cost (TFC)	29644.30	26757.14	25,627.44	27342.96
Total cost (TC)	97289.85	91770.62	95862.02	94974.16
Gross Margin (GM)	53975.09	45675.31	44936.71	48195.70
Net Return (NR)	24330.79	18918.17	19302.27	20852.74

Figure in Tk.

Particulars	Districts			All Areas
	Mymensingh	Shariatpur	Rangpur	
BCR over Variable Cost	1.80	1.70	1.64	1.71
BCR over Total Cost	1.25	1.21	1.20	1.22
Cost of production (Tk./kg)	47.03	47.95	48.50	47.82

Source: Author's own calculations from field survey data during 2019-20

11.4.1 Economic profitability of Jute: The estimated Domestic Resource Cost (DRC) for Tossa and *Deshi* jute were less than one (0.932 and 0.962), indicating that the crop had comparative advantage in exporting (Table 11.7). This was mostly owing to the utilization of fewer inputs, which led to lower production costs compared to many other crops produced in the country. Tossa jute is cultivated in most of the jute growing areas of Bangladesh at present as compared to *Deshi* jute. Overall, the DRC value of Jute is 0.947, implying that, production of jute has comparative advantage for export.

Table 11.7: Domestic resource cost (DRC) of Jute (export parity)

Particulars	Tossa	<i>Deshi</i>	Average
A. Traded input (Tk/MT)	1380	1067	1223
Urea	559	468	514
TSP	489	363	426
MoP	332	236	284
B. Non-Traded inputs and domestic resources (Tk/MT)	39320	40947	40134
Human labour	26854	28935	27895
Land preparation	2550	2520	2535
Seed	387	430	409
Manure	91	73	82
Pesticide	580	298	439
Irrigation	1044	254	649
Interest on operating capital	656	668	662
Land use cost	7158	7770	7464
C. Output price (Tk/MT)	43544	43650	43597
D. Value added (Tradable) (Tk/MT)(C-A)	42164	42583	42374
E. DRC (B/D) -Import parity	0.932	0.962	0.947

11.5.1 Problems faced by the farmers in Tossa jute cultivation: Tossa jute farmers encountered many problems related to production, marketing, and other factors which are needed to be addressed for improving the production environment of the crop at farm level (Table 11.8). The most important constraint as opined by the farmers was low market price of jute and it was identified by the majority of farmers (66%) in all locations. Problems on the high wage of labour as well as labour crisis during requirement, ranked second and third, respectively (Table 11.8).

Table 11.8: Problems faced by farmers (%) to produce Tossa jute indifferent study areas

SL No	Identified problems	% farmers opined				Ranking
		Faridpur	Pabna	Jamalpur	All	
1	Seed related					
1.1	Price hike during sowing time	43	49	50	47	7
1.2	Unavailability of quality seed during sowing time	44	54	52	50	6
2	Fertilizer related					
2.1	Price hike during sowing time	13	17	15	15	17
3	Insect-Pest infestation related					
3.1	Occasional insect-pest infestation	51	56	51	53	4
4	Labour related					
4.1	Unavailability during requirement	54	63	63	60	3
4.2	High wage during requirement (harvest, post harvest time etc.)	76	55	64	65	2
5	Credit related					
5.1	No credit facility for jute production	36	34	36	35	11
6	Storage related					
6.1	No proper storage facilities at home	49	52	51	51	5
7	Marketing related					
7.1	Unstable market price	35	41	41	39	9
7.2	Intermediary syndicate at market	38	24	25	29	12
7.3	Lack of good communication system	25	30	25	27	13
7.4	Low marketprice	75	64	59	66	1
8	Misc. problems					
8.1	Weather Condition (Excessive rain/drought)	46	48	44	46	8
8.2	High cost of production	36	38	36	37	10
8.3	Lack of knowledge on improved cultivation practices	26	27	26	26	14
8.4	Unavailability of retting water and retting places	19	32	25	25	15

11.5.2 Remedial measures of problems in Tossa jute cultivation: Farmers opined that minimum price fixation, along with government monitoring of the procurement system and infrastructural development, should be done to ensure a fair price for jute in the market and solve marketing problems (Table 11.9). Regarding labour related problems, farmers opined that agricultural labour availability should be increased through migration during requirements and labour wages should be controlled. Farmers also urged that government pricing controls be implemented, as well as ensuring the supply of quality jute seeds in sufficient quantities by BADC throughout the sowing season to solve seed-related problems.

Table 11.9: Remedial measures as opined by farmers (%) in relation to identified problems in Tossa jute cultivation in the study areas

SL No	Probable Solutions	% farmers opined			
		Faridpur	Pabna	Jamalpur	All areas
1	Seed related				
1.1	Government price regulations	44	49	50	48
1.2	Ensuring quality seed with adequate quantity by BADC	59	61	63	61
2	Fertilizer related				
2.1	Solutions through government regulations	17	20	17	18
3	Insect-Pest infestation related				
3.1	Supply of necessary insecticide-pesticide with reasonable price	51	20	51	53
4	Labour related				
4.1	Labour availability should be increased through migration during requirement	54	63	63	60
4.2	Labour wage should be controlled during requirement	76	55	64	65
5	Credit related				
5.1	Extend credit facilities for jute production separately	36	52	36	36
6	Marketing related				
6.1	Minimum market price fixation through govt. regulations	35	41	41	39
6.2	Development of infrastructure, roads, bridges, highways	25	30	25	27
6.3	Monitoring govt. procurement system	75	64	59	66
7	Misc. solutions				
7.1	Modern and improved irrigation/drainage technology	46	48	44	46
7.2	Improved production technology	36	38	36	37
7.3	Proper and adequate training with supervision	26	27	26	26
7.4	Improve retting system technology by govt.	19	32	25	25

11.6.1 Problems faced by the farmers in Deshi jute cultivation: *Deshi* jute farmers experienced a number of problems in relation to production, marketing, and other aspects that need to be addressed in order to improve the crop production environment at the farm level (Table 11.10). The low and unreasonable price of jute at the market, which was recognized by the majority of farmers (64 percent) in all areas, and appeared as major problem (rank 1). Problems regarding the shortage of labor and the high wage rate during the time of labor requirement ranked second and third, respectively (Table 11.10).

Table 11.10: Problems face by farmers (%) to produce *Deshi* jute in different study areas

SL No	Identified problems	% farmers opined				Ranking
		Mymensingh	Shariatpur	Rangpur	All areas	
1	Seed related					
1.1	Price hike during sowing time	49	53	53	52	6
1.2	Lack of quality seed during sowing time	43	51	49	48	7
2	Fertilizer related					
2.1	Price hike during sowing time	17	4	4	8	14
2.2	Shortage of supply at market during requirement	19	20	13	17	13
3	Insect-Pest infestation related					
3.1	Occasional insect-pest infestation	53	52	60	55	5
4	Labour related					
4.1	Crisis during requirement	72	64	53	63	2
4.2	Higher wage during requirement	65	52	64	60	3
5	Credit related					
5.1	No credit facility for jute production	48	53	37	46	8
6	Storage related					
6.1	No proper storage facilities at home	49	65	53	56	4
7	Marketing related					
7.1	Low and unreasonable price	69	64	57	64	1
7.2	Intermediary syndicate at market	33	27	29	30	10
7.3	Lack of good communication system	32	51	33	39	9
8	Misc. problems					
8.2	Lack of knowledge on improved cultivation practices	24	27	31	27	11
8.3	Unavailability of retting water and places	19	27	28	24	12

11.6.2 Remedial measures for problems in *Deshi* jute cultivation: Farmers are of the view that minimum prices should be fixed, monitoring of the procurement system and infrastructural development should be done by the government so that it can resolve problems related to low or unreasonable prices of jute in the market and market related problems (Table 11.11). Farmers opined that agricultural labor availability should be extended through migration and that labor wages should be regulated in order to address labor-related matters. Farmers advocated that proper and improved storage facilities, training, and knowledge assistance be adopted to resolve storage-related problems. They also suggested that the Govt. should ensure the supply of necessary insecticide-pesticide at a low price during infestation in the crop.

Table 11.11: Remedial measures as opined by farmers (%) in relation to identified problems in *Deshi* jute cultivation in the study areas

SL No	Probable Solutions	% farmers opined			
		Mymensingh	Shariatpur	Rangpur	All areas
1	Seed related				
1.1	Government price regulations	49	53	53	52
1.2	Ensuring quality seed with adequate quantity by BADC	43	51	49	48
2	Fertilizer related				
2.1	Government regulations on price	17	4	4	8
2.2	Market availability to be controlled by the govt.	19	20	13	17
3	Insect-Pest infestation related				
3.1	Supply of necessary insecticide-pesticide with low price	53	52	60	55
4	Labour related				
4.1	Labour availability should be increased through migration during requirement	72	64	53	63
4.2	Labour wage should be controlled during requirement	65	52	64	60
5	Credit related				
5.1	Separate credit facilities to be extended for jute production.	48	53	37	46
6	Storage related				
6.1	Proper and improved storage facilities, training and knowledge assistance	49	65	53	56
7	Marketing related				
7.1	Minimum market price fixation through govt. regulations	69	64	57	63
7.2	Development of infrastructure, roads, bridges, highways	32	51	33	39
7.3	Monitoring of govt. procurementsystem	43	63	69	58
8	Misc. solutions				
8.1	Modern and improved irrigation/drainage technology	27	44	48	40
8.2	Improved production technology	28	36	44	36
8.3	Proper and adequate training &supervision	24	27	31	27
8.4	Improve retting system technology by govt.	19	27	28	25

Fig 11.1. Jute in the farmers field



Fig 11.2. Jute fibre extraction and retting



Fig 11.3. Jute retting and stacking of Jute sticks



Fig 11.4. Jute bundles and products



B. BARI Component

Cereal crops

11.2 Financial and economic profitability of wheat

11.2.1 Pattern of input use for wheat cultivation

Farmers in the study areas used various inputs for wheat cultivation. Farmers used on an average 81 man-days per hectare of total human labour for wheat cultivation where family labour was 40 man-days and hired labour was 44 man-days. On an average, they used 164 kg seed per hectare. They applied urea at the rate of 199 kg/ha, TSP 147 kg/ha, and MoP 117 kg/ha. It was observed that among the chemical fertilizers, farmers used highest amount of urea (Table 11.1). In the study areas, farmers also applied Gypsum (32 kg/ha), DAP (28 kg/ha) and Boron (3 kg/ha) for wheat cultivation.

Table 11.1: Level of input use (per hectare) in wheat cultivation in the study areas

Particulars	Districts			All
	Thakurgaon	Pabna	Faridpur	
Human labour (man-day)	87	78	79	81
Family	53	34	34	40
Hired	41	46	45	44
Seed (kg)	172	165	155	164
Cowdung (kg)	2020	1957	120	1366
Urea (kg)	209	203	186	199
TSP (kg)	175	152	114	147
MoP (kg)	149	107	96	117
DAP (kg)	7	23	55	28
Gypsum (kg)	39	35	21	32
Boron (kg)	3	2	3	3
Zink sulphate (kg)	5	7	2	5

Source: Field Survey during 2018-19

11.2.2 Cost of wheat cultivation

The cost of production included all kinds of variable costs such as hired labour, land preparation, seed/seedling, manure, fertilizers, irrigation, pesticides, etc. used for the production of wheat. Both cash expenses and imputed value of family supplied inputs were included in the variable cost. The analyses revealed that total variable cost of wheat cultivation was Tk. 46819 per hectare which was 63% of total cost of production (Table 11.2). The highest cost item was hired labour which accounted for about 18 % of the total cost. Seed cost accounted for about 9% of total cost and ranked second cost item. Family labour and rental value of land was considered as fixed cost of production. The family labour and land use cost were Tk. 12100 and Tk. 15528 per hectare which was accounted for about 16% and 21% of total cost respectively (Table 11.2). On an average, the total cost of production was Tk. 74447 per hectare where 37% was fixed costs and 63% was variable cost (Table 11.2).

Table 11.2: Per hectare cost of wheat cultivation

Figure in Tk.

Particulars	Districts				% of Total cost
	Thakurgaon	Pabna	Faridpur	All Areas	
Variable cost					
Cost of land preparation	5844	5192	5348	5461	7.34
Hired labor	12300	13800	13500	13200	17.73
Seed	7224	6930	6510	6888	9.25
Cowdung	2020	1957	120	1366	1.83
Urea	4598	4466	4092	4385	5.89
TSP	5250	4560	3420	4410	5.92
MoP	2384	1712	1536	1877	2.52
DAP	112	368	880	453	0.61
Gypsum	468	420	252	380	0.51
Boron	420	280	420	373	0.50
Zink sulphate	750	1050	300	700	0.94
Irrigation	4765	4778	4681	4741	6.37
Pesticides	1609	1908	1478	1665	2.24
Sub-total	47744	47421	42537	45901	61.66
Interest on operating capital	955	948	851	918	1.23
Total variable cost	48699	48369	43388	46819	62.89
Fixed cost					
Family labor	15900	10200	10200	12100	16.25
Land use cost	15369	17573	13642	15528	20.86
Total fixed cost	31269	27773	23842	27628	37.11
Total cost	79968	76142	67230	74447	100.00

Source: Author's own calculations from field survey data during 2018-19

11.2.3 Financial profitability of wheat

Profitability is one of the major criteria for determination of acceptance of a crop. Financial profitability (FP) is based on calculation of market prices of inputs and outputs that farmers actually pay or receive for producing a crop. Farmers allocate land and other resources in the production of different crops on the basis of relative financial profitability. The production cost, gross return, gross margin, benefit cost ratio, etc. for wheat crop cultivation at different locations are discussed below:

Per hectare average yield of wheat was 4.16 ton and per kg average price was about Tk. 22. The average gross return and gross margin of wheat cultivation were found Tk. 93760/ha and Tk. 46941/ha respectively. Per hectare average net return was Tk. 19313 which was the highest in Faridpur (Tk. 22348) followed by Pabna (Tk. 19216) and Thakurgaon (Tk. 16376). BCR on total cost basis was found 1.26 which was more or less similar among the districts. It was estimated that, to produce one kilogram of wheat, total cost incurred Tk. 17.88 (Table 11.3).

Table 11.3: Per hectare returns from wheat**Figure in Tk.**

Particulars	Districts			All
	Thakurgaon	Pabna	Faridpur	
Yield (Ton)	4.33	4.13	4.03	4.16
Price (Tk./kg)	21.5	22.25	21.6	21.78
Return from by-product	3356	3577	2573	3169
Gross return	96344	95358	89578	93760
Total variable cost (TVC)	48699	48369	43388	46819
Total fixed cost (TFC)	31269	27773	23842	27628
Total cost (TC)	79968	76142	67230	74447
Gross margin	47645	46989	46190	46941
Net return	16376	19216	22348	19313
BCR over total cost	1.20	1.25	1.33	1.26
Cost of production (Tk./kg)	18.49	18.46	16.69	17.88

Source: Author's own calculations from field survey data during 2018-19



Fig 11.1 Wheat in the farmers field

11.2.4 Economic profitability of wheat

In most developing countries, including Bangladesh, social or economic profitability of most production ventures deviates from private profitability because of distortions in input and output markets, import and export duties, externalities and government policy interventions that tend to distort relative prices. Bangladesh, as a member of WTO, is committed to the rules and regulations that the Uruguay Round (UR) applied to agriculture. The commitments cover a wide range of topics including those in the area of domestic support, market access and export subsidies in agriculture. The potential benefits of the UR Agreements for Bangladesh would emerge from the trading regime in its present form and the potential trading opportunities for both import substitution and export promotion in Bangladesh. However, eventually, whether or not a country can take advantage of the new trading opportunities would depend upon its comparative advantage, without subsidies or with limited subsidies that are permitted for all trading partners by the rules governing the new trading environment. Therefore, an assessment of comparative advantage of crop production either for import substitution or export can be helpful in this respect.

The Domestic Resource Cost (DRC) values for wheat (for all three regions) under import parity price were less than one (see Table 11.4) indicating that Bangladesh had comparative advantage in terms of efficiency of domestic production for import substitution. This is plausibly attributed to the high prices in the international markets resulting from different climatic shock in leading wheat producing countries in the

world. However, the results of the comparative advantage of wheat are similar to the results obtained by Shahabuddin and Dorosh (2002) and Rashid et al. (2009).

Table.11.4: Domestic resource cost (DRC) of wheat (import parity)

Particulars	Districts			All
	Thakurgaon	Pabna	Faridpur	
A. Traded input (Tk/MT)	4206	3838	3334	3792
Urea	1550	1579	1482	1537
TSP	1644	1497	1150	1430
MoP	1012	762	701	825
B. Non-Traded inputs and domestic resources (Tk/MT)	15239	15323	13978	14847
Human labour	6513	5811	5881	6068
Land preparation	1350	1257	1327	1311
Seed	1668	1678	1615	1654
Manure	467	474	30	323
Pesticide	372	462	367	400
Irrigation	1100	1157	1162	1140
Int. on oprating capital	221	230	211	220
Land use cost	3549	4255	3385	3730
C. Output price (Tk/MT)	25360	25360	25360	25360
D. Value added (Tradable) (Tk/MT) (C-A)	21154	21522	22026	21568
E. DRC (B/D) - Import parity	0.72	0.71	0.63	0.69

Source: Author's own calculations

11.2.5 Problems faced by the farmers in wheat cultivation

Although the farmers in the study areas are cultivating wheat, but there are several problems to its higher production. The first and the foremost constraint for wheat cultivation in all areas was low market price at harvesting time (57%). Farmers mentioned as second highest difficulties that due to severe infestation of insect (36%) and diseases (30%) wheat yield was drastically reduced and it leads to substantial amount of loss. So they faced uncertainty about this crop. They also stated lack of storage materials and insect infestation in storage time (20%), unavailable bank loan (15%) and crisis of labour at harvesting time (13%), seed germination and fertilizer not working properly (13%) might be due to adulterations as the problems of wheat cultivation (Table 11.5).

Table 11.5: Problems faced by the farmers in wheat cultivation

Particulars	% farmers responded			
	Thakurgaon	Pabna	Faridpur	All
Seed related problems				
High price	8	7	6	7
Adulterated seed	15	11	12	13
Fertilizer related problems				
High price	12	14	10	12
Adulterated fertilizer	13	14	12	13

Particulars	% farmers responded			
	Thakurgaon	Pabna	Faridpur	All
Insect/disease related problems				
Insect infestation (leaf hopper, aphid)	37	33	38	36
Leaf rust, strip rust	35	22	32	30
Labour related problems				
Labour crisis	15	11	12	13
Loan related problems				
Unavailability of bank loan	14	18	14	15
Store related problems				
Lack of storage materials	22	16	21	20
Insect infestation in storage time	22	21	18	20
Marketing related problems				
Low market price at harvesting time	55	56	60	57

11.2.6 Remedial measure for wheat cultivation

- Government should take initiatives regarding reasonable price and adulterated seed and fertilizer.
- DAE personnel should frequently visit farmers' field and give appropriate suggestions to them with the help of research organizations for reducing the effect of insect infestation and disease infection.
- Mechanization should be disseminated among the farmers.
- Government should control import to make reasonable price of wheat at harvesting time.

11.3 Financial and economic profitability of maize

11.3.1 Pattern of input use for maize cultivation

In the selected districts, farmers employed different level of inputs for maize cultivation. An attempt was made to estimate the level of inputs used and benefits obtained by the farmers of selected districts. On an average, farmers applied Urea at the rate of 343 kg/ha, TSP 198 kg/ha, and MoP 166 kg/ha. It was observed that among the chemical fertilizers, farmers used highest amount of urea for the studied districts (Table 11.6). Farmers used on an average 124 man-days per hectare of total human labour for maize cultivation, which was 136 man-days for Chuadunga district, 128 man-days for Manikgonj and 108 man-days for Dinajpur district. In the study areas, farmers also applied DAP (195 kg/ha) and Gypsum (63 kg/ha) for maize cultivation.

Table 11.6: Level of input use per hectare of maize cultivation

Particulars	Districts			
	Manikganj	Chuadunga	Dinajpur	All
Human labour (man-days)	128	136	108	124
Family	83	79	67	76
Hired	45	57	41	48
Seed (kg)	17	22	31	23
Cowdung (kg)	2222	7157	5515	4965
Urea (kg)	377	367	284	343
TSP (kg)	109	230	256	198

Particulars	Districts			
	Manikganj	Chuadunga	Dinajpur	All
MoP (kg)	117	149	234	167
Gypsum (kg)	38	63	89	63
DAP (kg)	220	184	182	195

Source: Field Survey during 2018-19

11.3.2 Cost of maize cultivation

The study revealed that total variable cost for maize cultivation was Tk. 71005 per hectare which was 64% of total cost of production (Table 11.7). The highest cost item was seed which accounted for about 10% of the total cost. Hired labour and irrigation cost accounted for about 9% of total cost and ranked second cost item. The family labour and land use cost were Tk. 15204 and Tk. 23910 per hectare which was accounted for about 14% and 22% of total cost respectively (Table 11.7). Total cost of production included variable costs and fixed costs incurred for maize cultivation. On an average, the total cost of production was Tk.110119 per hectare where 36% was fixed costs and 64% was variable cost (Table 11.7).

Table 11.7: Per hectare cost of maize cultivation

Figure in Tk.

Particulars	Districts				% of Total cost
	Manikganj	Dinajpur	Chuadanga	All Areas	
Variable cost					
Cost of land preparation	10140	8319	6030	8163	7
Hired labor	9014	9071	10302	9603	9
Seed	8208	13740	10728	10892	10
Cowdung	2222	5515	3578	3772	3
Urea	6026	4549	5872	5482	5
TSP	2613	6277	5760	4883	4
MoP	1760	3648	2388	2598	2
Gypsum	963	1683	1586	1410	1
DAP	6167	4843	5511	5507	5
Zink sulphate	-	2059	-	686	1
Boric Acid	-	1336	-	445	0.4
Mg	-	1292	3091	1461	1
Zn	-	1115	8810	3308	3
Irrigation	8394	7465	12287	9382	9
Pesticides	1884	4659	1585	2709	2
Sub-total	57389	75569	77527	70302	-
Interest on operating capital	574	756	775	703	1
Total variable cost	57963	76324	78302	71005	64
Fixed cost					
Family labor	16626	12572	16836	15204	14
Land use cost	24949	21831	24949	23910	22
Total fixed cost	41575	34403	41785	39114	36
Total cost	99538	110727	120088	110119	100

Source: Author's own calculations from field survey data during 2018-19

11.3.3 Financial profitability of maize

Per hectare average yield of maize was 10.95 ton and per kg average price was about Tk. 19. The average gross return and gross margin of maize cultivation were found Tk. 205229/ha and Tk. 134224/ha respectively. Per hectare average net return was Tk. 95110 which was found to be highest in Chuadanga (Tk. 110420) followed by Dinajpur (Tk. 102340) and Manikganj (Tk. 72574). BCR on total cost basis was found 1.86 which was more or less similar among the districts. It was estimated that, to produce one kilogram of maize, total cost stood at Tk.10.05 (Table 11.8).

Table 11.8: Per hectare returns from maize

Figure in Tk.

Particulars	Districts			
	Manikganj	Chuadunga	Dinajpur	All
Yield (Ton)	9.22	11.69	11.95	10.95
Price (Tk./kg)	19	19	18	19
Return from by-product	1525	1878	2145	1849
Gross return	172112	221147	222428	205229
Total variable cost (TVC)	57963	76324	78302	71005
Total fixed cost (TFC)	41575	34403	41785	39114
Total cost (TC)	99538	110727	120088	110119
Gross margin	114149	144823	144126	134224
Net return	72574	110420	102340	95110
BCR over total cost	1.73	2.00	1.85	1.86
Cost of production (Tk./kg)	10.79	9.47	10.05	10.05

Source: Author's own calculations from field survey data during 2018-19



Fig 11.2 Maize in the farmers field

11.3.4 Economic profitability of maize

The DRC value for maize found to be less than one (0.50) indicating that Bangladesh had comparative advantage in producing maize for import substitution (Table 11.9). This is plausibly attributed to the higher yield of hybrid maize resulting to the lower cost of production of per unit of land. Moreover, higher demand for maize in the poultry and fisheries industries led to encouraging production of maize. The result is similar to the result found by Rashid et al. (2009).

Table 11.9: Domestic resource cost (DRC) of maize (Import parity)

Particulars	Districts			All
	Manikganj	Chuadunga	Dinajpur	
A. Traded input (Tk/MT)	2167	2183	2211	2187
Urea	1313	1008	763	1028
TSP	481	800	871	717
MoP	373	375	576	441
B. Non-Traded inputs and domestic resources (Tk/MT)	8895	7179	7286	7787
Human labour	2781	1851	2271	2301
Land preparation	1100	712	505	772
Seed	890	1175	898	988
Manure	241	472	299	337
Pesticide	204	399	133	245
Irrigation	910	639	1028	859
Int. on oprating capital	62	65	65	64
Land use cost	2706	1867	2088	2220
C. Output price (Tk/MT)	17915	17915	17915	17915
D. Value added (Tradable) (Tk/MT)(C-A)	15748	15732	15704	15728
E. DRC (B/D)-Import parity	0.56	0.46	0.46	0.50

Source: Author's own calculations

11.3.5 Problems faced by the farmers in maize cultivation

Although the farmers in the study areas are cultivating maize, there are several problems to its higher production. The first and the foremost problems for maize production in all areas was low market price at harvesting time (59%). The second highest constraint was that due to severe infestation of insect (36%) and diseases (32%), maize yield were drastically reduced leading to heavy loss to the growers. So they faced uncertainty about this crop. They also mentioned insect infestation in storage time (20%), crisis of labour at harvesting time (13%) and unavailability of bank loan (10%). The other difficulties were low seed germination and adulteration in fertilizer (13%) (Table 11.10).

Table 11.10: Problems faced by the farmers in maize cultivation

Particulars	% of farmers opined			
	Manikganj	Chuadunga	Dinajpur	All
Seed related problems				
High price	11	17	16	15
Lack of quality seed	15	11	12	13
Fertilizer related problems				
High price	10	12	10	11
Adulterated fertilizer	13	14	12	13
Insect/disease realted problems				
Insect infestation (Earworm, cutworm, aphid)	35	38	36	36
Leaf blight	35	28	32	32
Labour related problems				

Particulars	% of farmers opined			
	Manikganj	Chuadunga	Dinajpur	All
Labour crisis in harvesting time	15	11	12	13
Loan related problems				
Unavailability of bank loan	11	9	10	10
Store related problems				
Insect infestation in storage time (weevil)	22	21	18	20
Marketing related problems				
Low market price at harvesting time	61	56	60	59

11.3.6 Remedial measure for maize cultivation

- Availability of quality seeds with reasonable price should be ensured to increase maize production in Bangladesh.
- DAE personnel (with the relevant scientists) should frequently visit to the farmers' field.

Pulse crops

11.4 Financial and economic profitability of lentil

11.4.1 Pattern of input use for lentil cultivation

Farmers used on an average 65 man-days per hectare of total human labour for lentil cultivation where family labour was 31 man-days and hired labour was 34 man-days. On an average, farmers used 51 kg seed per hectare of land. They applied Urea at the rate of 72 kg/ha, TSP 112 kg/ha, and MoP 68 kg/ha. It was observed that among the chemical fertilizers, farmers used highest amount of TSP for lentil production (Table 11.11). In the study areas, farmers also applied gypsum (32 kg/ha) for lentil cultivation.

Table 11.11: Level of input use per hectare of lentil cultivation

Particulars	Districts			All
	Natore	Jashore	Faridpur	
Human labour (man-days)	64	66	66	65
Family	38	28	27	31
Hired	26	38	39	34
Seed (kg)	54	53	46	51
Cowdung (kg)	3768	3491	2212	3157
Urea (kg)	67	65	84	72
TSP (kg)	97	121	118	112
MoP (kg)	53	75	76	68
Gypsum (kg)	46	22	27	32

Source: Field Survey during 2018-19

11.4.2 Cost of lentil cultivation

The study revealed that total variable cost of lentil cultivation was Tk. 30072 per hectare which was 57% of total cost of production (Table 11.12). The highest cost item was hired labour which accounted for about 15 % of the total cost. Cost of land preparation and seed cost accounted for about 10% and 6% of total cost and ranked second and third cost item respectively. The family labour and land use costs were Tk. 7552 and Tk. 15120 per hectare which accounted for about 14% and 29% of total cost respectively (Table 11.12). On an average, the total cost of production was Tk. 52744 per hectare of which 43% was fixed costs and 57% was variable cost (Table 11.12).

Table 11.12: Per hectare cost of lentil cultivation

Particulars	District				% of Total cost
	Natore	Jashore	Faridpur	All	
Variable cost					
Cost of land preparation	4072	5508	5550	5043	9.56
Hired labor	7263	7573	9331	8056	15.27
Seed	3229	4271	2744	3415	6.47
Cowdung	3768	3491	2212	3157	5.99
Urea	1068	1040	1338	1149	2.18
TSP	2708	3026	2585	2773	5.26
MoP	864	1275	1146	1095	2.08
Gypsum	1272	439	536	749	1.42
Cost of irrigation	1665	1502	1896	1688	3.20
Cost of insecticide pesticide	2382	2817	1877	2359	4.47
Sub-total	28291	30942	29215	29483	55.90
Interest on operating capital	566	619	584	590	1.12
Total variable cost	28857	31561	29799	30072	57.02
Fixed cost					
Family labor	10616	5580	6460	7552	14.32
Land use cost	15915	14970	14475	15120	28.67
Total fixed cost	26531	20550	20935	22672	42.98
Total cost	55388	52111	50734	52744	100.00

Source: Author's own calculations from field survey data during 2018-19

11.4.3 Financial profitability of lentil

Per hectare average yield of lentil was 1.42 ton and per kg average price was about Tk. 61. The average gross return and gross margin of lentil cultivation were found Tk. 86153/ha and Tk. 56081/ha respectively. Per hectare average net return was Tk. 33409 which was found to be slightly higher in Faridpur (Tk. 34466) followed by Natore (Tk. 33272) and Jashore (Tk. 32489). BCR on total cost basis was found 1.63. Kazal et al., 2013 also stated lentil cultivation is profitable. It was estimated that, to produce one kilogram of lentil, farmers had to incur Tk. 37.14 (Table 11.13).

Table 11.13: Per hectare returns from lentil cultivation

Figure in Tk.

Particulars	Districts			All
	Natore	Jashore	Faridpur	
Yield (Ton)	1.43	1.41	1.42	1.42
Price (Tk./kg)	62	60	60	61
Gross return	88660	84600	85200	86153
Total variable cost (TVC)	28857	31561	29799	30072
Total fixed cost (TFC)	26531	20550	20935	22672
Total cost (TC)	55388	52111	50734	52744

Figure in Tk.

Particulars	Districts			All
	Natore	Jashore	Faridpur	
Gross margin	59803	53039	55401	56081
Net return	33272	32489	34466	33409
BCR over total cost	1.60	1.62	1.68	1.63
Cost of production (Tk./kg)	38.73	36.96	35.73	37.14

Source: Author's own calculations from field survey data during 2018-19

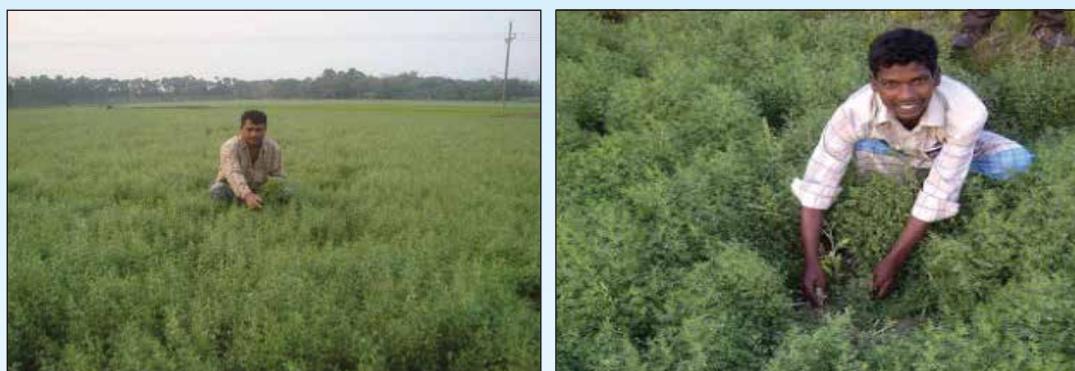


Fig 11.3 Lentil in the farmers field

11.4.4 Economic profitability of lentil cultivation

Comparative advantage in the production of a given crop for a particular country is measured by comparing its border price with the social or economic opportunity costs of producing, processing, transporting, handling and marketing an incremental unit of commodity. The results of DRC are presented in Table 11.14. DRC indicates whether the domestic economy has comparative advantage in lentil production relative to other countries. The estimate of DRC for lentil was observed to be less than unity in all three districts implying that Bangladesh had comparative advantage in lentil production for import substitution.

Table 11.14: Domestic resource cost (DRC) of lentil (import parity)

Particulars	Districts			All
	Natore	Jashore	Faridpur	
A. Traded input (Tk/MT)	5354	6535	6854	6248
Urea	1505	1481	1900	1629
TSP	2759	3490	3380	3209
MoP	1090	1564	1574	1409
B. Non-Traded inputs and domestic resources (Tk/MT)	34598	32859	31781	33079
Human labour	12503	9328	11120	10984
Land preparation	2848	3906	3908	3554
Seed	2258	3029	1932	2407
Manure	2635	2476	1558	2223
Pesticide	1666	1998	1322	1662
Irrigation	1164	1065	1335	1188
Int. on operating capital	396	439	411	415
Land use cost	11129	10617	10194	10647
C. Output price (Tk/MT)	59358	59358	59358	59358
D. Value added (Tradable) (Tk/MT) (C-A)	54004	52823	52504	53110
E. DRC (B/D)- Import parity	0.64	0.62	0.61	0.62

11.4.5 Problems faced by the farmers in lentil cultivation

Although the farmers in the study areas are cultivating lentil, but there are several problems to its higher production. The main problem for lentil in all areas was low market price at harvesting time (67%). Another problem was high seed price (33%) and low seed germination (22%) might be due to adulterations. They also mentioned that due to severe infestation of insect (30%) and diseases (26%), lentil yield was drastically reduced and it leads to heavy loss to the growers. So they faced uncertainty about this crop. They also mentioned lack of right vessel to store lentil (27%), insect infestation in storage time (21%), high wage rate (34%) and crisis of labour at harvesting time (12%) (Table 11.15).

Table 11.15: Problems faced by the farmers in lentil cultivation

Particulars	% farmers opined			
	Natore	Jashore	Faridpur	All
Seed related problems				
High price	32	28	38	33
Adulterated seed	24	24	18	22
Fertilizer related problems				
High price	16	15	17	16
Adulterated fertilizer	13	11	14	13
Insect/disease related problems				
Fusarium wilt (Leaves turn yellow in color)	26	37	26	30
Yellow spot on upper surface of leaves	25	25	27	26
Labour related problems				
High wage rate	37	32	33	34
Labour crisis	15	11	10	12
Loan related problems				
Unavailable in bank loan	14	12	13	13
Store related problems				
Lack of right vessel to keep	32	22	28	27
Insect infestation in storage time	22	21	20	21
Marketing related problems				
Low price at harvesting time	68	70	64	67

11.4.6 Remedial measures to overcome those problems in lentil cultivation

- Government should take initiatives regarding reasonable price and minimizing adulteration in seed and fertilizer.
- DAE personnel (with the help of relevant scientists) should frequently visit to the lentil farmers' field.
- Mechanization technology should be introduced to the lentil cultivation due to labour crisis.
- Government should take initiatives to ensure reasonable price of lentil at harvesting time.

11.5 Financial and economic profitability of mungbean

11.5.1 Pattern of input use for mungbean cultivation

Farmers in the study areas used various inputs for mungbean cultivation. Farmers used on an average 63 man-days per hectare of total human labour for mungbean cultivation where family labour was 36 man-days and hired labour was 27 man-days. On an average, they sowed 22 kg seed per hectare of land. They applied Urea at the rate of 38 kg/ha, TSP 31 kg/ha, and MoP 24 kg/ha. It was observed that among the chemical fertilizer, farmers used highest amount of Urea for mungbean cultivation (Table 11.16). In the study areas, farmers also applied DAP (12 kg/ha) for mungbean cultivation.

Table 11.16: Level of input use per hectare of mungbean cultivation

Particulars	Districts			All
	Natore	Potuakhali	Bhola	
Human labour (man-days)	56	70	64	63
Family	34	38	37	36
Hired	22	32	27	27
Seed (kg)	23	20	24	22
Urea (kg)	30	33	52	38
TSP (kg)	29	24	40	31
MoP (kg)	16	22	34	24
DAP (kg)	10	14	11	12

Source: Field Survey during 2018-19

11.5.2 Cost of mungbean cultivation

The study revealed that total variable cost of mungbean cultivation was Tk. 22168 per hectare which was 47% of total cost of production (Table 11.17). The highest cost item was hired labour which accounted for about 17 % of the total cost. Cost of land preparation and insecticide cost accounted for about 12% and 8% of total cost and ranked second and third cost item respectively. The family labour and land use cost were Tk. 10900 and Tk. 13722 per hectare which was accounted for about 23% and 29% of total cost respectively (Table 11.17). On an average, the total cost of production was Tk. 46791 per hectare where 53% was fixed costs and 47% was variable cost (Table 11.17).

Table 11.17: Per hectare cost of mungbean cultivation

Figure in Tk.

Particulars	Districts				% of Total cost
	Natore	Potuakhali	Bhola	All	
Variable cost					
Cost of land preparation	4715	5321	6736	5591	11.95
Hired labor	6600	9600	8100	8100	17.31
Seed	2070	1800	2160	2010	4.30
Urea	660	726	1144	843	1.80
TSP	754	624	1040	806	1.72
MoP	256	352	544	384	0.82
DAP	160	224	176	187	0.40
Cost of irrigation	460	244	155	286	0.61
Cost of insect./pesticide	3042	3457	4081	3527	7.54

Figure in Tk.

Particulars	Districts				% of Total cost
	Natore	Potuakhali	Bhola	All	
Variable cost					
Sub-total	18717	22348	24136	21734	46.45
Interest on opera. capital	374	447	483	435	0.93
Total variable cost	19091	22795	24619	22168	47.38
Fixed cost					
Family labor	10200	11400	11100	10900	23.30
Land use cost	14970	13722	12475	13722	29.32
Total fixed cost	25170	25122	23575	24622	52.62
Total cost	44261	47917	48194	46791	100.00

Source: Author's own calculations from field survey data during 2018-19

11.5.3 Financial profitability of mungbean

Per hectare average yield of mungbean was 1.28 ton and per kg average price was about Tk. 57. The average gross return and gross margin of mungbean cultivation were found Tk. 72934/ha and Tk. 50766/ha respectively. Per hectare average net return was Tk. 26144 which was found to be slightly higher in Patuakhali (Tk. 28295) followed by Natore (Tk. 25424) and Bhola (Tk. 24712). The estimated average BCR on total cost basis was found 1.56. The findings support the results obtained by Islam et al. 2008. It was estimated that, to produce one kilogram of mungbean, total cost incurred Tk. 36.58 (Table 11.18).

Table 11.18: Per hectare returns from mungbean

Figure in Tk.

Particulars	Districts			All
	Natore	Potuakhali	Bhola	
Yield (Ton)	1.27	1.31	1.26	1.28
Price (Tk./kg)	55	58	58	57
Gross return	69685	76212	72906	72934
Total variable cost (TVC)	19091	22795	24619	22168
Total fixed cost (TFC)	25170	25122	23575	24622
Total cost (TC)	44261	47917	48194	46791
Gross margin	50594	53417	48287	50766
Net return	25424	28295	24712	26144
BCR over total cost	1.57	1.59	1.51	1.56
Cost of production (Tk./kg)	34.93	36.47	38.34	36.58

Source: Author's own calculations from field survey data during 2018-19



Fig 11.4 Mungbean in the farmers field

11.5.4 Economic profitability of mungbean cultivation

Comparative advantage in the production of a given crop for a particular country is measured by comparing its border price with the social or economic opportunity costs of producing, processing, transporting, handling and marketing an incremental unit of commodity. The results of DRC are presented in Table 11.19. DRC indicates whether the domestic economy has a comparative advantage in mungbean production relative to other countries. The estimated DRC for mungbean crop was observed to be less than unity implying that Bangladesh had comparative advantage in mungbean production for import substitution.

Table 11.19: Domestic resource cost (DRC) of mungbean (import parity)

Particulars	Districts			All areas
	Natore	Jashore	Faridpur	
A. Traded input (Tk/MT)	2058	2048	3410	2505
Urea	759	809	1326	964
TSP	929	745	1291	988
MoP	371	494	794	553
B. Non-Traded inputs and domestic resources (Tk/MT)	33410	35108	35944	34821
Human labour	13228	16031	15238	14832
Land preparation	3713	4062	5346	4373
Seed	1630	1374	1714	1573
Pesticide	2395	2639	3239	2758
Irrigation	362	186	123	224
Int. on operating capital	294	341	383	340
Land use cost	11787	10475	9901	10721
C. Output price (Tk/MT)	58233	58233	58233	58233
D. Value added (Tradable) (Tk/MT) (C-A)	56175	56185	54823	55728
E. DRC (B/D)-Import parity	0.59	0.62	0.66	0.63

Source: Author's own calculations

11.5.5 Problems faced by the farmers in mungbean cultivation

Although mungbean is a profitable crop in the study areas, there are several problems to its higher production. The first and the foremost constraint for mungbean cultivation in all areas was low market price at harvesting time (58%). They mentioned that, due to severe infestation of diseases and insect (44% and 36% respectively) mungbean yield was drastically reduced and it leads to heavy loss to the growers. So they faced uncertainty about this crop. The other problems were high price of seed (26%), low germination of seed (20%) might be due to adulterations of seed and high price of fertilizer (18%) and adulteration of fertilizer (15%). Lack of right vessel to keep (22%) and insect infestation in storage time (21%) and also unavailability of bank loan (15%) and labour crisis at harvesting time (13%) were also opined as the problems to mungbean cultivation in the study areas (Table 11.20).

Table 11.20: Problems of mungbean cultivation

Particulars	% Farmers opined			
	Natore	Patukhali	Bhola	All
Seed related problems				
High price	23	28	28	26
Adulterated seed	15	24	22	20

Particulars	% Farmers opined			
	Natore	Patukhali	Bhola	All
Fertilizer related problems				
High price	20	18	17	18
Adulterated fertilizer	13	14	17	15
Insect/disease related problems				
Insect infestation	37	33	38	36
Yellow mosaic virus	35	58	39	44
Labour related problems				
Labour crisis	15	11	12	13
Loan related problems				
Unavailable in bank loan	14	18	14	15
Store related problems				
Lack of right vessel to keep	22	24	21	22
Insect infestation in storage time	22	21	20	21
Marketing related problems				
Low market price at harvesting time	60	56	59	58

11.5.6 Remedial measures in overcoming the problems in mungbean cultivation

- Government should take initiatives regarding reasonable price and adulterated seed and fertilizer.
- DAE personnel (with the help of relevant scientist) should frequently visit to the farmer's field.
- Mechanization technology should be introduced to the mungbean growing areas.
- Government should take initiatives regarding reasonable price of mungbean at harvesting time.

Spice crops

11.6 Financial and economic profitability of onion

11.6.1 Pattern of input use for onion cultivation

Farmers in the study areas used various inputs for onion cultivation. They used on an average 290 man-days per hectare of total human labour for onion cultivation where family labour was 125 man-days and hired labour was 165 man-days. On an average, they sowed 8 kg seed per hectare of land. They applied on an average one-ton cowdung in each hectare of onion field. They applied Urea at the rate of 321 kg/ha, TSP 260 kg/ha, and MoP 217 kg/ha. (Table 11.21). In the study areas, farmers also applied Gypsum (81 kg/ha), DAP (95 kg/ha), and zinc (12 kg/ha) for onion cultivation.

Table 11.21: Level of input use per hectare of onion cultivation

Particulars	Districts			All
	Pabna	Rajshahi	Faridpur	
Human labour (man-days)	289	295	286	290
Family	124	127	123	125
Hired	165	168	163	165
Seed (kg)	7	8	8	8
Cowdung (kg)	163	2749	229	1047

Particulars	Districts			All
	Pabna	Rajshahi	Faridpur	
Urea (kg)	278	385	300	321
TSP (kg)	288	272	221	260
MoP (kg)	159	278	213	217
Gypsum (kg)	67	115	62	81
DAP (kg)	112	90	83	95
Zn(kg)	10	19	7	12

Source: Field Survey during 2018-19

11.6.2 Cost of onion cultivation

The analysis revealed that total variable cost of onion cultivation was Tk. 120080 per hectare which was 69% of total cost of production (Table 11.22). The highest cost item was hired labour which accounted for about 27 % of the total cost. Cost of seed and irrigation accounted for about 8% and 6% respectively of total cost. The family labour and land use cost were Tk. 35358 and Tk. 18712 per hectare which accounted for about 20% and 11 % of total cost respectively (Table 11.22). On an average, the total cost of production was Tk. 174151 per hectare where 31% was fixed costs and 69 % was variable cost (Table 11.22).

Table 11.22: Per hectare cost of onion cultivation

Figures in Tk.

Particulars	Districts				% of Total cost
	Pabna	Rajshahi	Faridpur	All	
Variable cost					
Cost of land prep.	14403	13368	12928	13566	7.79
Hired labor	49476	50400	40806	46894	26.93
Seed	14409	12470	12470	13116	7.53
Cowdung	131	2199	229	853	0.49
Urea	4452	6159	4799	5137	2.95
TSP	8055	7616	6182	7284	4.18
MoP	2380	4176	3198	3251	1.87
Gypsum	2012	3443	1869	2441	1.40
DAP	3136	1440	2332	2303	1.32
Zn	768	1482	1318	1189	0.68
Cost of irrigation	9533	11470	10461	10488	6.02
Cost of insecticide	6528	9808	7723	8020	4.61
Cost of weedicide	1730	1890	1084	1568	0.90
Growth hormone	1192	2766	886	1615	0.93
Sub-total	118205	128687	106285	117726	67.60
Interest on operating capital	2364	2574	2125.7	2355	1.35
Total variable cost	120569	131261	108411	120080	68.95
Fixed cost					0.00
Family labour	37182	38100	30792	35358	20.30
Land use cost	19960	19960	16217	18712	10.74
Total fixed cost	57142	58060	47009	54070	31.05
Total cost	177711	189321	155420	174151	100.00

Source: Author's own calculations from field survey data during 2018-19

11.6.3 Financial profitability of onion

Per hectare average yield of onion was 14.98 ton and per kg average price was about Tk. 20. The average gross return and gross margin of onion cultivation were found Tk. 304330/ha and Tk.188389/ha respectively. Per hectare average net return was Tk. 130179 which was found to be highest in Rajshahi (Tk. 173079) followed by Pabna (Tk. 120279) and Faridpur (Tk. 97180). BCR on total cost basis was found 1.74 which was also highest in Rajshahi (1.91). It was estimated that, to produce one kilogram of onion, total cost incurred Tk.11.76 (Table 11.23).

Table 11.23: Per hectare return from onion

Figure in Tk.

Particulars	Districts			All
	Pabna	Rajshahi	Faridpur	
Yield (Ton)	14.19	18.12	12.63	14.98
Price (Tk./kg)	21	20	20	20
Gross return	297990	362400	252600	304330
Total variable cost (TVC)	120323	131261	96238	115941
Total fixed cost (TFC)	57142	92234	47009	65462
Total cost (TC)	177711	189321	155420	174151
Gross margin	177667	231139	156362	188389
Net return	120279	173079	97180	130179
BCR over total cost	1.68	1.91	1.63	1.74
Cost of production (Tk./kg)	12.52	10.45	12.31	11.76

Source: Author's own calculations from field survey data during 2018-19



Fig 11.5 Onion in the farmers field

11.6.4 Economic profitability of onion cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in onion crop relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of onion (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for onion crop for the year 2018-19 are presented in Table 11.24. The DRCs for onion crop was observed to be less than unity (0.39) implying that Bangladesh had comparative advantage in onion production for import substitution.

Table 11.24: Domestic resource cost (DRC) of onion (Import parity)

Particulars	Districts			All
	Rajshahi	Faridpur	Pabna	
A. Traded input (Tk/MT)	1784	1744	1971	1833
Urea	629	682	763	692
TSP	825	610	712	716
MoP	330	451	496	426
B. Non-Traded inputs and domestic resources (Tk/MT)	10852	8849	10590	10097
Human labour	6107	4884	5669	5553
Land preparation	1015	738	1024	925
Seed	1015	688	987	897
Manure	9	121	18	50
Pesticide	460	541	611	538
Irrigation	672	633	828	711
Int. on oprating capital	167	142	168	159
Land use cost	1407	1102	1284	1264
C. Output price (Tk/MT)	27519	27519	27519	27519
D. Value added (Tradable) (Tk/MT) (C-A)	25734	25775	25548	25686
E. DRC (B/D)-Import parity	0.42	0.34	0.41	0.39

Source: Author's own calculations

11.6.5 Problems faced by the farmers in onion cultivation

Although the farmers in the study areas are cultivating onion, there are several problems to its higher production. The most acute problem for onion cultivation in all areas was low market price at harvesting time (75%). The other problems were lack of quality seed (25%) and low rate of seed germination (24%) might be due to adulterations, crisis of labour at harvesting time (27%) and high wage rate (13%). They also mentioned that due to severe infestation of insect (15%) and diseases (15%), onion yield drastically reduced and it leads to heavy loss to the growers. They also opined the problems like, lack of storage related facility and high price of fertilizer (Table 11.25).

Table 11.25: Problems faced by the farmers in onion cultivation

Particulars	% Farmer opined			
	Pabna	Rajshahi	Faridpur	All
Seed related problem				
Lack of good quality seed	33	6	36	25
High price of seed	10	4	19	11
Adulterated seed	26	23	24	24
Fertilizer related problems				
High price of fertilizer	24	46	22	31
Adulterated fertilizer	21	19	24	21
Insect and disease related				
Infested with white fly	13	11	14	13
Leaf rust disease	15	11	12	13
Dandruff or early digestive disease	12	16	17	15

Particulars	% Farmer opined			
	Pabna	Rajshahi	Faridpur	All
Attack by Fusarium fungus and leaves fall off	13	12	16	14
labour related problems				
Crisis of labour	51	18	13	27
High wage of labour	13	14	12	13
Loan/Credit related problem				
Trouble in getting govt. loan	13	16	18	16
Store related problems				
Lack of technical knowledge of storing	14	10	12	12
Rotten when storing for several days	13	12	16	14
Marketing related problem				
Lower market price	74	76	74	75

11.6.6 Remedial measures for onion cultivation

- Government should take initiatives regarding reasonable price of onion at harvesting time
- Government should ensure the supply of good quality seed and fertilizer in time.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.
- Mechanization technology should be introduced to the onion cultivation to minimize labour crisis.

11.7 Financial and economic profitability of garlic

11.7.1 Pattern of input use for garlic cultivation

Farmers in the study areas used various inputs for garlic cultivation. Farmers used on an average 268 man-days per hectare of total human labour for garlic cultivation where family labour was 138 man-days and hired labour was 130 man-days. On an average, they sowed 681 kg seed per hectare of land. They applied on an average 5.6 ton cowdung in the garlic field. They applied Urea at the rate of 246 kg/ha, TSP 232 kg/ha, and MoP 186 kg/ha (Table 11.26). In the study areas, farmers also applied gypsum (77 kg/ha), DAP (129 kg/ha) and Zinc (17 kg/ha) for garlic cultivation.

Table 11.26: Level of input use per hectare of garlic cultivation

Particulars	Districts			All
	Pabna	Natore	Rajbari	
Human labour (man-days)	273	295	236	268
Family	156	139	120	138
Hired	118	156	115	130
Seed (kg)	695	675	672	681
Cowdung (kg)	2186	6151	8708	5682
Urea (kg)	224	283	231	246
TSP (kg)	226	229	242	232
MoP (kg)	194	197	166	186
Gypsum (kg)	104	57	71	77
DAP (kg)	64	92	230	129
Zinc (kg)	20	11	21	17

Source: Field Survey during 2018-19

11.7.2 Cost of garlic cultivation

The study revealed that total variable cost of garlic cultivation was Tk. 148232 per hectare which was 67% of total cost of production (Table 11.27). The highest cost item was seed which shared about 23 % of the total cost. Hired labour cost accounted for about 21% of total cost and ranked second cost item. The family labour and land use cost were Tk. 49013 and Tk. 23392 per hectare which was accounted for about 22 % and 11 % of total cost respectively (Table 11.27). On an average, the total cost of production was Tk. 220637 per hectare where 33% was fixed costs and 67% was variable cost (Table 11.27).

Table 11.27: Per hectare cost of garlic cultivation

Figure in Tk.

Particulars	Districts				% of Total cost
	Pabna	Natore	Rajbari	All areas	
Variable Cost					
Cost of land preparation	5613	3455	7774	5614	2.54
Hired labor	47280	54540	34440	45420	20.59
Seed	52125	50625	50400	51050	23.14
Cowdung	2186	6151	8708	5682	2.58
Urea	3841	4982	3897	4240	1.92
TSP	6363	6412	7247	6674	3.02
MoP	3331	3258	2634	3074	1.39
Gypsum	1252	684	1849	1262	0.57
DAP	2192	3171	7258	4207	1.91
Zinc	3175	1423	3037	2545	1.15
Cost of irrigation	10225	12570	11472	11422	5.18
Cost of insecticides	3865	4644	3897	4135	1.87
Sub-total	141448	151915	142613	145325	65.87
Interest on oper. capital	2829	3038	2852	2907	1.32
Total variable cost	144277	154953	145465	148232	67.18
Fixed cost					
Family labour	62505	48597	35937	49013	22.21
Land use cost	20378	24949	24848	23392	10.60
Total fixed cost	82883	73546	60785	72405	32.82
Total cost	227160	228499	206250	220637	100.00

Source: Author's own calculations from field survey data during 2018-19

11.7.3 Financial profitability of garlic cultivation

Per hectare average yield of garlic was 7.98 ton and per kg average price was about Tk. 47.33. The average gross return and gross margin of garlic cultivation were found Tk. 377800/ha and Tk. 229568/ha respectively. Per hectare average net return was Tk. 157163 which was found to be highest in Pabna (Tk. 179390) followed by Rajbari (Tk. 148600) and Natore (Tk. 143501). BCR on total cost basis was found 1.71 which was more or less similar among the districts. It was estimated that, to produce one kilogram of garlic, total cost incurred about Tk. 28 (Table 11.28).

Table 11.28: Per hectare return of garlic

Figure in Tk.

Particulars	Districts			All
	Pabna	Natore	Rajbari	
Yield (Ton)	8.65	7.75	7.55	7.98
Price (Tk./kg)	47	48	47	47.33
Gross return	406550	372000	354850	377800
Total variable cost (TVC)	144277	154953	145465	148232
Total fixed cost (TFC)	82883	73546	60785	72405
Total cost (TC)	227160	228499	206250	220637
Gross margin	262273	217047	209385	229568
Net return	179390	143501	148600	157163
BCR over total cost	1.79	1.63	1.72	1.71
Cost of production (Tk./kg)	26.26	29.48	27.32	27.69

Source: Author's own calculations from field survey data during 2018-19



Fig 11.6 Garlic in the farmers field

11.7.4 Economic profitability of garlic cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in garlic relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of garlic (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for garlic for the year 2018-19 are presented in Table 11.29. The DRCs for garlic was observed to be less than unity (0.27) implying that Bangladesh had comparative advantage in garlic production for import substitution.

Table 11.29: Domestic resource cost (DRC) of garlic (import parity)

Particulars	Districts			All
	Pabna	Natore	Rajbari	
A. Traded input (Tk/MT)	2554	3122	2933	2870
Urea	832	1173	983	996
TSP	1063	1202	1304	1189
MoP	660	748	647	685
B. Non-Traded inputs and domestic resources (Tk/MT)	23931	26912	23885	24909

Particulars	Districts			All
	Pabna	Natore	Rajbari	
Human labour	12692	13308	9321	11774
Land preparation	649	446	1030	708
Seed	6026	6532	6675	6411
Manure	253	794	1153	733
Pesticide	447	599	516	521
Irrigation	1182	1622	1519	1441
Int. on oprating capital	327	392	378	366
Land use cost	2356	3219	3291	2955
C. Output price (Tk/MT)	95177	95177	95177	95177
D. Value added (Tradable) (Tk/MT) (C-A)	92623	92055	92244	92307
E. DRC (B/D)-Import parity	0.26	0.29	0.26	0.27

Source: Author's own calculations

11.7.5 Problems faced by the farmers in garlic cultivation

Although the farmers in the study areas are cultivating garlic, there are several problems to its higher production. The first and the foremost constraint for garlic in all areas was low market price at harvesting time (76%). The other problems were lack of quality seed (15%) and lack of high yielding variety (14%), crisis of labour at harvesting time (16%) and high wage rate (13%). They also mentioned that due to severe insect infestation (21%) and diseases infection (20%), garlic yield drastically reduced and it leads to heavy loss to the growers. They also opined other problems of garlic cultivation as lack of storage facilities, high price and low quality of fertilizer (Table 11.30).

Table 11.30: Problems faced by the farmers in garlic cultivation

Particulars	% Farmer opined			
	Pabna	Notore	Rajbari	All
Seed related problems				
Lack of quality seed	12	18	16	15
High price of seed	14	19	11	15
Lack of improved variety	17	13	12	14
Fertilizer related problems				
Adulterated fertilizer	10	17	11	13
High price of fertilizer	19	18	26	21
Low quality fertilizer	13	11	12	12
Insect/disease related problems				
Leaves crumble	22	27	14	21
Dandruff or early digestive disease	28	24	7	20
Yellow colour leaves	11	19	19	16
Labour related problems				
Crisis of labour (Unavailability of labor in time)	14	18	17	16
Higher wages	14	13	11	13

Particulars	% Farmer opined			
	Pabna	Notore	Rajbari	All
Loan related problems				
Less availability	15	24	17	19
Store related problems				
Burst of garlic cloves	16	16	12	16
Dry and hollow after storing	11	20	12	16
Traditional storing system	12	15	14	13
Insect infestation at store	12	14	18	18
Marketing related problems				
Low market price at harvesting time	77	79	71	76

11.7.6 Remedial measure for garlic cultivation

- Government should take initiatives regarding reasonable price of garlic at harvesting time
- Government should ensure availability of good quality seed and fertilizer to the growers.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.

11.8 Financial and economic profitability of green chilli

11.8.1 Pattern of input use for green chilli cultivation

The human labour used for producing green chilli was found to be 265 man days per hectare of which 36% were family supplied (Table 11.31). The use of human labor was highest in Cumilla (280 man-days/ha) followed by Bogura (262 man-days/ha) and Sherpur (253 man-days). The average seedling used by the farmers was 24201/ha. On an average, farmers used 2227 kg of cow dung per hectare for producing green chilli. Green chilli farmers used different types of chemical fertilizers such as urea (371 kg/ha), TSP (390 kg/ha), MoP (207 kg/ha), Zinc sulphate (6 kg/ha) and Boric acid (4 kg/ha) in the study areas. Among the chemical fertilizers, TSP was used at a higher rate for producing green chilli in the study areas.

Table 11.31: Level of input use per hectare of green chilli

Particulars	Districts			
	Bogura	Jamalpur	Bhola	All
Human labour (man-days)	262	253	280	265
Family	95	88	102	95
Hired	167	165	178	170
Seedlings (no.)	22454	23952	26197	24201
Cowdung (kg)	2250	1980	2450	2227
Urea (kg)	375	360	378	371
TSP (kg)	350	325	495	390
MoP (kg)	201	215	205	207
Zinc sulphate (kg)	5	6	7	6
Boric acid (kg)	4	4	5	4

Source: Field Survey during 2018-19

11.8.2 Cost of green chilli cultivation

The study revealed that on an average total variable cost of green chilli cultivation was Tk.134047 per hectare which was 71% of total cost of production (Table 11.32). The highest cost item was hired labour which accounted for about 31% of the total cost. Pesticides cost accounted for about 8% of total cost and ranked second in the study areas. The average cost of green chilli production was Tk 189701 per hectare of which 29% was fixed costs and 71% was variable cost (Table 11.32).

Table 11.32: Per hectare cost of green chilli cultivation

Figure in Tk.

Particulars	Districts				% of total cost
	Bogura	Jamalpur	Bhola	All	
Variable cost					
Cost of land preparation	7484	7904	8982	8123	4.28
Hired labor	58450	57750	62300	59500	31.37
Seedlings	11227	11976	13099	12101	6.38
Cowdung	3375	2970	3675	3340	1.76
Urea	8250	7920	8316	8162	4.30
TSP	9100	8450	12870	10140	5.35
MoP	3216	3440	3280	3312	1.75
Zinc sulphate	750	900	1050	900	0.47
Boric acid	480	480	600	520	0.27
Irrigation	7550	6916	5988	6818	3.59
Bamboo stick	3421	4210	3850	3827	2.02
Pesticides	15550	13227	15250	14676	7.74
Sub-total	128853	126143	139260	131419	69.28
Interest on opera. capital	2577	2523	2785	2628	1.39
Total variable cost	131430	128666	142045	134047	70.66
Fixed cost					
Family labor	33250	30800	35700	33250	17.53
Land use cost	21207	22454	23550	22404	11.81
Total fixed cost	54457	53254	59250	55654	29.34
Total cost	185887	181920	201295	189701	100.00

Source: Author's own calculations from field survey data during 2018-19

11.8.3. Financial profitability of green chilli

The average yield of green chilli was 15.85 t/ha in the study areas while it was highest in Bogura (16.56 t/ha) followed by Bhola (15.55 t/ha) and Jamalpur (15.45 t/ha) (Table 11.33). The average gross return, gross margin and net return of green chilli were found to be Tk 346049/ha, Tk 212002/ha and Tk 156348/ha, respectively. Average benefit cost ratio was found to be 1.83 on the basis of total cost. The average cost of producing per kg of green chilli was Tk. 11.98 (Table 11.33).

Table 11.33: Per hectare returns from green chilli

Figure in Tk.

Particulars	Districts			All
	Bogura	Jamalpur	Bhola	
Yield (ton)	16.56	15.45	15.55	15.85
Price (Tk/kg)	21.55	21.45	22.5	21.83
Gross return	356868	331403	349875	346049
Total variable cost (TVC)	131430	128666	142045	134047
Total fixed cost (TFC)	54457	53254	59250	55654

Figure in Tk.

Particulars	Districts			All
	Bogura	Jamalpur	Bhola	
Total cost (TC)	185887	181920	201295	189701
Gross margin	225438	202737	207830	212002
Net return	170981	149483	148580	156348
BCR over total cost	1.92	1.82	1.74	1.83
Cost of production (Tk/kg)	11.23	11.77	12.95	11.98

Source: Author's own calculations from field survey data during 2018-19



Fig 11.7 Green chilli in the farmers field

11.8.4 Economic profitability of green chilli

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in green chilli crop relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of green chilli (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for green chilli for the year 2018-19 are presented in Table 11.34. The DRCs for green chilli was observed to be less than unity (0.12) implying that Bangladesh had comparative advantage in chilli production for export promotion.

Table 11.34: Domestic resource cost (DRC) of green chilli (export parity)

Particulars	Districts			All
	Bogura	Jamalpur	Bhola	
A. Traded input (Tk/MT)	1944	2013	2463	2140
Urea	727	748	781	752
TSP	860	856	1295	1003
MoP	357	409	388	385
B. Non-Traded inputs and domestic resources (Tk/MT)	9705	10211	11029	10315
Human labour	5537	5731	6302	5857
Land preparation	452	512	578	514
Seedlings	678	775	842	765
Bamboo stick	207	272	248	242
Pesticide	939	856	981	925
Irrigation	456	448	385	430

Particulars	Districts			All
	Bogura	Jamalpur	Bhola	
Interest on operating capital	156	163	179	166
Land use cost	1281	1453	1514	1416
C. Output price (Tk/MT)	91042	91064	91062	91056
D. Value added (Tradable) (Tk/MT) (C-A)	89098	89051	88599	88916
E. DRC (B/D)-Export parity	0.11	0.11	0.12	0.12

Source: Author's own calculations

11.8.5 Problems faced by the farmers in green chilli cultivation

Although the farmers in the study areas are cultivating green chilli, there are several problems to its higher production. The first and the foremost constraint for green chilli in all areas was low market price at harvesting time (74%). The other problems were lack of quality seed (14%), lack of high yielding variety (13%), crisis of labour at harvesting time (14%) and high wage rate (11%). They also mentioned that due to severe infestation of insect (28%) and diseases (26%), green chilli yield drastically reduced and leading to heavy loss to the growers (Table 11.35).

Table 11.35: Problems faced by the farmers in green chilli cultivation

Particulars	%Farmer opined			
	Bogura	Jamalpur	Bhola	All
Seed related problems				
Lack of quality seed	12	14	16	14
High price of seed	14	19	11	15
Local variety	14	13	12	13
Fertilizer related problems				
Adulterated fertilizer	10	17	11	13
High price of fertilizer	19	18	26	21
Low quality fertilizer	13	11	12	12
Insect/disease related problems				
Leaves crumble	28	27	34	28
Dandruff or early digestive disease	28	24	27	26
Yellow colour leaves	11	19	19	16
Labour related problems				
Crisis of labour (Unavailability of labor in time)	14	15	13	14
Higher wages	12	13	11	11
Loan related problems				
Harassment	15	24	17	19
Marketing related problems				
Low market price at harvesting time	75	76	71	74

11.8.6 Remedial measures for green chilli cultivation

- Government should take initiatives regarding reasonable price of green chilli at harvesting time.
- Government should ensure availability of good quality seed and fertilizer to the growers.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.
- Mechanization/appropriate technology should be introduced to the green chilli cultivation areas to minimize labour crisis.

11.9 Financial and economic profitability of betel leaf

11.9.1 Pattern of inputs use for betel leaf cultivation

On an average, 1621 man-days/ha was required for betel leaf cultivation in the study areas (Table 11.36). Use of human labour was highest in Barishal (1693 man-days/ha) as compared to other two districts. In the study areas, farmers used 3942 kg/ha cowdung, 2438 kg/ha oilcake, 213 kg/ha urea, 307 kg/ha TSP, 124 kg/ha MoP, 12 kg/ha zinc sulphate and 10 kg/ha boric acid for producing betel leaf in the study areas. On an average 150102 pices of vine were required per hectare. Among the chemical fertilizers, TSP was used highest for producing betel leaf in the study areas.

Table 11.36: Level of input use per hectare for betel leaf cultivation

Particulars	Districts			
	Chuadunga	Barishal	Gopalganj	All
Human labour (man-days)	1572	1693	1597	1621
Family	688	718	672	693
Hired	884	975	925	928
Seedling (no. of vine)	149290	152255	148760	150102
Cowdung (kg)	4025	4000	3800	3942
Oilcake (kg)	2513	2300	2500	2438
Urea (kg)	218	225	195	213
TSP (kg)	346	300	275	307
MoP (kg)	137	110	125	124
Zinc sulphate	12	12	12	12
Boric Acid (kg)	9	10	10	10

Source: Field Survey during 2018-19

11.9.2 Cost of betel leaf cultivation

The average cost of betel leaf production was estimated at Tk 952567 per hectare which accounted for 69% of the variable cost and 31% of fixed cost (Table 11.37). Human labour cost was the lion share (58%) of total cost and it is followed by seedling (vine) (13%) and boroj cost (6%) in the study areas.

Table 11.37: Per hectare cost of betel leaf cultivation

Figure in Tk.

Particulars	Districts			All Areas	% of total cost
	Chuadunga	Barishal	Gopalganj		
Variable cost					
Cost of land preparation	8982	8872	8756	8870	0.93
Hired labor	309488	341250	323750	324829	34.10
Seedling	122418	124849	121983	123083	12.92
Cowdung	6038	6000	5700	5913	0.62
Oilcake	50250	46000	50000	48750	5.12
Urea	4802	4950	4290	4681	0.49

Figure in Tk.

Particulars	Districts			All Areas	% of total cost
	Chuadunga	Barishal	Gopalganj		
MoP	2184	1760	2000	1981	0.21
Zinc sulphate	1800	1800	1800	1800	0.19
Boric Acid	1065	1200	1200	1155	0.12
Irrigation	17428	15740	17450	16873	1.77
Boroj making	56136	55125	54332	55198	5.79
Pesticides	19925	18655	20145	19575	2.05
Sub-total	609517	634001	618556	620691	65.16
Interest on operating capital	36571	38040	37113	37241	3.91
Total variable cost	646088	672041	655670	657933	69.07
Fixed cost					
Family labor	240669	251300	235200	242390	25.45
Land use cost	52394	52885	51456	52245	5.48
Total fixed cost	293063	304185	286656	294635	30.93
Total cost	939151	976226	942326	952567	100.00

Source: Author's own calculations from field survey data during 2018-19

11.9.3 Financial profitability of betel leaf

The average yield of betel leaf was recorded 9.69 t/ha in all study areas while it was highest in Barishal (9.85 t/ha) followed by Gopalganj (9.55 t/ha) and Chuadunga (9.67 t/ha) (Table 11.38). The average gross return, gross margin and net return of betel leaf were found to be Tk 1211250/ha, Tk 553317/ha, and Tk 258683/ha, respectively. Average benefit cost ratio was found to be 1.27 on the basis of total cost. The average cost of producing per kg of betel leaf was Tk. 98 (Table 11.38).

Table 11.38: Per hectare returns from betel leaf

Figure in Tk.

Particulars	Districts			
	Chuadunga	Barishal	Gopalganj	All Areas
Yield (ton)	9.67	9.85	9.55	9.69
Price (Tk./kg)	125	125	126	125
Gross return	1208750	1231250	1193750	1211250
Total variable cost (TVC)	646088	672041	655670	657933
Total fixed cost (TFC)	293063	304185	286656	294635
Total cost (TC)	939151	976226	942326	952567
Gross margin	562662	559209	538080	553317
Net return	269599	255024	251424	258683
BCR over total cost	1.29	1.26	1.27	1.27
Cost of production (Tk./kg)	97	99	99	98

Source: Author's own calculations from field survey data during 2018-19



Fig 11.8 Betel leaf in the farmers field

11.9.4 Problems faced by the farmers in betel leaf cultivation

Although the farmers in the study areas are cultivating betel leaf, there are several problems to its higher production. The first and the foremost constraint for betel leaf in all areas was low market price at harvesting time (70%). They also mentioned that due to severe infestation of insect (28%) and diseases (24%), betel leaf yield drastically reduced and it leads to heavy loss to the growers (Table 11.39). The other problems were lack of quality seed (12%) and lack of high yielding variety, unavailability of bank loan (19%) and crisis of labour at harvesting time (16%) in the study areas.

Table 11.39: Problems faced by the farmers in betel leaf cultivation

Particulars	% Farmers responded			
	Chuadunga	Barishal	Gopalganj	All Areas
Seed related problems				
Lack of quality seed	10	13	14	12
Local variety	12	13	12	12
Fertilizer related problems				
Adulterated fertilizer	10	17	11	13
High price of fertilizer	6	7	10	8
Insect/pest related problem				
Insect infestation	28	25	31	28
Leaf disease	22	27	24	24
Labour related problems				
Crisis of labour (Unavailability of labor in time)	14	18	17	16
Loan related problems				
Unavailability of bank loan	15	24	17	19
Marketing related problems				
Low market price	71	69	70	70

11.9.5 Remedial measure for betel leaf cultivation

- Government should take initiatives regarding reasonable price of betel leaf at harvesting time
- Government should ensure the supply of good quality sapling and fertilizer in time.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.
- Mechanization technology should be introduced to the betel leaf cultivation to minimize labour crisis.

Tuber crops

11.10 Financial and economic profitability of potato

11.10.1 Pattern of input use for potato cultivation

The human labour used for producing potato was found to be 255 man days per hectare of which 37.25% were family supplied (Table 11.40). The use of human labor was highest in Rangpur (266 man-days/ha) followed by Cumilla (251 man-days/ha) and Munsigonj (250 man-days/ha). The average quantity of seed used by the farmers were 924 kg/ha. On an average, farmers used 2050 kg/ha of cowdung, 478 kg/ha of Urea, 586 kg/ha of TSP and 336 kg/ha of MoP. They used higher doses of urea, TSP and MoP than the recommended doses (250-350kg/ha, 140- 160kg/ha and 250-350 kg/ha) (Kabir et al., 2012). Farmers also used Zinc sulphate and Boric acid in potato cultivation.

Table 11.40: Level of input use per hectare for potato cultivation

Particulars	Districts			
	Rangpur	Cumilla	Munsigonj	All Areas
Human labour (man-days)	266	251	250	255
Family	101	95	90	95
Hired	165	156	160	160
Seed (kg)	937	936	898	924
Cowdung (kg)	1890	2215	2045	2050
Urea (kg)	475	475	485	478
TSP (kg)	588	590	580	586
MoP (kg)	333	350	325	336
Zinc sulphate (kg)	12	10	11	11
Boric acid (kg)	6	7	8	7

Source: Field Survey during 2018-19

11.10.2 Cost of potato cultivation

For calculating the cost of cultivation of potato, all variable costs like human labor, land preparation, seed, manures, fertilizers, insecticides, irrigation, and interest on operating capital were calculated per hectare basis. The fixed cost of potato cultivation included cost of land use and family labour. The cost of land use was calculated on the basis of lease value of land. The total cost was calculated by adding fixed cost and variable cost. The cost of potato cultivation was estimated to be Tk. 230357 and Tk. 177031 per hectare on total cost and variable cost basis, respectively. Cost of human labour occupied the major share of total cost (38%) followed by pesticides (18%) and seed (12%) in the study areas (Table 11.41).

Table 11.41: Per hectare cost of potato cultivation

Figure in Tk.

Particulars	Districts				% of total cost
	Rangpur	Cumilla	Munsigonj	All Areas	
Variable cost					
Cost of land preparation	8981	9880	9730	9530	4.14
Hired labor	56000	57750	54600	56117	24.36
Seed	25144	28110	28080	27111	11.77
Cowdung	3068	2835	3323	3075	1.33
Urea	10670	10450	10450	10523	4.57
TSP	15080	15288	15340	15236	6.61
MoP	5200	5328	5600	5376	2.33
Zinc sulphate	1650	1800	1500	1650	0.72
Boric acid	960	720	840	840	0.36
Irrigation	3742	3850	3750	3781	1.64
Pesticides	38425	39585	42950	40320	17.50
Sub-total	168920	175596	176163	173559	75.34
Interest on opera. capital	3378	3512	3523	3471	1.51
Total variable cost	172298	179108	179686	177031	76.85
Fixed cost					
Family labor	31500	35350	33250	33367	14.48
Land use cost	21207	19960	18712	19960	8.66
Total fixed cost	52707	55310	51962	53326	23.15
Total cost	225005	234418	231648	230357	100.00

Source: Author's own calculations from field survey data during 2018-19

11.10.3 Financial profitability of potato

The average yield of potato was recorded 28.40 t/ha in the study areas while it was highest in Rangpur (29.56 t/ha) followed by Munshigonj (28.75 t/ha) and Cumilla (26.90 t/ha) (Table 11.42). The average gross return, gross margin and net return of potato were found to be Tk 320920/ha, Tk 143763/ha, and Tk 90437/ha, respectively. Average benefit cost ratio was found to be 1.39 on the basis of total cost. The average cost of producing per kg of potato was Tk. 8.12 (Table 11.42).

Table 11.42: Per hectare returns from potato

Figure in Tk.

Particulars	Districts			
	Rangpur	Cumilla	Munshigonj	All Areas
Yield (ton)	29.56	26.90	28.75	28.40
Price (Tk/kg)	11.15	11.50	11.25	11.30
Gross return	329594	309350	323438	320920
Total variable cost (TVC)	179108	179686	172298	177031
Total fixed cost (TFC)	55310	51962	52707	53326
Total cost (TC)	234418	231648	225005	230357
Gross margin	150486	129664	151140	143763
Net return	95176	77702	98433	90437
BCR over total cost	1.41	1.34	1.44	1.39
Cost of production (Tk/kg)	7.93	8.61	7.83	8.12

Source: Author's own calculations from field survey data during 2018-19



Fig 11.9 Potato in the farmers field

11.10.4 Economic profitability of potato

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in potato relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of potato (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for potato for the year 2018-19 are presented in Table 11.43. The DRCs for potato was observed to be less than unity (0.53) implying that Bangladesh had comparative advantage in potato production for export promotion.

Table 11.43: Domestic resource cost (DRC) of potato (export parity)

Particulars	Districts			All Areas
	Rangpur	Cumilla	Munshigonj	
A. Traded input (Tk/MT)	1656	1842	1695	1731
Urea	516	567	542	542
TSP	809	892	820	840
MoP	331	383	332	349

Particulars	Districts			All Areas
	Rangpur	Cumilla	Munshigonj	
B. Non-Traded inputs and domestic resources (Tk/MT)	6476	7466	6884	6942
Human labour	2960	3461	3056	3159
Land preparation	304	367	338	337
Seedlings	851	1045	977	957
Manure	104	105	116	108
Pesticide	1300	1472	1494	1422
Irrigation	127	143	130	133
Interest on operating capital	114	131	123	122
Land use cost	717	742	651	703
C. Output price (Tk/MT)	14885	14878	14883	14882
D. Value added (Tradable) (Tk/MT) (C-A)	13229	13036	13188	13151
E. DRC (B/D)-Export parity	0.49	0.57	0.52	0.53

Source: Author's own calculations

11.10.5 Problems faced by the farmers in potato cultivation

Although the farmers in the study areas are cultivating potato, there are several problems to its higher production. The first and the foremost constraint for potato in all areas was low market price at harvesting time (61%). They also mentioned that due to severe infestation of insect (27%) and diseases (19%), potato yield was drastically reduced and it leads to heavy loss to the growers. The other problems were high price of potato seed (39%) and fertilizer not working properly (15%) might be due to adulterations, crisis of labour at harvesting time (15%) and high wage rate (13%). They were also opined to be the problems to potato cultivation as lack of cold storage and traditional storing system in the study areas (Table 11.44).

Table 11.44: Problems faced by the farmers in potato cultivation

Particulars	% Farmers responded			
	Rangpur	Cumilla	Munshigonj	All Areas
Seed related problems				
High price	34	46	37	39
Fertilizer related problems				
Adulterated fertilizer	15	17	12	15
High price of fertilizer	14	12	18	15
Insect/disease related problems				
Leaves crumble or late blight	27	25	29	27
Insect infestation	16	19	22	19
Labour related problems				
Crisis of labour (Unavailability of labor in time)	13	16	17	15
Higher wages	12	11	15	13
Loan related problems				
Unavailability of bank loan	16	24	18	19
Store related problems				
Traditional storing system	10	12	14	12
Unavailability of cold storage	22	25	29	25
Marketing related problems				
Low market price at harvesting time	58	62	63	61

11.10.6 Remedial measure for potato cultivation

- Govt. should take initiatives to ensure reasonable price of potato at harvesting time.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.
- Mechanization technology should be introduced to the potato cultivation for minimizing labour crisis.

11.11 Financial and economic profitability of sweet potato

11.11.1 Pattern of input use for sweet potato cultivation

The human labour used for producing sweet potato was found to be 246 man days per hectare of which 48% were family supplied (Table 11.45). The use of human labor was highest in Brahmonbaria (249 man-days/ha) followed by Noakhali (246 man-days/ha) and Kurigram (242 man-days/ha). The average number of seedling used by the farmers was 55525 no. /ha. On an average, farmers used 3361 kg/ha of cowdung, 205 kg/ha of urea, 247 kg/ha of TSP and 112 kg/ha of MoP.

Table 11.45: Level of input use per hectare for sweet potato cultivation

Particulars	Districts			All Areas
	Kurigram	B'baria	Noakhali	
Human labour (man-days)	242	249	246	246
Family	145	112	99	119
Hired	97	137	147	127
Seedling (no.)	56136	55115	55325	55525
Cowdung (kg)	6579	826	2679	3361
Urea (kg)	195	283	138	205
TSP (kg)	157	318	266	247
MoP (kg)	101	147	89	112

Source: Field Survey during 2018-19

11.11.2 Cost of sweet potato cultivation

For calculating the cost of cultivation of sweet potato, all variable costs like human labor, land preparation, seed, manures, fertilizers, insecticides, irrigation, and interest on operating capital were calculated per hectare basis. The cost of land use was calculated on the basis of lease value of land. The total cost was calculated by adding fixed cost and variable cost. The cost of sweet potato cultivation was estimated to be Tk. 143396 and Tk. 88252 per hectare on total cost and variable cost basis, respectively. The major share in total cost was for human labour (52%) followed by land use cost (14%) and seed (12%) in the study areas (Table 11.46).

Table 11.46: Per hectare cost of sweet potato cultivation

Figure in Tk.

Particulars	Districts				% of total cost
	Kurigram	B'Baria	Noakhali	All Areas	
Variable cost					
Cost of land prep.	8420	8982	7859	8420	5.87
Hired labor	29100	41100	44100	38100	26.57
Seedling	16841	16535	16598	16658	11.62
Cowdung	6579	826	2679	3361	2.34
Urea	4290	6226	3036	4517	3.15
TSP	4082	8268	6916	6422	4.48

Figure in Tk.

Particulars	Districts				% of total cost
	Kurigram	B'Baria	Noakhali	All Areas	
MoP	1616	2352	1424	1797	1.25
Irrigation	6974	5050	2371	4798	3.35
Pesticides	3861	1158	2323	2447	1.71
Sub-total	81763	90497	87305	86522	60.34
Interest on operating capital	1635	1810	1746	1730	1.21
Total variable cost	83398	92307	89051	88252	61.54
Fixed cost					
Family labor	43500	33600	29700	35600	24.83
Land use cost	18712	19960	19960	19544	13.63
Total fixed cost	62212	53560	49660	55144	38.46
Total cost	145610	145867	138711	143396	100.00

Source: Author's own calculations from field survey data during 2018-19

11.11.3 Financial profitability of sweet potato

The average head yield of sweet potato was recorded 22.58 t/ha in all study areas while it was highest in Kurigram and Brahmonbaria (23.10 t/ha) followed by Noakhali (20.67 t/ha) (Table 11.47). The average gross return, gross margin and net return of sweet potato were found to be Tk. 289515/ha, Tk. 209851/ha and Tk. 154707/ha, respectively. Average benefit cost ratio was found to be 2.14 on the basis of total cost. The average cost of producing per kg of sweet potato was Tk. 5.99 (Table 11.47).

Table 11.47: Per hectare returns from sweet potato

Figure in Tk.

Particulars	Districts			
	Kurigram	B'Baria	Noakhali	All Areas
Yield (ton)	23.10	23.10	20.67	22.58
Price (Tk/kg)	13	13	12	13
Gross return	300281	311869	256394	289515
Total variable cost (TVC)	74810	83145	81035	79663
Total fixed cost (TFC)	62212	53560	49660	55144
Total cost (TC)	137022	136705	130695	134807
Gross margin	225471	228723	175359	209851
Net return	163259	175163	125699	154707
BCR over total cost	2.19	2.28	1.96	2.14
Cost of production (Tk./kg)	5.93	5.70	6.33	5.99

Source: Author's own calculations from field survey data during 2018-19



Fig 11.10 Sweet potato in the farmers field

11.11.4 Economic profitability of sweet potato

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in sweet potato relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of sweet potato (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for sweet potato for the year 2018-19 are presented in Table 11.48. The DRCs for sweet potato was observed to be less than unity (0.46) implying that Bangladesh had comparative advantage in sweet potato production for export promotion.

Table 11.48: Domestic resource cost (DRC) of sweet potato (export parity)

Particulars	Districts			All Areas
	Kurigram	B'Baria	Noakhali	
A. Traded input (Tk/MT)	676	1141	864	894
Urea	271	394	214	293
TSP	276	560	523	453
MoP	129	187	127	147
B. Non-Traded inputs and domestic resources (Tk/MT)	5871	5585	6160	5872
Human labour	3143	3234	3570	3316
Land preparation	365	389	380	378
Seedlings	729	716	803	749
Manure	285	36	130	150
Pesticide	167	50	112	110
Irrigation	302	219	115	212
Int. on oprating capital	71	78	84	78
Land use cost	810	864	966	880
C. Output price (Tk/MT)	13789	13789	13809	13796
D. Value added (Tradable) (Tk/MT) (C-A)	13113	12648	12945	12902
E. DRC (B/D)-Export parity	0.45	0.44	0.48	0.46

Source: Author's own calculations

11.11.5 Problems faced by the farmers in sweet potato cultivation

Although the farmers in the study areas are cultivating sweet potato, there are several problems to its higher production. The first and the foremost constraint for sweet potato in all areas was low market price at harvesting time (57%). They also mentioned that due to severe infestation of insect (24%) and diseases (19%), sweet potato yield drastically reduced and it leads to heavy loss to the growers. The other problems were high price of fertilizer (14%) and fertilizer not working properly (13%) might be due to adulterations, crisis of labour at harvesting time (15%) and high wage rate (13%). They also opined few other problems to sweet potato cultivation as lack of cold storage and traditional storing system in the study areas (Table 11.49).

Table 11.49: Problems faced by the farmers in sweet potato cultivation

Particulars	% Farmers responded			
	Kurigram	B'Baria	Noakhali	All Areas
Seed related problems				
Lack of HYV quality seed	10	11	12	11
Local variety	6	7	11	8
Fertilizer related problems				
Adulterated fertilizer	11	13	15	13
High price of fertilizer	10	13	18	14
Insect/disease related problems				
Leaves crumble	20	22	29	24
Yellow color leaves (Yellow leaf curling virus)	16	19	22	19
Labour related problems				
Crisis of labour (Unavailability of labor in time)	13	16	17	15
Higher wages	12	11	15	13
Loan related problems				
Unavailability of bank loan	16	24	18	19
Store related problems				
Traditional storing system	10	12	14	12
Insect infestation when store	12	10	9	10
Marketing related problems				
Low market price	56	55	60	57

11.11.6 Remedial measure for sweet potato cultivation

- High yielding sweet potato variety should be developed. In this aspect Tuber Crops Research Center of BARI should strengthen research on sweet potato.
- Government should take initiatives to ensure reasonable price of sweet potato at harvesting time
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.
- Mechanization technology should be introduced to the sweet potato cultivation for minimizing labour crisis.

11.12 Financial and economic profitability of aroid**11.12.1 Pattern of inputs use for aroid cultivation**

The average total number of human labour used for aroid cultivation was 265 man-days/ha (Table 11.50). The highest human labour (280 man-days/ha) were used in Cumilla area due to more use in cleaning and washing of aroid and the lowest was in Sherpur (255 man-days/ha). The average aroid seedling was required 29937 no./ha in the study areas, while the seedling were 30605, 29640 and 29565 no./ha for Cumilla, Jashore and Sherpur respectively. Level of per hectare seedling use was lower in Sherpur due to following higher spacing. The average application of cowdung, Urea, TSP and MoP were 13073 kg, 378 kg, 468 kg, and 269 kg per hectare, respectively in all study areas.

Table 11.50: Level of input use per hectare for aroid cultivation

Particulars	Districts			
	Sherpur	Jashore	Cumilla	All Areas
Human labour (man-days)	255	262	280	265
Family	85	90	102	92
Hired	170	172	178	173
Seedlings (no.)	29565	29640	30605	29937
Cowdung (kg)	22580	12750	3890	13073
Urea (kg)	375	380	378	378
TSP (kg)	450	460	495	468
MoP (kg)	388	215	205	269
Zinc sulphate (kg)	7	6	7	7
Boric acid (kg)	7	6	5	6

11.12.2 Cost of aroid cultivation

The cost of cultivation was calculated on the basis of total variable cost and total cost. The average cost of aroid production was estimated at Tk 223241 per hectare which accounted about 75% of variable cost and 25% of fixed cost (Table 11.51). Human labour cost occupied the lion share (41%) of total cost followed by pesticide cost (12%) in the study areas.

Table 11.51: Per hectare cost of aroid cultivation**Figure in Tk.**

Particulars	Districts				% of total cost
	Sherpur	Jashore	Cumilla	All Areas	
Variable cost					
Cost of land preparation	7484	8982	9730	8732	3.91
Hired labor	59500	60200	62300	60667	27.18
Seedlings	14783	14820	15303	14968	6.71
Cowdung	33870	19125	5835	19610	8.78
Urea	8250	8360	8316	8309	3.72
TSP	11700	11960	12870	12177	5.45
MoP	6208	3440	3280	4309	1.93
Zinc sulphate	1050	900	1050	1000	0.45
Boric acid	840	720	600	720	0.32
Irrigation	8645	7880	9550	8692	3.89
Pesticides	27880	25660	24560	26033	11.66
Sub-total	180210	162047	153394	165217	74.01
Interest on operating capital	3604	3241	3068	3304	1.48
Total variable cost	183814	165288	156461	168521	75.49
Fixed cost					
Family labor	29750	31500	35700	32317	14.48
Land use cost	21207	22454	23550	22404	10.04
Total fixed cost	50957	53954	59250	54720	24.51
Total cost	234771	219242	215711	223241	100.00

Source: Author's own calculations from field survey data during 2018-19

11.12.3 Financial profitability of aroid

The average head yield of aroid was recorded 36.61 t/ha in the study areas while it was highest in Sherpur (35.45 t/ha) followed by Cumilla (35.12 t/ha) and Jeshore (33.25 t/ha) (Table 11.52). The average gross return, gross margin and net return of aroid were found to be Tk. 440626/ha, Tk. 272105/ha, and Tk. 217385/ha, respectively. Average benefit cost ratio was found to be 1.97 on the basis of total cost. The average cost of producing per kg of aroid was Tk. 6.45 (Table 4.57).

Table 11.52: Per hectare returns from aroid cultivation

Figure in Tk.

Particulars	Districts			
	Sherpur	Jashore	Cumilla	All Areas
Yield (ton)	35.45	33.25	35.12	34.61
Price (Tk/kg)	10.15	10.25	10.15	10.18
By-product (Tk/ha)	95450	88780	80550	88260
Gross return	455268	429593	437018	440626
Total variable cost (TVC)	183814	165288	156461	168521
Total fixed cost (TFC)	50957	53954	59250	54720
Total cost (TC)	234771	219242	215711	223241
Gross margin	271454	264305	280557	272105
Net return	220497	210351	221307	217385
BCR over total cost	1.94	1.96	2.03	1.97
Cost of production (Tk/kg)	6.62	6.59	6.14	6.45

Source: Author's own calculations from field survey data during 2018-19



Fig 11.11 Aroid in the farmers field

11.12.4 Problems faced by the farmers in aroid cultivation

Although the farmers in the study areas are cultivating aroid, there are several problems to its higher production. The prime problem of aroids in the study areas was low market price at harvesting time (61%). They were also opined to be the problems to aroid cultivation as lack of HYV aroid (39%) in the study areas. They also mentioned infestation of insect and diseases (19%), unavailability of bank loan (19%) as the problems of aroid cultivation (Table 11.53).

Table 11.53: Problems of aroid cultivation

Particulars	% Farmers responded			
	Sherpur	Jashore	Cumilla	All Areas
Seed related problems				
Unavailable HYV	34	46	37	39
Fertilizer related problems				
Adulterated fertilizer	15	17	12	15
Insect/disease related problems				
Insect/disease infestation	16	19	22	19
Labour related problems				
Crisis of labour (Unavailability of labor in time)	13	16	17	15
Loan related problems				
Unavailable in bank loan	16	24	18	19
Marketing related problems				
Low market price at harvesting time	58	62	63	61

11.12.5 Remedial measure for aroid cultivation

- Government should take initiatives to ensure reasonable price of aroid at harvesting time
- High yielding variety of aroids should be developed. In this aspect Tuber Crops Research Center of BARI should strengthening research on aroid.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.
- Mechanization technology should be introduced to the aroid cultivation for minimizing labour crisis.

Kharif vegetables

11.13 Financial and economic profitability of pointed gourd

11.13.1 Pattern of input use for pointed gourd cultivation

The human labour used for producing pointed gourd was found to be 233 man-days per hectare of which was highest in Jhenaidha (246 man-days). The average quantity of seed used by the farmers were 0.83 kg/ha. On an average, farmers used cow dung 1952 kg/ha which was highest (2045 kg/ha) at Jhenaidha compared to other two districts. On an average, farmers applied Urea 329 kg/ha, TSP 353 kg/ha, MoP 193 kg/ha, Zinc sulphate 6 kg/ha and Boric acid 4 kg/ha (Table 11.54) for pointed gourd cultivation. Among the chemical fertilizers, farmers used highest amount of TSP for producing pointed gourd in the study areas (Table 11.54).

Table 11.54: Level of input use per hectare for pointed gourd cultivation

Particulars	Districts			
	Pabna	Jashore	Jhenaidha	All Areas
Human labour (man-days)	210	245	246	233
Family	65	90	101	85
Hired	145	155	145	148
Seed (kg)	0.85	0.90	0.75	0.83
Cowdung (kg)	2250	1560	2045	1952
Urea (kg)	325	322	340	329
TSP (kg)	350	345	365	353
MoP (kg)	215	190	175	193
Zinc sulphate (kg)	5	6	7	6
Boric acid (kg)	4	4	5	4

Source: Field Survey during 2018-19

11.13.2 Cost of pointed gourd production

On an average the estimated total variable cost for pointed gourd production was Tk.170012 per hectare which shared 77% of the total cost of production. The highest variable cost was incurred by the farmers of Jhenaidha (Tk. 174266/ha) district due to higher level use of inputs. Among the cost items, human labour (both hired and family supplied) was the major cost item which shared 38% of the total cost in the study areas (Table 11.55). The second highest cost item was fencing which accounted for about 18% of the total cost. Among all variable costs, pesticides cost accounted for about 9% of the total cost and ranked third in cost item. On an average the fixed cost item was Tk. 49826 per hectare which accounted for about 23% of the total cost of production (Table 11.55). On an average total cost of production for pointed gourd cultivation was Tk. 219838 per hectare of which about 23% was fixed costs and 77% was variable cost (Table 11.55).

Table 11.55: Per hectare cost of pointed gourd**Figure in Tk.**

Particulars	Districts			All Areas	% of total cost
	Pabna	Jashore	Jhenaidha		
Variable cost					
Cost of land preparation	8981	9430	9581	9331	4.24
Hired labor	50750	54250	50750	51917	23.62
Seedlings	5100	5850	4875	5275	2.40
Cowdung	3375	2340	3067.5	2928	1.33
Urea	7150	7084	7480	7238	3.29
TSP	9100	8970	9490	9187	4.18
MoP	3440	3040	2800	3093	1.41
Zinc sulphate	750	900	1050	900	0.41
Boric acid	480	480	600	520	0.24
Irrigation	14750	15650	18450	16283	7.41
Fencing/Macha	37856	38560	41250	39222	17.84
Pesticides	18750	22150	21456	20785	9.45
Sub-total	160482	168704	170850	166679	75.82
Interest on operating capital	3210	3374	3417	3334	1.52
Total variable cost	163692	172078	174266	170012	77.34
Fixed cost					
Family labor	22750	31500	35350	29867	13.59
Land use cost	21207	19960	18712	19960	9.08
Total fixed cost	43957	51460	54062	49826	22.66
Total cost	207649	223538	228328	219838	100.00

Source: Author's own calculations from field survey data during 2018-19

11.13.3 Financial profitability of pointed gourd

The average yield of pointed gourd was 29.15 ton per hectare. The yield was found to be higher in Pabna (31.15 t/ha) compared to Jhenaidha (28.81 t/ha) and Jashore (27.50 t/ha) (Table 11.56). The average gross return from pointed gourd production was Tk.359510/ha. Highest gross return was obtained from Jhenaidha (Tk.366013/ha) due to higher price than that of other two districts. Average gross margin was Tk.189498 per hectare. Net return was Tk. 139672 on an average in the study areas. The average benefit cost ratio (BCR) was 1.64 which was also highest at Pabna (1.76) compared to other two districts. The average cost of producing per kg of pointed gourd was Tk. 7.57.

Table 11.56: Per hectare returns from pointed gourd**Figure in Tk.**

Particulars	Districts			
	Pabna	Jashore	Jhenaidha	All Areas
Yield (ton)	31.15	27.5	28.81	29.15
Price (Tk./kg)	11.75	12.5	12.8	12.35
Gross return	366013	343750	368768	359510
Total variable cost (TVC)	163692	172078	174266	170012
Total fixed cost (TFC)	43957	51460	54062	49826
Total cost (TC)	207649	223538	228328	219838
Gross margin	202321	171672	194502	189498
Net return	158364	120212	140440	139672
BCR over total cost	1.76	1.54	1.62	1.64
Cost of production (Tk./kg)	6.67	8.13	7.93	7.57

Source: Author's own calculations from field survey data during 2018-19



Fig 11.12 Pointed gourd in the farmers field

11.13.4 Economic profitability of pointed gourd

DRC indicates whether the domestic economy has a comparative advantage in vegetables production relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of the vegetables (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for pointed gourd for the year 2018-19 are presented in Table 11.57. The DRC for pointed gourd was observed to be less than unity implying that Bangladesh had comparative advantage in pointed gourd production for export promotion.

Table 11.57: Domestic resource cost (DRC) of pointed gourd (export parity)

Particulars	Districts			All Areas
	Pabna	Jashore	Jhenaidha	
A. Traded input (Tk/MT)	995	1089	1073	1052
Urea	335	376	379	363
TSP	457	510	515	494
MoP	203	203	179	195
B. Non-Traded inputs and domestic resources (Tk/MT)	4779	5982	5750	5504
Human labour	2360	3118	2989	2822
Land preparation	288	343	333	321
Seedlings	164	213	169	182
Manure	108	85	106	100
Pesticide	602	805	745	717
Irrigation	474	569	640	561
Int. on oprating capital	103	123	119	115
Land use cost	681	726	649	685
C. Output price (Tk/MT)	77857	77842	77836	77845
D. Value added (Tradable) (Tk/MT) (C-A)	76862	76753	76763	76793
E. DRC (B/D) - Export parity	0.062	0.078	0.075	0.072

Source: Author's own calculations

11.13.5 Problems faced by the farmers in pointed gourd

Although the farmers in the study areas are cultivating pointed gourd, there are a number of problems to its higher production. The first and the foremost constraint for pointed gourd in all areas was low market price at

harvesting time (58%). They also mentioned that due to severe infestation of insect (49%) and diseases (39%), pointed gourd yield was drastically reduced. Other problems were high price of fertilizer (12%) and adulteration of fertilizers (16%), crisis of labour at harvesting time (13%) and high wage rate (8%) (Table 11.58).

Table 11.58: Problems faced by the farmers in pointed gourd cultivation

Particulars	% Farmers responded			
	Pabna	Jashore	Jhenaidha	All Areas
Seed related problems				
High price of seed	27	28	26	27
Adulterated seed	25	24	23	24
Fertilizer related problems				
Adulterated fertilizer	20	12	15	16
High price of fertilizer	10	11	16	12
Insect/disease related problems				
Severe insect infestation	47	50	49	49
Disease infection	41	36	39	39
Labour related problems				
Unavailability of labor in time	11	17	11	13
Higher wages	9	8	6	8
Loan related problems				
Unavailability of bank loan	6	5	9	7
Marketing related problems				
Low market price	55	57	61	58

11.13.6 Remedial measure for pointed gourd

- Government should take initiatives to ensure reasonable price of pointed gourd at harvesting time
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.
- Mechanization technology should be introduced to the pointed gourd cultivation for minimizing labour crisis.

11.14 Financial and economic profitability of okra

11.14.1 Pattern of input use for okra cultivation

Human labour was required for land preparation, planting, application of fertilizers, spraying, weeding, irrigation and harvesting. It may be noted here that about 245 man-days (both family and hired labour) per hectare were required for okra cultivation in the selected study areas (Table 11.59). In the study areas, farmers used chemical fertilizers at the rate of urea 362 kg/ha, TSP 397 kg/ha and MoP 202 kg/ha and seed required 6 kg/ha. Among the chemical fertilizers, TSP was used highest for okra cultivation in the study areas (Table 11.59).

Table 11.59: Level of input use per hectare for okra cultivation

Particulars	Districts			
	Pabna	Tangail	Chattogram	All Areas
Human labour (man-days)	248	240	245	245
Family	88	95	90	91
Hired	160	145	156	154
Seed (kg)	6.0	5.5	5.0	6.0
Cowdung (kg)	1260	1620	1245	1375

Particulars	Districts			
	Pabna	Tangail	Chattogram	All Areas
Urea (kg)	350	380	357	362
TSP (kg)	385	402	405	397
MoP (kg)	195	210	201	202
Zinc sulphate (kg)	7	8	6	7
Boric acid (kg)	5	5	3	4

Source: Field Survey during 2018-19

11.14.2 Cost of okra cultivation

Farmer's decision about production is mainly influenced by the cost of inputs. Farmers had to pay cash for the purchased inputs. On the other hand, for the home supplied inputs (for example, family labour) costs were estimated by applying the opportunity cost principle. Farmers had to spend Tk. 202642/ha as total cost for conducting okra cultivation, while the highest cost was incurred for human labour (both family plus hired), which represented 42 percent of total costs. The second highest cost item was pesticides which accounted for about 12% of the total cost. On an average the fixed cost was Tk. 51810 per hectare which accounted for about 26% of the total cost of production (Table 11.60). On an average total cost of production for okra cultivation was Tk. 202642 per hectare of which 26% was fixed costs and 74% was variable cost (Table 11.60).

Table 11.60: Per hectare cost of okra

Figure in Tk.

Particulars	Districts				% of total cost
	Pabna	Tangail	Chattogram	All Areas	
Variable cost					
Cost of land preparation	8981	9430	9581	9331	4.60
Hired labor	56000	50750	54600	53783	26.54
Seed	27000	24200	21000	24067	11.88
Cowdung	1890	2430	1868	2063	1.02
Urea	7700	8360	7854	7971	3.93
TSP	10010	10452	10530	10331	5.10
MoP	3120	3360	3216	3232	1.59
Zinc sulphate	1050	1200	900	1050	0.52
Boric acid	600	600	360	520	0.26
Irrigation	12450	10345	10329	11041	5.45
Pesticides	25450	23460	24550	24487	12.08
Sub-total	154251	144587	144788	147875	72.97
Interest on ope. capital	3085	2892	2896	2958	1.46
Total variable cost	157336	147479	147683	150833	74.43
Fixed cost					
Family labor	30800	33250	31500	31850	15.72
Land use cost	21207	19960	18712	19960	9.85
Total fixed cost	52007	53210	50212	51810	25.57
Total cost	209343	200689	197895	202642	100.00

Source: Author's own calculations from field survey data during 2018-19

11.14.3 Financial profitability of okra cultivation

The average yield of okra was 26.93 ton per hectare which was found to be slightly higher in Chattogram (28.45 t/ha) compared to Tangail (26.55 t/ha) and Pabna (25.80 t/ha). The average gross return from okra production was Tk.418181/ha which was also higher in Chattogram (Tk.433863/ha) than that of other two districts which was due to higher yield of okra. Average gross margin was Tk.267348 per hectare and net return was Tk. 215538 in the study areas. The average benefit cost ratio (BCR) was 2.07 which was slightly higher at Chattogram (2.19) compared to other two districts. The average cost of producing per kg of okra was Tk. 7.54 (Table 11.61).

Table 11.61: Per hectare returns from okra

Figure in Tk.

Particulars	Districts			
	Pabna	Tangail	Chattogram	All Areas
Yield (ton)	25.80	26.55	28.45	26.93
Price (Tk./kg)	15.55	15.80	15.25	15.53
Gross return	401190	419490	433863	418181
Total variable cost (TVC)	157336	147479	147683	150833
Total fixed cost (TFC)	52007	53210	50212	51810
Total cost (TC)	209343	200689	197895	202642
Gross margin	243854	272011	286179	267348
Net return	191847	218801	235967	215538
BCR over total cost	1.92	2.09	2.19	2.07
Cost of production (Tk./kg)	8.11	7.56	6.96	7.54

Source: Author's own calculations from field survey data during 2018-19



Fig 11.13 Okra in the farmers field

11.14.4 Economic profitability of okra cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in okra relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of okra (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for okra for the year 2018-19 are presented in Table 11.62. The DRCs for okra was observed to be less than unity (0.087) implying that Bangladesh had comparative advantage in okra production for export promotion.

Table 11.62: Domestic resource cost (DRC) of okra (export parity)

Particulars	Districts			All Areas
	Pabna	Tangail	Chattogram	
A. Traded input (Tk/MT)	1202	1309	1190	1232
Urea	405	460	403	422

Particulars	Districts			All Areas
	Pabna	Tangail	Chattogram	
TSP	552	616	579	582
MoP	245	233	208	228
B. Non-Traded inputs and domestic resources (Tk/MT)	7243	6656	6152	6684
Human labour	3364	3164	3026	3185
Land preparation	348	355	337	347
Seedlings	1047	911	738	899
Manure	73	92	66	77
Pesticide	986	884	863	911
Irrigation	483	390	363	412
Int. on operating capital	120	109	102	110
Land use cost	822	752	658	744
C. Output price (Tk/MT)	77781	77776	77787	77782
D. Value added (Tradable) (Tk/MT) (C-A)	76580	76468	76597	76548
E. DRC (B/D)- Export parity	0.095	0.087	0.080	0.087

Source: Author's own calculations

11.14.5 Problems of okra cultivation

There were quite a few difficulties to cultivate okra in the study areas. The first and the foremost problem for okra cultivation in the study areas was low market price at harvesting time (56%). They mentioned severe infestation of insect (46%) and diseases (35%), high price of seed (24%), adulterated seed (21%), high price of fertilizer (8%), adulterated fertilizer (16%), crisis of labour at harvesting time (14%) and high wage rate (7%) were other problems in the study areas.(Table 11.63).

Table 11.63: Problems of okra cultivation

Particulars	% Farmers responded			
	Pabna	Tangail	Chattogram	All Areas
Seed related problems				
High price of seed	23	22	28	24
Adulterated seed	21	20	22	21
Fertilizer related problems				
Adulterated fertilizer	17	20	18	18
High price of fertilizer	8	11	9	9
Insect/disease related problems				
Severe insect infestation	44	46	49	46
Disease infection	33	36	35	35
Labour related problems				
Crisis of labour (Unavailability of labor in time)	12	17	14	14
Higher wages	7	6	8	7
Loan related problems				
Unavailability of bank loan	6	4	8	6
Marketing related problems				
Low market price	54	55	59	56

11.14.6 Remedial measure for okra cultivation

- Government should take initiatives to ensure reasonable price of okra at harvesting time
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.
- Mechanization technology should be introduced to the okra cultivation for minimizing labour crisis.

11.15 Financial and economic profitability of bitter gourd

11.15.1 Pattern of input use for bitter gourd cultivation

On an average, farmers applied Urea 340 kg/ha, TSP 320 kg/ha, MoP 281 kg/ha, zinc sulphate 7 kg/ha, boric acid 5 kg/ha and cowdung 1557 kg/ha for bitter gourd cultivation (Table 11.64). The cultivation of bitter gourd required on an average 256 man days which was highest (267 man-days) in Mymensingh (Table 11.64).

Table 11.64: Level of input use per hectare for bitter gourd cultivation

Particulars	Districts			
	Bogura	Jashore	Mymensingh	All Areas
Human labour (man-days)	255	246	267	256
Family	95	101	110	102
Hired	160	145	157	154
Seed (kg)	1.05	1.07	1.06	1.06
Cowdung (kg)	1560	1065	2045	1557
Urea (kg)	335	339	345	340
TSP (kg)	285	350	325	320
MoP (kg)	250	295	298	281
Zinc sulphate (kg)	6	7	7	7
Boric acid (kg)	4	5	7	5

Source: Field Survey during 2018-19

11.15.2 Cost of bitter gourd cultivation

The study revealed that total variable cost of bitter gourd cultivation was Tk.170724 per hectare which was 75% of total cost of production. Higher variable cost was recorded at Mymensingh (Tk. 172481/ha) than that of other two districts due to highest level of inputs used by the farmers. Among the different cost items, human labour cost was the major cost item which accounted for about 40% of total cost. Macha/fencing making cost was the second cost item which accounted for about 14% of total cost (Table 11.65). The third highest cost item was both pesticides and irrigation cost which accounted for about 9% of total cost. The total fixed cost was Tk. 55660 per hectare which accounted for about 25% of total cost of production. On an average total cost of production for bitter gourd was Tk. 226384 per hectare of which 25% was fixed costs and 75% was variable cost in the study areas (Table 11.65).

Table 11.65: Per hectare cost of bitter gourd

Figure in Tk.

Particulars	Districts			All Areas	% of total cost
	Bogura	Jashore	Mymensingh		
Variable cost					
Cost of land preparation	7859	8982	9730	8857	3.91
Hired labor	50750	56000	54950	53900	23.81
Seed	6420	6825	6890	6712	2.96
Cowdung	1597.5	2340	3067.5	2335	1.03
Urea	7458	7370	7590	7473	3.30
TSP	9100	7410	8450	8320	3.68
MoP	4720	4000	4768	4496	1.99
Zinc sulphate	1050	900	1050	1000	0.44
Boric acid	600	480	840	640	0.28

Figure in Tk.

Particulars	Districts			All Areas	% of total cost
	Bogura	Jashore	Mymensingh		
Irrigation	20336	22685	19660	20894	9.23
Fencing/Macha	33458	30252	33442	32384	14.30
Pesticides	22223	20215	18662	20367	9.00
Sub-total	165572	167459	169100	167377	73.93
Interest on ope. capital	3311	3349	3382	3348	1.48
Total variable cost	168883	170808	172481	170724	75.41
Fixed cost					
Family labor	35350	33250	38500	35700	15.77
Land use cost	21207	19960	18712	19960	8.82
Total fixed cost	56557	53210	57212	55660	24.59
Total cost	225440	224018	229693	226384	100.00

Source: Author's own calculations from field survey data during 2018-19

11.15.3 Financial profitability of bitter gourd

The average yield of bitter gourd was 25.80 ton per hectare. The yield was found to be slightly higher in Mymensingh (26.88t/ha) compared to Jashore (25.66 t/ha) and Bogura (24.85 t/ha). The average gross return from bitter gourd production was Tk. 416331/ha. Highest gross return was also obtained from Mymensingh (Tk.443520/ha) than that of other two districts which was due to highest yield and price of bitter gourd. Average gross margin was Tk. 245607 per hectare which varied from Tk. 271039 per hectare at Mymensingh Tk. 235262 per hectare at Jashore and Tk. 230519 per hectare at Bogura. Net return also followed similar trend. The average benefit cost ratio (BCR) was 1.84 which was also highest at Mymensingh (1.93) compared to other two districts. The average cost of producing per kg of bitter gourd was Tk. 8.78 (Table 11.66).

Table 11.66: Per hectare return of bitter gourd

Figure in Tk.

Particulars	Districts			
	Bogura	Jashore	Mymensingh	All Areas
Yield (ton)	24.85	25.66	26.88	25.80
Price (Tk./kg)	16.15	15.75	16.5	16.13
Gross return	401328	404145	443520	416331
Total variable cost (TVC)	170808	168883	172481	170724
Total fixed cost (TFC)	53210	56557	57212	55660
Total cost (TC)	224018	225440	229693	226384
Gross margin	230519	235262	271039	245607
Net return	177309	178705	213827	189947
BCR over total cost	1.79	1.79	1.93	1.84
Cost of production (Tk./kg)	9.01	8.79	8.55	8.78

Source: Author's own calculations from field survey data during 2018-19

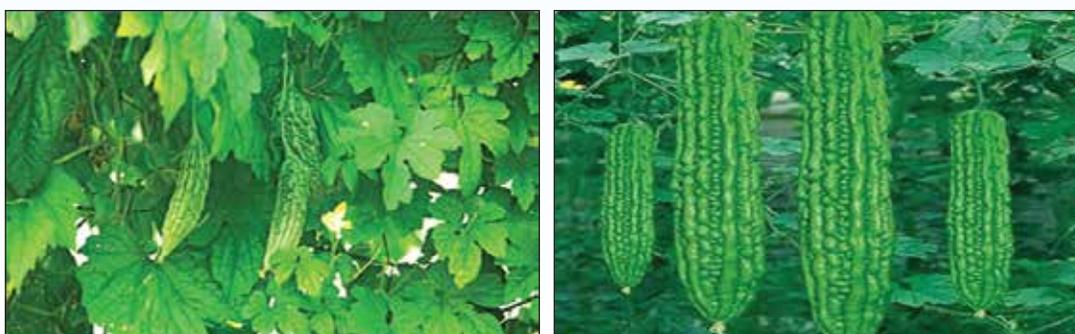


Fig 11.14 Bitter gourd in the farmers field

11.15.4 Economic profitability of bitter gourd cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in bitter gourd relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of bitter gourd (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for bitter gourd for the year 2018-19 are presented in Table 11.67. The DRCs for bitter gourd was observed to be less than unity (0.104) implying that Bangladesh had comparative advantage in bitter gourd production for export promotion.

Table 11.67: Domestic resource cost (DRC) of bitter gourd_ export parity

Particulars	Districts			All Areas
	Bogura	Jashore	Mymensingh	
A. Traded input (Tk/MT)	1195	1317	1230	1248
Urea	433	424	412	423
TSP	466	555	492	504
MoP	296	338	326	320
B. Non-Traded inputs and domestic resources (Tk/MT)	8149	7945	7701	7932
Human labour	3465	3478	3477	3473
Land preparation	316	350	362	343
Seedlings	258	266	256	260
Manure	64	91	114	90
Pesticide	894	788	694	792
Irrigation	818	884	731	811
Macha (Trellis)	1346	1179	1244	1256
Int. on oprating capital	133	131	126	130
Land use cost	853	778	696	776
C. Output price (Tk/MT)	77769	77777	77762	77770
D. Value added (Tradable) (Tk/MT) (C-A)	76574	76460	76532	76522
E. DRC (B/D) -Export parity	0.106	0.104	0.101	0.104

11.15.5 Problems faced by the farmers in bitter gourd cultivation

There are several problems farmers faced in bitter gourd cultivation in the study areas. The first and the foremost problem for bitter gourd cultivation was low market price at harvesting time (57%). They mentioned that due to severe infestation of insect (52%) and diseases (47%), bitter gourd yield was drastically reduced and it leads to heavy loss to the growers. They also mentioned that high price of seed (25%) and adulterated seed (13%) were the problems in the study areas. The other problems were high price of fertilizer (14%), adulterated fertilizer (13%) crisis of labour at harvesting time (15%) and high wage rate (8%) (Table 11.68).

Table 11.68: Problems faced by the farmers in of bitter gourd cultivation

Particulars	% Farmers responded			
	Bogura	Jashore	Mymenshingh	All Areas
Seed related problems				
High price of seed	23	24	28	25
Adulterated seed	12	15	11	13

Particulars	% Farmers responded			
	Bogura	Jashore	Mymensingh	All Areas
Fertilizer related problems				
Adulterated fertilizer	11	13	15	13
High price of fertilizer	10	13	18	14
Insect/disease related problems				
Severe insect infestation	52	55	50	52
Disease infestation	46	48	47	47
Labour related problems				
Crisis of labour (Unavailability of labor in time)	13	16	17	15
Higher wages	10	8	6	8
Loan related problems				
Unavailability of bank loan	7	5	8	7
Marketing related problems				
Low market price	56	55	60	57

11.15.6 Remedial measure of bitter gourd cultivation

- Government should take initiatives so that producers can get reasonable price of bitter gourd at harvesting time.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.
- Mechanization should be introduced to the respective areas for minimizing labour crisis.

11.16 Financial and economic profitability of cucumber

11.16.1 Pattern of input use for cucumber cultivation

In cultivating cucumber, farmers used 250 man-days of human labour per hectare which was used 255 man-days for Mymensingh, 252 man-days for Meherpur and 244 man-days for Chattogram (Table 11.69). On an average seed was required 1.11 per hectare for producing cucumber which was highest (1.25 kg/ha) in Meherpur than other two districts. On an average, farmers applied Urea at the rate of 346 kg/ha, TSP 443 kg/ha and MoP 204 kg/ha for producing cucumber. Among the chemical fertilizers TSP (443 kg/ha) was used at higher rate in the study areas. Farmers also used DAP (134 kg/ha), Gypsum (57 Kg/ha) and Zinc (12 kg/ha) in their cucumber fields.

Table 11.69: Level of input use per hectare for cucumber cultivation

Particulars	Districts			All areas
	Meherpur	Mymensingh	Chattogram	
Human labour (man-days)	252	255	244	250
Family	122	130	95	116
Hired	130	125	149	135
Seed (kg)	1.25	1.11	0.98	1.11
Cowdung (kg)	1560	1465	745	1257
Urea (kg)	317	372	350	346
TSP (kg)	476	471	382	443
MoP (kg)	196	237	178	204
DAP (kg)	195	76	131	134
Gypsum (kg)	62	87	22	57
Zinc (kg)	15	12	8	12

Source: Field Survey during 2018-19

11.16.2 Cost of cucumber cultivation

The analysis revealed that on an average total variable cost of cucumber cultivation was Tk. 144973 per hectare which accounted for 73% of the total cost of production. Among the cost items on an average human labour was the major cost item which accounted for 38% of the total cost in the study areas (Table 11.70). The second highest cost item was pesticide which accounted for about 10% of the total cost. For all variable costs, irrigation cost accounted for about 5% of the total cost and ranked third in the cost item. On an average the fixed cost item was Tk. 54660 per hectare which accounted for about 27% of the total cost of production (Table 11.70). On an average total cost of production for cucumber cultivation was Tk. 199633 per hectare of which 27% was fixed costs and about 73% was variable cost (Table 11.70).

Table 11.70: Per hectare cost of cucumber

Figure in Tk.

Particulars	Districts			All Areas	% of total cost
	Meherpur	Mymensingh	Chattogram		
Variable cost					
Cost of land preparation	7859	8982	9730	8857	4.44
Hired labor	39000	37500	44700	40400	20.24
Seed	5625	4995	4410	5010	2.51
Cowdung	1560	1465	745	1257	0.63
Urea	6974	8184	7700	7619	3.82
TSP	14280	14130	11460	13290	6.66
MoP	3136	3792	2848	3259	1.63
DAP	3120	1216	2096	2144	1.07
Gypsum	1364	1914	484	1254	0.63
Zinc	2250	1800	1200	1750	0.88
Irrigation	11884	8803	10612	10433	5.23
Pesticides	19108	22627	18365	20033	10.04
Macha (Trellis)	25122	26652	28699	26824	13.44
Sub-total	141282	142060	143049	142130	71.20
Interest on operating capital	2826	2841	2861	2843	1.42
Total variable cost	144108	144901	145910	144973	72.62
Fixed cost					
Family labor	36600	39000	28500	34700	17.38
Land use cost	21207	19960	18712	19960	10.00
Total fixed cost	57807	58960	47212	54660	27.38
Total cost	201915	203861	193122	199633	100.00

Source: Author's own calculations from field survey data during 2018-19

11.16.3 Financial profitability of cucumber

The average yield of cucumber was 24.42 ton per hectare which was found to be slightly higher in Mymensingh (25.64/ha) compared to Meherpur (24.41 t/ha) and Chattogram (23.20 t/ha). The average gross return from cucumber production was Tk. 357604/ha which was also higher in Mymensingh (Tk. 391025/ha) than that of other two districts due to higher yield of cucumber. Average gross margin was Tk. 212631 and net return was Tk. 157971 per hectare in the study areas. The average benefit cost ratio (BCR) was 1.79 which was more or less same in the study areas. The average cost of producing per kg of cucumber was Tk. 8.18 (Table 11.71).

Table 11.71: Per hectare returns from cucumber

Figure in Tk.

Particulars	Districts			All Areas
	Meherpur	Mymensingh	Chattogram	
Yield (ton)	24.41	25.64	23.20	24.42
Price (Tk./kg)	14.15	15.25	14.5	14.63
Gross return	345416	391025	336371	357604
Total variable cost (TVC)	144108	144901	145910	144973
Total fixed cost (TFC)	57807	58960	47212	54660
Total cost (TC)	201915	203861	193122	199633
Gross margin	201308	246124	190461	212631
Net return	143501	187164	143249	157971
BCR over total cost	1.71	1.92	1.74	1.79
Cost of production (Tk./kg)	8.27	7.95	8.32	8.18

Source: Author's own calculations from field survey data during 2018-19



Fig 11.15 Cucumber in the farmers field

11.16.4 Economic profitability of cucumber cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in cucumber relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of cucumber (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for cucumber for the year 2018-19 are presented in Table 11.72. The DRCs for cucumber was observed to be less than unity (0.103) implying that Bangladesh had comparative advantage in cucumber production for export promotion.

Table 11.72: Domestic resource cost (DRC) of cucumber (export parity)

Particulars	Districts			All Areas
	Meherpur	Mymensingh	Chattogram	
A. Traded input (Tk/MT)	1446	1485	1381	1438
Urea	417	466	485	456
TSP	793	747	670	737
MoP	236	272	226	245
B. Non-Traded inputs and domestic resources (Tk/MT)	6996	6740	7213	6983
Human labour	3097	2984	3155	3079
Land preparation	322	350	419	364

Particulars	Districts			All Areas
	Meherpur	Mymensingh	Chattogram	
Manure	64	57	32	51
Pesticide	783	882	792	819
Irrigation	487	343	457	429
Macha (Trellis)	1029	1039	1237	1102
Int. on operating capital	116	111	123	117
Land use cost	869	778	807	818
C. Output price (Tk/MT)	69498	69476	69491	69489
D. Value added (Tradable) (Tk/MT) (C-A)	68052	67991	68111	68052
E. DRC (B/D)- Export parity	0.103	0.099	0.106	0.103

Source: Author's own calculations

11.16.5 Problems of cucumber cultivation

There are numerous problems to cucumber production. The first and the foremost problem for cucumber cultivation in the study areas was low market price at harvesting time (58%). They mentioned severe infestation of insect (50%) and diseases (38%), high price of seed (21%), adulterated seed (19%), adulterated fertilizer (20%), crisis of labour at harvesting time (15%) as the problems of cucumber cultivation in the study areas. (Table 11.73).

Table 11.73: Problems of cucumber cultivation

Particulars	% Farmers responded			
	Meherpur	Mymensingh	Chattogram	All Areas
Seed related problems				
High price of seed	19	23	22	21
Adulterated seed	17	22	19	19
Fertilizer related problems				
Adulterated fertilizer	22	18	21	20
High price of fertilizer	7	8	9	8
Insect/disease related problems				
Severe insect infestation	49	46	55	50
Disease infestation	38	36	39	38
Labour related problems				
Unavailability of labor in time	11	18	16	15
Higher wages	8	7	8	8
Loan related problems				
Unavailability of bank loan	4	4	6	5
Marketing related problems				
Low market price	55	57	62	58

11.16.6 Remedial measure for cucumber cultivation

- Government should take initiatives to ensure reasonable price of cucumber at harvesting time
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field suggesting controlling measure for insect infestation.

11.17 Financial and economic profitability of ash gourd

11.17.1 Inputs use pattern for ash gourd cultivation

On an average 259 man-days of labour is required to cultivate ash gourd in one hectare of land. Farmers in the study areas used both family and hired labour for ash gourd cultivation (Table 11.74). On an average 1558 seedlings were planted in one hectare of land. Farmers used mainly chemical fertilizer for ash gourd cultivation. Among the chemical fertilizers, farmers used highest amount of urea for the selected districts in the study areas.

Table 11.74: Level of input use per hectare for ash gourd cultivation

Particulars	Districts			
	Dhaka (Savar)	Narshingdi	Cumilla	All Areas
Human labour (man-days)	250	257	270	259
Family	99	100	115	105
Hired	151	157	155	154
Seedlings (no.)	1550	1565	1560	1558
Cowdung (kg)	550	2050	3050	1883
Urea (kg)	235	301	332	289
TSP (kg)	212	265	250	242
MoP (kg)	150	150	175	158
Zinc sulphate (kg)	5	5	4	5
Boric acid (kg)	5	5	4	5

Source: Field Survey during 2018-19

11.17.2 Cost of ash gourd production

On an average the estimated total variable cost for ash gourd production was Tk.162828 per hectare in the selected study areas. These costs shared 74% of the total cost of production. Among the cost items, human labour was the major cost item which shared 41% of the total cost in the study areas (Table 11.75). The second important cost item was fencing which accounted for about 15% of the total cost. For all variable costs, irrigation cost accounted for about 10% of the total cost and ranked third in cost item. Pesticides cost for the selected districts were Tk. 15660/ha which accounted for about 7% of the total cost (Table 11.75). On an average total cost of production for ash gourd cultivation was Tk. 219421 per hectare of which 26% was fixed costs and 74% was variable cost (Table 11.75).

Table 11.75: Per hectare cost of ash gourd

Figure in Tk.

Particulars	Districts			All Areas	% of total cost
	Dhaka (Savar)	Narshingdi	Cumilla		
Variable cost					
Cost of land preparation	7859	8982	9730	8857	4.04
Hired labor	52850	54950	54250	54017	24.62
Seedlings	5425	5477.5	5460	5454	2.49
Cowdung	825	3075	4575	2825	1.29
Urea	5170	6622	7304	6365	2.90
TSP	5512	6890	6500	6301	2.87
MoP	2400	2400	2800	2533	1.15
Zinc sulphate	750	750	600	700	0.32
Boric acid	600	600	480	560	0.26
Irrigation	18336	22447	26347	22377	10.20
Fencing/Macha	32850	35560	33550	33987	15.49

Figure in Tk.

Particulars	Districts			All Areas	% of total cost
	Dhaka (Savar)	Narshingdi	Cumilla		
Pesticides	15620	14540	16820	15660	7.14
Sub-total	148197	162293.5	168416	159636	72.75
Interest on operating capital	2964	3246	3368	3193	1.46
Total variable cost	151161	165539	171784	162828	74.21
Fixed cost					
Family labor	34650	35000	40250	36633	16.70
Land use cost	21207	19960	18712	19960	9.10
Total fixed cost	55857	54960	58962	56593	25.79
Total cost	207018	220499	230746	219421	100.00

Source: Author's own calculations from field survey data during 2018-19

11.17.3 Financial profitability of ashgourd

Per hectare average yield of ash gourd was 45 t/ha and yield difference among the farmers was not prominent. On an average gross return was Tk. 378212/ha. Highest gross return was obtained in Cumilla district (Tk. 393125/ha) than that of other two districts. On an average, gross margin was Tk. 215383/ per hectare which was highest in Dhaka district (Tk. 224214 per hectare). The net return was Tk.158790 per hectare on an average which was also highest in Dhaka district (Tk. 168357 per hectare) due to lower production cost. The benefit cost ratio (BCR) was 1.73 which was also highest for Dhaka (1.81). On the basis of total cost, the cost of production per kilogram of ash gourd was about Tk. 5 in the study areas (Table 11.76).

Table 11.76: Per hectare return of ash gourd

Figure in Tk.

Particulars	Districts			
	Dhaka (Savar)	Jashore	Cumilla	All Areas
Yield (ton)	45.5	44.38	46.25	45.38
Price (Tk./kg)	8.25	8.25	8.5	8.33
Gross return	375375	366135	393125	378212
Total variable cost (TVC)	151161	165539	171784	162828
Total fixed cost (TFC)	55857	54960	58962	56593
Total cost (TC)	207018	220499	230746	219421
Gross margin	224214	200596	221341	215383
Net return	168357	145636	162379	158790
BCR over total cost	1.81	1.66	1.70	1.73
Cost of production (Tk./kg)	4.55	4.97	4.99	4.84

Source: Author's own calculations from field survey data during 2018-19



Fig 11.16 Ash gourd in the farmers field

Table 11.77: Domestic resource cost (DRC) of ash gourd (export parity)

Particulars	Districts			All Areas
	Dhaka	Jashore	Cumilla	
A. Traded input (Tk/MT)	452	560	562	525
Urea	166	218	231	205
TSP	189	243	220	217
MoP	97	99	111	103
B. Non-Traded inputs and domestic resources (Tk/MT)	4233	4579	4607	4473
Human labour	1923	2027	2043	1998
Land preparation	173	202	210	195
Seedlings	119	123	118	120
Manure	18	69	99	62
Pesticide	343	328	364	345
Irrigation	403	506	570	493
Macha (Trellis)	722	801	725	750
Interest on oprating capital	65	73	73	70
Land use cost	466	450	405	440
C. Output price (Tk/MT)	77927	77927	77922	77926
D. Value added (Tradable) (Tk/MT) (C-A)	77475	77367	77361	77401
E. DRC (B/D) - Export parity	0.055	0.059	0.060	0.058

Source: Author's own calculations

11.17.4 Economic profitability of ashgourd cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in ash gourd relative to other countries. The estimates of DRCs for ash gourd for the year 2018-19 are presented in Table 11.77. The DRCs for ash gourd was observed to be less than unity (0.058) implying that Bangladesh had comparative advantage in ash gourd production for export promotion.

11.17.5 Problems of ash gourd cultivation

There are several problems to ash gourd production. The first and the foremost constraint for ash gourd in all areas was low market price at harvesting time (54%) and market syndicate (7%). They mentioned that due to severe infestation of insect (52%) and diseases (49%), ash gourd yield was drastically reduced and it leads to heavy loss to the growers. They also mentioned that lack of quality seed (19%) and adulterated seed (20%) were other problems in the study areas. They also mentioned adulterated fertilizer (23%), crisis of labour at harvesting time (25%) and high wage of labour (11%) as the difficulties in ash gourd cultivation in the study areas (Table 11.78).

Table 11.78: Problems of ash gourd cultivation

Particulars	% Farmers opined			
	Dhaka	Jashore	Cumilla	All Areas
Seed related problem				
Lack of good quality seed	26	22	9	19
High price of seed	10	8	9	9
Adulterated seed	22	20	19	20

Particulars	% Farmers opined			
	Dhaka	Jashore	Cumilla	All Areas
Fertilizer related problems				
Adulterated fertilizer	25	23	22	23
Insect and disease related				
Infested with insect	53	55	49	52
Infested with disease	48	55	44	49
Labour related problems				
Crisis of labour	22	28	25	25
High wage of labour	10	12	11	11
Loan/Credit related problem				
Unavailability of bank loan	9	8	7	8
Marketing related problem				
Lower market price	50	55	58	54
Market syndicate	8	6	7	7

11.17.6 Remedial measure for ash gourd cultivation

- Government should take initiatives to ensure reasonable price of ash gourd at harvesting time
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.

11.18 Financial and economic profitability of snake gourd

11.18.1 Input use pattern of snake gourd

The human labour used for producing snake gourd on an average was found to be 250 man-days per hectare of which highest was in Cumilla (270 man-days) than other two districts (Narshingdi 250 man-days/ha and Jashore 230 man-days). The average quantity of seed used by the farmers was 1.06 kg/ha. On an average, farmers used cow dung 1348 kg/ha which was highest (1550 kg/ha) at Cumilla compared to other two districts. On an average, farmers applied Urea 304 kg/ha, TSP 224 kg/ha, MoP 181 kg/ha, Zinc sulphate 6 kg/ha and Boric acid 4 kg/ha (Table 11.79) for snake gourd cultivation in the study areas.

Table 11.79: Level of input use per hectare for snake gourd cultivation

Particulars	Districts			
	Jashore	Narshingdi	Cumilla	All Areas
Human labour (man-days)	230	250	270	250
Family	75	88	105	89
Hired	155	162	165	161
Seed (kg)	1.08	1.06	1.05	1.06
Cowdung (kg)	1250	1245	1550	1348
Urea (kg)	302	298	312	304
TSP (kg)	195	201	275	224
MoP (kg)	175	188	180	181
Zinc sulphate (kg)	6	6	6	6
Boric acid (kg)	4	5	4	4

Source: Field Survey during 2018-19

11.18.2 Cost of snake gourd production

On an average the estimated total variable cost for snake gourd production were Tk.172237 per hectare and these costs shared 77% of the total cost of production. The highest variable cost was incurred by the Cumilla farmers (Tk. 174090/ha) due to the use of higher level of inputs. Among the cost items, human labour (both hired and family supplied) was the major cost item which shared 39% of the total cost in the study areas (Table 11.80). The second highest cost item was fencing which accounted for about 16% of the total cost. For all variable costs, pesticides cost accounted for about 10% of the total cost and ranked third in cost item. Rental value of land and family supplied labour were considered as fixed cost of production for snake gourd. On an average the cost of this item was Tk. 51226 per hectare which accounted for about 23% of the total cost of production (Table 11.80). On an average total cost of production for snake gourd cultivation was Tk. 223463 per hectare of which 23% was fixed costs and 77% was variable cost (Table 11.80). It was observed that the total cost of production of snake gourd was highest (Tk. 229552 per hectare) in Cumilla compared to other two districts due to use of high amount of inputs.

Table 11.80: Per hectare cost of snake gourd

Figure in Tk.

Particulars	Districts			All Areas	% of total cost
	Jashore	Narshingdi	Cumilla		
Variable cost					
Cost of land preparation	7859	8982	9730	8857	3.96
Hired labour	54250	56700	57750	56233	25.16
Seedlings	6480	6890	6825	6732	3.01
Cowdung	1875	1867.5	2325	2023	0.91
Urea	6644	6556	6864	6688	2.99
TSP	5070	5226	7150	5815	2.60
MoP	2800	3008	2880	2896	1.30
Zinc sulphate	900	900	900	900	0.40
Boric acid	480	600	480	520	0.23
Irrigation	20336	22685	19660	20894	9.35
Fencing/Macha	35545	33254	35642	34814	15.58
Pesticides	24545	22450	20470	22488	10.06
Sub-total	166784	169118.5	170676	168860	75.57
Interest on operating capital	3336	3382	3414	3377	1.51
Total variable cost	170120	172501	174090	172237	77.08
Fixed cost					
Family labor	26250	30800	36750	31267	13.99
Land use cost	21207	19960	18712	19960	8.93
Total fixed cost	47457	50760	55462	51226	22.92
Total cost	217577	223261	229552	223463	100.00

Source: Author's own calculations from field survey data during 2018-19

11.18.3 Financial profitability of snake gourd

The average yield of snake gourd was 27.90 ton per hectare. The yield was found to be slightly higher in Narshingdi (28.45 t/ha) compared to Jashore (27.65 t/ha) and Cumilla (27.60 t/ha). The average gross return from snake gourd production was Tk. 411521/ha. Highest gross return was obtained in Narshingdi (Tk. 419638/ha) than that of other two districts which was due to highest yield of bitter gourd. Average gross margin was Tk. 239284 per hectare which varied from Tk. 247137 per hectare at Narshingdi, Tk. 239910 per hectare at Cumilla and Tk. 230805 per hectare at Jashore. Net return was Tk. 188058 on an average in the study areas. The average benefit cost ratio (BR) was 1.84 which was also highest at Narshingdi (1.88) compared to other two districts. The average cost in producing per kg of snake gourd was Tk. 8.01 (Table 11.81).

Table 11.81: Per hectare returns from snake gourd

Figure in Tk.

Particulars	Districts			
	Jashore	Narshingdi	Cumilla	All Areas
Yield (ton)	27.65	28.45	27.6	27.9
Price (Tk./kg)	14.5	14.75	15	14.75
Gross return	400925	419638	414000	411521
Total variable cost (TVC)	170120	172501	174090	172237
Total fixed cost (TFC)	47457	50760	55462	51226
Total cost (TC)	217577	223261	229552	223463
Gross margin	230805	247137	239910	239284
Net return	183348	196377	184448	188058
BCR over total cost	1.84	1.88	1.80	1.84
Cost of production (Tk./kg)	7.87	7.85	8.32	8.01

Source: Author's own calculations from field survey data during 2018-19



Fig 11.17 Snake gourd in the farmers field

Table 11.82: Domestic resource cost (DRC) of snake gourd (export parity)

Particulars	Districts			All Areas
	Jashore	Narshingdi	Cumilla	
A. Traded input (Tk/MT)	824	817	960	867
Urea	351	336	363	350
TSP	287	287	405	326
MoP	186	194	192	191
B. Non-Traded inputs and domestic resources (Tk/MT)	7294	7275	7655	7408
Human labour	2911	3076	3424	3137
Land preparation	284	316	353	317
Seedlings	234	242	247	241
Manure	68	66	84	73
Pesticide	888	789	742	806
Irrigation	735	797	712	748
Macha	1286	1169	1291	1249
Int. on operating capital	121	119	124	121
Land use cost	767	702	678	716

Particulars	Districts			All Areas
	Jashore	Narshingdi	Cumilla	
C. Output price (Tk/MT)	77802	77797	77792	77797
D. Value added (Tradable) (Tk/MT) (C-A)	76978	76979	76832	76930
E. DRC (B/D)- Export parity	0.095	0.095	0.100	0.096

Source: Author's own calculations

11.18.4 Economic profitability of snake gourd cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in snake gourd relative to other countries. The estimates of DRC for snake gourd for the year 2018-19 are presented in Table 11.82. The DRC for snake gourd was observed to be less than unity (0.096) implying that Bangladesh had comparative advantage in snake gourd production for export promotion.

11.18.5 Problems of snake gourd cultivation

There are several problems to snake gourd production in the study areas. Low market price at harvesting time (52%) was found more responded problem in snakegourd cultivation. Farmers mentioned that due to severe infestation of insect (54%) and diseases (50%), snake gourd yield was drastically reduced and it leads to substantial amount of loss to the growers. They also mentioned that lack of quality seed (25%) and adulterated seed (22%), fertilizer not working properly (25%) might be due to adulterations, crisis of labour at harvesting time (23%) and high wage of labour (8%) were other problems in the study areas. (Table 11.83).

Table 11.83: Problems of snake gourd cultivation

Particulars	% Farmers opined			
	Jashore	Narshingdi	Cumilla	All Areas
Seed related problem				
Lack of good quality seed	27	25	22	25
High price of seed	11	8	8	9
Adulterated seed	24	22	21	22
Fertilizer related problems				
Adulterated fertilizer	28	22	26	25
Insect and disease related				
Infested with insect	55	58	48	54
Infested with disease	50	51	48	50
Labour related problems				
Crisis of labour	20	22	26	23
High wage of labour	9	7	7	8
Loan/Credit related problem				
Unavailability of bank loan	6	5	7	6
Marketing related problem				
Lower market price	48	52	55	52
Market syndicate	7	9	6	7

11.18.6 Remedial measure for snake gourd cultivation

- Government should take initiatives to ensure reasonable price of snake gourd at harvesting time.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.

11.19 Financial and economic profitability of teasel gourd

11.19.1 Pattern of input use for teasel gourd cultivation

In the selected districts, farmers used different level of inputs for teasel gourd cultivation. An attempt was made to estimate the level of inputs used and benefits obtained by the farmers of selected districts. On an average, farmers applied Urea at the rate of 327 kg/ha, TSP 346 kg/ha, and MoP 207 kg/ha. It was observed that among the chemical fertilizers, farmers used highest amount of TSP for the selected districts in the study areas (Table 11.84). Farmers used on an average 235 man-days per hectare of total human labour (both family & hired) for teasel gourd cultivation, which was higher (245 man-days) for Jashore compared to other two districts. In the study areas, farmers applied also Zinc sulphate and Boric acid for teasel gourd cultivation.

Table 11.84: Level of input use per hectare for teasel gourd cultivation

Particulars	Districts			
	Rangpur	Jashore	Cumilla	All Areas
Human labour (man-days)	225	245	235	235
Family	75	85	80	80
Hired	150	160	155	155
Seed (kg)	0.85	0.8	0.82	0.82
Cowdung (kg)	2155	1620	2140	1972
Urea (kg)	322	320	338	327
TSP (kg)	342	340	355	346
MoP (kg)	210	201	210	207
Zinc sulphate (kg)	5	6	7	6
Boric acid (kg)	5	5	4	5

Source: Field Survey during 2018-19

11.19.2 Cost of cultivation of teasel gourd

On an average the estimated total variable cost for teasel gourd production were Tk.171781 per hectare which shared 78% of the total cost of production. Among the cost items, human labour (both hired and family supplied) was the major cost item which shared 38% of the total cost in the study areas (Table 11.85). The second highest cost item was fencing which accounted for about 18% of the total cost. Among the variable costs, pesticides cost accounted for about 9% of the total cost and ranked third in cost item. On an average the fixed cost item was Tk. 47960 per hectare which accounted for about 22% of the total cost of production (Table 11.85). On an average total cost of production for teasel gourd cultivation was Tk. 219741 per hectare of which about 22% was fixed costs and 78% was variable cost (Table 11.85).

Table 11.85: Per hectare cost of teasel gourd

Particulars	Districts			All Areas	Figure in Tk. % of total cost
	Rangpur	Jashore	Cumilla		
Variable cost					
Cost of land preparation	8981	9430	9581	9331	4.25
Hired labor	52500	56000	54250	54250	24.69
Seedlings	5100	5200	5330	5210	2.37
Cowdung	3233	2430	3210	2958	1.35

Figure in Tk.

Particulars	Districts			All Areas	% of total cost
	Rangpur	Jashore	Cumilla		
Urea	7084	7040	7436	7187	3.27
TSP	8892	8840	9230	8987	4.09
MoP	3360	3216	3360	3312	1.51
Zinc sulphate	750	900	1050	900	0.41
Boric acid	600	600	480	560	0.25
Irrigation	15450	16450	17480	16460	7.49
Fencing/Macha	38450	37520	39450	38473	17.51
Pesticides	18750	22150	21456	20785	9.46
Sub-total	163150	169776	172313	168413	76.64
Interest on operating capital	3263	3396	3446	3368	1.53
Total variable cost	166412	173172	175759	171781	78.17
Fixed cost					
Family labor	26250	29750	28000	28000	12.74
Land use cost	21207	19960	18712	19960	9.08
Total fixed cost	47457	49710	46712	47960	21.83
Total cost	213869	222882	222471	219741	100.00

Source: Author's own calculations from field survey data during 2018-19

11.19.3 Financial profitability of teasel gourd

The average yield of teasel gourd was 28.27 ton per hectare which was found to be slightly higher in Cumilla (28.75 t/ha) compared to Jashore (28.52 t/ha) and Rangpur (27.55 t/ha). The average gross return from teasel gourd production was Tk. 348725/ha which was highest in Jashore (Tk. 356500/ha). Average gross margin was Tk. 176944 per hectare. Net return was Tk. 128984 on an average in the study areas. The average benefit cost ratio (BCR) was 1.59 which was also highest at Jashore (1.60) compared to other two districts. The average cost of producing per kg of teasel gourd was Tk. 7.77 (Table 11.86).

Table 11.86: Per hectare returns from teasel gourd

Figure in Tk.

Particulars	Districts			
	Rangpur	Jashore	Cumilla	All Areas
Yield (ton)	27.55	28.52	28.75	28.27
Price (Tk./kg)	12.25	12.50	12.25	12.33
Gross Return	337488	356500	352188	348725
Total variable cost (TVC)	166412	173172	175759	171781
Total fixed cost (TFC)	47457	49710	46712	47960
Total cost (TC)	213869	222882	222471	219741
Gross Margin	171075	183328	176428	176944
Net Return	123618	133618	129716	128984
BCR over total cost	1.58	1.60	1.58	1.59
Cost of production (Tk./kg)	7.76	7.81	7.74	7.77

Source: Author's own calculations from field survey data during 2018-19



Fig 11.18 Teasel gourd in the farmers field

11.19.4 Economic profitability of teasel gourd cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in teasel gourd production relative to other countries. The estimates of DRCs for teasel gourd for the year 2018-19 are presented in Table 11.87. The DRCs for teasel gourd was observed to be less than unity (0.092) implying that Bangladesh had comparative advantage in teasel gourd production for export promotion.

Table 11.87: Domestic resource cost (DRC) of teasel gourd (export parity)

Particulars	Districts			All Areas
	Rangpur	Jashore	Cumilla	
A. Traded input (Tk/MT)	1104	1053	1095	1084
Urea	375	360	378	371
TSP	505	485	502	497
MoP	224	207	215	215
B. Non-Traded inputs and domestic resources (Tk/MT)	7012	7093	6988	7031
Human labour	2858	3007	2861	2909
Land preparation	326	331	333	330
Seedlings	185	182	185	184
Manure	117	85	112	105
Pesticide	681	777	746	735
Irrigation	561	577	608	582
Macha	1396	1316	1372	1361
Interest on operating capital	118	119	120	119
Land use cost	770	700	651	707
C. Output price (Tk/MT)	77847	77842	77847	77846
D. Value added (Tradable) (Tk/MT) (C-A)	76743	76790	76753	76762
E. DRC (B/D)- Export parity	0.091	0.092	0.091	0.092

Source: Author's own calculations

11.19.5 Problems of teasel gourd cultivation

There are several problems to teasel gourd production. The acute problems for teasel gourd cultivation in the study areas was low market price at harvesting time (54%) and market syndicate (12%). They mentioned severe infestation of insect (51%) and diseases (46%), Farmers also mentioned lack of quality seed (25%), adulterated seed (23%), adulterated fertilizer (23%), crisis of labour at harvesting time (21%)

and high wage of labour (7%) as some difficulties of teasel gourd cultivation in the study areas (Table 11.88).

Table 11.88: Problems of teasel gourd cultivation

Particulars	% Farmers responded			
	Rangpur	Jashore	Cumilla	All Areas
Seed related problem				
Lack of good quality seed	25	28	22	25
High price of seed	10	7	9	9
Adulterated seed	22	23	25	23
Fertilizer related problems				
Adulterated fertilizer	25	23	22	23
Insect and disease related				
Infested with insect	51	53	50	51
Infected with disease	47	44	48	46
Labour related problems				
Crisis of labour	18	21	24	21
High wage of labour	7	8	7	7
Loan/Credit related problem				
Unavailability of bank loan	7	8	7	7
Marketing related problem				
Lower market price	52	55	55	54
Market syndicate	11	10	14	12

11.19.6 Remedial measure for teasel gourd cultivation

- Government should take initiatives to ensure reasonable price of teasel gourd at harvesting time
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.

11.20 Financial and economic profitability of ridge gourd

11.20.1 Pattern of input use for ridge gourd cultivation

On an average, farmers applied the chemical fertilizers to their ridge gourd field at the rate of urea 333 kg/ha, TSP 335 kg/ha and MoP 202 kg/ha. Farmers also used zinc sulphate and Boric acid in their ridge gourd field. For ridge gourd cultivation farmers used 224 man-days per hectare of total human labour, which was higher (242 man-days) at Narshingdi district than other two districts (Table 11.89). In the study areas, seed was used on an average 0.43 kg/ha.

Table 11.89: Level of input use per hectare for ridge gourd cultivation

Particulars	Districts			
	Jashore	Narshingdi	Cumilla	All Areas
Human labour (man-days)	230	242	200	224
Family	75	82	60	72
Hired	155	160	140	152
Seed (kg)	0.45	0.42	0.41	0.43
Cowdung (kg)	1560	1620	1450	1543
Urea (kg)	325	325	350	333
TSP (kg)	345	315	345	335

Particulars	Districts			
	Jashore	Narshingdi	Cumilla	All Areas
MoP (kg)	195	201	211	202
Zinc sulphate (kg)	10	12	15	12
Boric acid (kg)	5	7	7	6

Source: Field Survey during 2018-19

11.20.2 Cost of cultivation for ridge gourd

The study revealed that on an average total variable cost of ridge gourd cultivation was Tk.164279 per hectare which accounted 78% of the total cost of production. The variable cost in all districts were more or less same due the favorable environment for producing vegetables. Among the cost items on an average human labour was the major cost item which accounted 37% of the total cost in the study areas (Table 11.90). The second highest cost item was fencing which accounted for about 15% of the total cost. For all variable costs, irrigation cost accounted for about 12% and pesticides cost for about 6% of the total cost and ranked third and fourth respectively among the cost items. On an average the fixed cost item was Tk. 45276 per hectare which accounted for about 22% of the total cost of production (Table 11.90). On an average total cost of production for ridge gourd cultivation was Tk. 209555 per hectare of which 22% was fixed costs and 78% was variable cost (Table 11.90).

Table 11.90: Per hectare cost of ridge gourd cultivation

Figure in Tk.

Particulars	Districts				% of total cost
	Jashore	Narshingdi	Cumilla	All Areas	
Variable cost					
Cost of land preparation	8981	9430	9581	9331	4.45
Hired labor	54250	56000	49000	53083	25.33
Seedlings	5175	5040	4920	5045	2.41
Cowdung	2340	2430	2175	2315	1.10
Urea	7150	7150	7700	7333	3.50
TSP	8970	8190	8970	8710	4.16
MoP	3120	3216	3376	3237	1.54
Zinc sulphate	1500	1800	2250	1850	0.88
Boric acid	600	840	840	760	0.36
Irrigation	24550	22450	25650	24217	11.56
Fencing/Macha	32540	29890	33250	31893	15.22
Pesticides	14550	12450	12850	13283	6.34
Sub-total	163726	158886	160562	161058	76.86
Interest on operating capital	3275	3178	3211	3221	1.54
Total variable cost	167001	162064	163773	164279	78.39
Fixed cost					
Family labor	26250	28700	21000	25317	12.08
Land use cost	21207	19960	18712	19960	9.52
Total fixed cost	47457	48660	39712	45276	21.61
Total cost	214458	210724	203485	209555	100.00

Source: Author's own calculations from field survey data during 2018-19

11.20.3 Financial profitability of ridge gourd cultivation

The average yield of ridge gourd was 22.10 ton per hectare which was found to be slightly highest in Cumilla (22.60 t/ha) compared to Jashore (22.45 t/ha) and Narshingdi (21.25 t/ha). The average gross return from ridge gourd production was Tk. 352196/ha which was higher in Cumilla (Tk. 367250/ha) than that of other two districts which was due to highest yield of ridge gourd. Average gross margin was Tk. 187917 per hectare. Net return was Tk. 142640 on an average in the study areas. The average benefit cost ratio (BCR) was 1.68 which was also highest at Cumilla (1.80) compared to other two districts. The average cost of producing per kg of ridge gourd was Tk. 9.49 (Table 11.91).

Table 11.91: Per hectare returns from ridge gourd cultivation

Figure in Tk.

Particulars	Districts			
	Jashore	Narshingdi	Cumilla	All Areas
Yield (ton)	22.45	21.25	22.6	22.10
Price (Tk./kg)	15.75	15.8	16.25	15.93
Gross return	353588	335750	367250	352196
Total variable cost (TVC)	167001	162064	163773	164279
Total fixed cost (TFC)	47457	48660	39712	45276
Total cost (TC)	214458	210724	203485	209555
Gross margin	186587	173686	203477	187917
Net return	139130	125026	163765	142640
BCR over total cost	1.65	1.59	1.80	1.68
Cost of production (Tk./kg)	9.55	9.92	9.00	9.49

Source: Author's own calculations from field survey data during 2018-19



Fig 11.19 Ridge gourd in the farmers field

11.20.4. Economic profitability of ridge gourd Cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in ridge gourd relative to other countries. The estimates of DRC for ridge gourd for the year 2018-19 are presented in Table 11.92. The DRCs for ridge gourd was observed to be less than unity (0.111) implying that Bangladesh had comparative advantage in ridge gourd production for export promotion.

Table 11.92: Domestic resource cost (DRC) of ridge gourd (export parity)

Particulars	District			All Areas
	Jashore	Narshingdi	Cumilla	
A. Traded input (Tk/MT)	1345	1372	1393	1370
Urea	465	491	497	485
TSP	625	603	621	616
MoP	255	278	275	269

Particulars	District			All Areas
	Jashore	Narshingdi	Cumilla	
B. Non-Traded inputs and domestic resources (Tk/MT)	8602	8919	7980	8500
Human labour	3586	3986	3097	3556
Land preparation	400	444	424	423
Seedlings	231	237	218	228
Manure	104	114	96	105
Pesticide	648	586	569	601
Irrigation	1094	1056	1135	1095
Macha (Trellis)	1449	1407	1471	1442
Interest on oprating capital	146	150	142	146
Land use cost	945	939	828	904
C. Output price (Tk/MT)	77777	77776	77767	77774
D. Value added (Tradable) (Tk/MT) (C-A)	76432	76404	76374	76403
E. DRC (B/D)- Export parity	0.113	0.117	0.104	0.111

Source: Author's own calculations

11.20.5 Problems of ridge gourd cultivation

There are a number of problems to ridge gourd production in the study areas. Majority of the farmers mentioned low market price at harvesting time (47%) and severe infestation of insect (47%) and diseases (39%) as acute problem in ridge gourd cultivation in the study areas. They also mentioned lack of quality seed (24%), adulterated seed (20%), adulterations of fertilizers (18%), crisis of labour at harvesting time (15%) and high wage of labour (7%) as the problems of ridge gourd cultivation in the study areas (Table 11.93).

Table 11.93: Problems of ridge gourd cultivation

Particulars	% Farmers responded			
	Jashore	Narshingdi	Cumilla	All Areas
Seed related problem				
Lack of good quality seed	22	26	25	24
High price of seed	9	7	7	8
Adulterated seed	20	21	18	20
Fertilizer related problems				
Adulterated fertilizer	20	18	16	18
Insect and disease related				
Infested with insect	47	44	49	47
Infected with disease	38	36	44	39
Labour related problems				
Crisis of labour	14	16	14	15
High wage of labour	6	7	7	7
Loan/Credit related problem				
Unavailability of bank loan	7	6	7	7
Marketing related problem				
Lower market price	45	48	49	47
Market syndicate	7	8	7	7

11.20.6 Remedial measure for ridge gourd cultivation

- Good quality seed should be made available to the farmers for increasing productivity of ridge gourd.
- Government should take initiatives to ensure reasonable price of ridge gourd at harvesting time.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field to give appropriate suggestions to the farmers so that insects and disease can be controlled and production of ridge gourd increased.

11.21 Financial and economic profitability of sponge gourd

11.21.1 Pattern of input use for sponge gourd cultivation

In cultivating sponge gourd, farmers used 227 man-days of human labour per hectare which was 232 man-days for Narshingdi, 230 man-days for Cumilla and 217 man-days for Jashore (Table 11.94). On an average, farmers applied Urea at the rate of 312 kg/ha, TSP 203 kg/ha and MoP 173 kg/ha for producing sponge gourd. In the study areas, farmers used also Zinc sulphate and Boric acid in their sponge gourd fields.

Table 11.94: Level of input use per hectare for sponge gourd cultivation

Particulars	Districts			
	Jashore	Narshingdi	Cumilla	All Areas
Human labour (man-days)	217	232	230	227
Family	65	72	78	72
Hired	152	160	152	155
Seed (kg)	0.62	0.55	0.57	0.58
Cowdung (kg)	750	980	1055	928
Urea (kg)	315	312	310	312
TSP (kg)	201	199	208	203
MoP (kg)	165	180	175	173
Zinc sulphate (kg)	5	6	5	5
Boric acid (kg)	4	5	4	4

Source: Field Survey during 2018-19

11.21.2 Cost of cultivation of sponge gourd

On an average total variable cost of sponge gourd cultivation was Tk.154585 per hectare which accounted 77% of the total cost. The variable cost of sponge gourd in the study areas was more or less same due the favorable environment for producing vegetables. Among the cost items on an average human labour was the major cost item which accounted 40% of the total cost in the study areas (Table 11.95). The second highest cost item was fencing which accounted for about 16% of the total cost. Among the variable costs, pesticides cost accounted for about 9% and irrigation cost for about 8% of the total cost and ranked third and fourth respectively in the cost items. On an average the fixed cost was Tk. 45043 per hectare which accounted for about 23% of the total cost of production (Table 11.95). On an average total cost of production for sponge gourd cultivation was Tk. 199628 per hectare of which 23% was fixed costs and 77% was variable cost (Table 11.95).

Table 11.95: Per hectare cost of sponge gourd

Figure in Tk.

Particulars	Districts				% of total cost
	Jashore	Narshingdi	Cumilla	All Areas	
Variable cost					
Cost of land preparation	7859	8982	9730	8857	4.44
Hired labor	53200	56000	53200	54133	27.12
Seedlings	3410	3300	3420	3377	1.69
Cowdung	1125	1470	1583	1393	0.70
Urea	6930	6864	6820	6871	3.44
TSP	5226	5174	5408	5269	2.64
MoP	2640	2880	2800	2773	1.39
Zinc sulphate	750	900	750	800	0.40
Boric acid	480	600	480	520	0.26
Irrigation	14550	16450	18456	16485	8.26
Fencing/Macha	32550	31245	33250	32348	16.20
Pesticides	19850	17650	18680	18727	9.38
Sub-total	148570	151515	154577	151554	75.92
Interest on operating capital	2971	3030	3092	3031	1.52
Total variable cost	151541	154545	157668	154585	77.44
Fixed cost					
Family labor	22750	25200	27300	25083	12.57
Land use cost	21207	19960	18712	19960	10.00
Total fixed cost	43957	45160	46012	45043	22.56
Total cost	195498	199705	203680	199628	100.00

Source: Author's own calculations from field survey data during 2018-19

11.21.3 Financial profitability of sponge gourd

The average yield of sponge gourd was 26.14 ton per hectare which was found to be slightly highest in Narshingdi (26.45 t/ha) compared to Cumilla (26.42 t/ha) and Jashore (25.55 t/ha). The average gross return from sponge gourd production was Tk. 328879/ha which was highest in Narshingdi (Tk. 330625/ha) than that of other two districts which was due to highest yield of sponge gourd. Average gross margin was Tk. 174294 per hectare and net return was Tk. 129251 in the study areas. The average benefit cost ratio (BCR) was 1.65 which was slightly higher at Jashore (1.67) compared to other two districts. The average cost of producing per kg of sponge gourd was Tk. 7.64 (Table 11.96).

Table 11.96: Per hectare returns from sponge gourd

Figure in Tk.

Particulars	Districts			
	Jashore	Narshingdi	Cumilla	All Areas
Yield (ton)	25.55	26.45	26.42	26.14
Price (Tk./kg)	12.75	12.5	12.5	12.58
Gross return	325763	330625	330250	328879
Total variable cost (TVC)	151541	154545	157668	154585
Total fixed cost (TFC)	43957	45160	46012	45043
Total cost (TC)	195498	199705	203680	199628

Figure in Tk.

Particulars	Districts			
	Jashore	Narshingdi	Cumilla	All Areas
Gross margin	174221	176080	172582	174294
Net return	130264	130920	126570	129251
BCR over total cost	1.67	1.66	1.62	1.65
Cost of production (Tk./kg)	7.65	7.55	7.71	7.64

Source: Author's own calculations from field survey data during 2018-19



Fig 11.20 Sponge gourd in the farmers field

Table 11.97: Domestic resource cost (DRC) of sponge gourd (export parity)

Particulars	Districts			All Areas
	Jashore	Narshingdi	Cumilla	
A. Traded input (Tk/MT)	906	885	892	894
Urea	396	379	377	384
TSP	320	306	320	315
MoP	190	200	195	195
B. Non-Traded inputs and domestic resources (Tk/MT)	7024	6930	7094	7016
Human labour	2973	3070	3047	3030
Land preparation	308	340	368	338
Seedlings	133	125	129	129
Manure	44	56	60	53
Pesticide	777	667	707	717
Irrigation	569	622	699	630
Macha (Trellis)	1274	1181	1259	1238
Interest on operating capital	116	115	117	116
Land use cost	830	755	708	764
C. Output price (Tk/MT)	77777	77782	77782	77781
D. Value added (Tradable) (Tk/MT) (C-A)	76871	76897	76890	76886
E. DRC (B/D)- Export parity	0.091	0.090	0.092	0.091

Source: Author's own calculations

11.21.4 Economic profitability of sponge gourd cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in sponge gourd relative to other countries. The estimates of DRCs for sponge gourd for the year 2018-19 are presented in Table 11.97. The DRCs for sponge gourd was observed to be less than unity (0.091) implying that Bangladesh had comparative advantage in ridge gourd production for export promotion.

11.21.5 Problems of sponge gourd cultivation

Farmers in the study areas faced a number of difficulties in cultivating sponge gourd. Half of the respondents mentioned they got lower market price at harvesting time. They mentioned that due to severe infestation of insect (46%) and diseases (37%), they face the problem of yield loss. They also mentioned lack of quality seed (22%), adulterated seed (18%), adulterated fertilizer (20%), crisis of labour at harvesting time (13%) and high wage of labour (7%) were the problems of sponge gourd cultivation in the study areas. (Table 11.98).

Table 11.98: Problems of sponge gourd cultivation

Particulars	% Farmers opined			
	Jashore	Narshingdi	Cumilla	All Areas
Seed related problem				
Lack of good quality seed	21	22	24	22
High price of seed	8	7	6	7
Adulterated seed	18	19	18	18
Fertilizer related problems				
Adulterated fertilizer	22	21	18	20
Insect and disease related				
Infested with insect	44	47	48	46
Infected with disease	35	38	39	37
Labour related problems				
Crisis of labour	12	15	12	13
High wage of labour	7	8	7	7
Loan/Credit related problem				
Unavailability of bank loan	8	7	7	7
Marketing related problem				
Lower market price	51	49	49	50
Market syndicate	8	7	7	7

11.21.6 Remedial measure for sponge gourd cultivation

- Government should take initiatives to ensure reasonable price of sponge gourd at harvesting time.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field to give appropriate suggestions to the farmers so that insects and disease can be controlled and production of sponge gourd increased.
- Good quality seed should be made available to the farmers for increasing productivity of sponge gourd.

Rabi Vegetables

11.22 Financial and economic profitability of yard long bean

11.22.1 Pattern of input use for yard long bean cultivation

On an average 231 man-days of human labour (both family and hired labour) per hectare were required for yard long bean cultivation in the selected study areas (Table 11.99). In the study areas, farmers used mainly chemical fertilizers at the rate Urea 377 kg/ha, TSP 427 kg/ha and MoP 232 kg/ha and seed was used 14.22 kg/ha. Among the chemical fertilizers, TSP was used higher for yard long bean cultivation in the study areas.

Table 11.99: Level of input use per hectare for yard long bean cultivation

Particulars	Districts			
	Jashore	Narshingdi	Cumilla	All Areas
Human labour (man-days)	217	230	246	231
Family	75	80	101	85
Hired	142	150	145	146
Seed (kg)	14.25	13.45	14.95	14.22
Cowdung (kg)	950	1025	980	985
Urea (kg)	365	388	378	377
TSP (kg)	450	425	405	427
MoP (kg)	260	225	210	232
Zinc sulphate (kg)	6	7	7	7
Boric acid (kg)	5	4	5	5

Source: Field Survey during 2018-19

Table 11.100: Per hectare cost of yard long bean cultivation

Figure in Tk.

Particulars	Districts				% of total cost
	Jashore	Narshingdi	Cumilla	All Areas	
Variable cost					
Cost of land preparation	8981	9430	9581	9331	4.00
Hired labor	49700	52500	50750	50983	21.86
Seedlings	22800	21520	23920	22747	9.75
Cowdung	1425	1538	1470	1478	0.63
Urea	8030	8536	8316	8294	3.56
TSP	11700	11050	10530	11093	4.76
MoP	4160	3600	3360	3707	1.59
Zinc sulphate	900	1050	1050	1000	0.43
Boric acid	600	480	600	560	0.24
Irrigation	11975	12845	12980	12600	5.40
Fencing/Macha	32540	33440	35640	33873	14.52
Pesticides	25450	22456	24650	24185	10.37
Sub-total	178261	178445	182847	179851	77.10
Interest on operating capital	3565	3569	3657	3597	1.54
Total variable cost	181826	182013	186504	183448	78.64
Fixed cost					
Family labor	26250	28000	35350	29867	12.80
Land use cost	21207	19960	18712	19960	8.56
Total fixed cost	47457	47960	54062	49826	21.36
Total cost	229283	229973	240566	233274	100.00

Source: Author's own calculations from field survey data during 2018-19

11.22.2 Cost of yard long bean cultivation

The analysis revealed that on an average total variable cost of yard long bean cultivation was Tk. 183448 per hectare which accounted 79% of the total cost of production. Among the cost items on an average human labour (both family and hired) was the major cost item which accounted 35% of the total cost in the study areas (Table 11.100). The second highest cost item was fencing which accounted for about 15% of the total cost. Among the variable costs, pesticides cost accounted for about 10% of the total cost and ranked third in the cost item. On an average the fixed cost was Tk. 49826 per hectare which accounted for about 21% of the total cost of production (Table 11.100). On an average total cost of production for yard long bean cultivation was Tk. 233274 per hectare of which 21% was fixed costs and 79% was variable cost (Table 11.100).

11.22.3 Financial profitability of yard long bean

The average yield of yard long bean was 24.59 ton per hectare which was slightly higher in Jashore (25.25 t/ha) compared to Cumilla (24.95 t/ha) and Narshingdi (23.58 t/ha). The average gross return from yard long bean production was Tk. 395433/ha which was also higher in Cumilla (Tk. 405438/ha) than that of other two districts which was due to highest price of yard long bean. Average gross margin was Tk. 211985 per hectare and net return was Tk. 162159 in the study areas. The average benefit cost ratio (BCR) was 1.70 which was also slightly higher at Jashore (1.73) compared to that of other two districts. The average cost of producing per kg of yard long bean was Tk. 9.49 (Table 11.101).

Table 11.101: Per hectare return of yard long bean

Figure in Tk.

Particulars	Districts			
	Jashore	Narshingdi	Cumilla	All Areas
Yield (ton)	25.25	23.58	24.95	24.59
Price (Tk./kg)	15.75	16.25	16.25	16.08
Gross return	397688	383175	405438	395433
Total variable cost (TVC)	181826	182013	186504	183448
Total fixed cost (TFC)	47457	47960	54062	49826
Total cost (TC)	229283	229973	240566	233274
Gross margin	215861	201162	218934	211985
Net return	168404	153202	164872	162159
BCR over total cost	1.73	1.67	1.69	1.70
Cost of production (Tk./kg)	9.08	9.75	9.64	9.49

Source: Author's own calculations from field survey data during 2018-19



Fig 11.21 Yard long bean in the farmers field

11.22.4 Economic profitability of yard long bean cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in yard long bean relative to other countries. The estimated DRC for yard long bean for the year 2018-19 are presented in Table 11.102. The DRC for yard long bean was observed to be less than unity (0.125) implying that Bangladesh had comparative advantage in yard long bean production for export promotion.

Table 11.102: Domestic resource cost (DRC) of yard longbean (export parity)

Particulars	Districts			All Areas
	Jashore	Narshingdi	Cumilla	
A. Traded input (Tk/MT)	1492	1543	1395	1476
Urea	464	529	487	493
TSP	725	733	660	706
MoP	303	281	248	277
B. Non-Traded inputs and domestic resources (Tk/MT)	8075	8705	8686	8488
Human labour	3008	3414	3451	3291
Land preparation	356	400	384	380
Seedlings	903	913	959	925
Manure	56	65	59	60
Pesticide	1008	952	988	983
Irrigation	474	545	520	513
Macha	1289	1418	1428	1378
Interest on oprating capital	141	151	147	146
Land use cost	840	846	750	812
C. Output price (Tk/MT)	69466	69456	69456	69460
D. Value added (Tradable) (Tk/MT) (C-A)	67974	67914	68062	67983
E. DRC (B/D)- Export parity	0.119	0.128	0.128	0.125

Source: Author's own calculations

11.22.5 Problems of yard long bean cultivation

There are quite a lot of problems in yard long bean production in the study areas. Over the half of the farmers mentioned lower market price at harvesting time (51%) was the prime problem in the study areas. They mentioned severe infestation of insect (42%) and diseases infection (41%) were the furthestmost concerning difficulties of yard long bean cultivation. They also mentioned lack of quality seed (24%), adulterated seed (16%), adulterated fertilizer (19%), crisis of labour at harvesting time (7%) and high wage of labour (7%) as the noticeable problem of yard long bean cultivation in the study areas (11.103).

Table 11.103: Problems of yard long bean cultivation

Particulars	% Farmers responded			
	Jashore	Narshingdi	Cumilla	All Areas
Seed related problem				
Lack of good quality seed	23	25	23	24
High price of seed	7	8	6	7
Adulterated seed	14	17	18	16
Fertilizer related problems				
Adulterated fertilizer	20	18	18	19

Particulars	% Farmers responded			
	Jashore	Narshingdi	Cumilla	All Areas
Infested with insect	38	45	44	42
Infected with disease	42	44	38	41
Labour related problems				
Crisis of labour	5	7	8	7
High wage of labour	6	7	8	7
Loan/Credit related problem				
Unavailability of bank loan	5	6	7	6
Marketing related problem				
Lower market price	50	55	48	51
Market syndicate	6	6	5	6

11.22.6 Remedial measure for yard long bean cultivation

- Government should take initiatives to ensure reasonable price of yard long bean at harvesting time
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field so that, they can get valuable prescription for controlling insect and diseases and increasing productivity of yard long bean.
- Quality seed should be made available in time which will also help the farmers to increase productivity of yard long bean.

11.23 Financial and economic profitability of brinjal

11.23.1 Pattern of input use for brinjal cultivation

On an average, human labour for producing brinjal was used 244 man-days/ha which was highest (250 man-days) at Rajshahi compared to other two districts (Table 11.104). In the selected districts, farmers used different levels of inputs for brinjal cultivation. It was observed from the study that on an average, brinjal farmers applied at the rate of Urea 283 kg/ha, TSP 395 kg/ha, MoP 223 kg/ha, zinc sulphate 7 kg/ha, boric acid 4 kg/ha, cow dung 1929 kg/ha and seedling was required 24949 for brinjal cultivation. Among the chemical fertilizers, on an average higher amount of TSP (395 kg/ha) was used for producing brinjal in the study areas.

Table 11.104: Level of input use per hectare for brinjal cultivation

Particulars	Districts			
	Rajshahi	Jamalpur	Jashore	All Areas
Human labour (man-days)	250	241	240	244
Family	90	85	85	87
Hired	160	156	155	157
Seedlings (no.)	23952	24700	26196	24949
Cowdung (kg)	1507	2045	2235	1929
Urea (kg)	275	288	285	283
TSP (kg)	395	406	385	395
MoP (kg)	220	225	225	223
Zinc sulphate (kg)	6	7	7	7
Boric acid (kg)	4	5	4	4

Source: Field Survey during 2018-19

11.23.2 Cost of brinjal cultivation

The cost of brinjal production was calculated on the basis of total variable cost and total fixed cost. The average cost of brinjal production was Tk 217978 per hectare of which 23% was fixed costs and 77% was variable cost (Table 11.105). Human labour (38%), pesticide cost (15%) and seedling (11%) were the major costs for producing brinjal production in the study areas.

Table 11.105: Per hectare cost of brinjal cultivation

Figure in Tk.

Particulars	Districts				% of total cost
	Rajshahi	Jamalpur	Jashore	All Areas	
Variable cost					
Cost of land preparation	8981	9880	9730	9530	4.37
Hired labor	54250	56000	54600	54950	25.21
Seedlings	26196	23952	24700	24949	11.45
Cowdung	3353	2261	3068	2894	1.33
Urea	6270	6050	6336	6219	2.85
TSP	10010	10270	10556	10279	4.72
MoP	3600	3520	3600	3573	1.64
Zinc sulphate	1050	900	1050	1000	0.46
Boric acid	480	480	600	520	0.24
Irrigation	16980	18550	18780	18103	8.31
Pesticides	33450	31250	32440	32380	14.85
Sub-total	164620	163113	165460	164397	75.42
Interest on oper. capital	3292	3262	3309	3288	1.51
Total variable cost	167912	166375	168769	167685	76.93
Fixed cost					
Family labor	29750	31500	29750	30333	13.92
Land use cost	21207	19960	18712	19960	9.16
Total fixed cost	50957	51460	48462	50293	23.07
Total cost	218869	217835	217231	217978	100.00

Source: Author's own calculations from field survey data during 2018-19

11.23.3 Financial profitability of brinjal

The average head yield of brinjal was recorded 30.36 t/ha in all study areas while it was highest in Jashore (31.28 t/ha) followed by Jamalpur (30.25 t/ha) and Rajshahi (29.56 t/ha) (Table 11.106). The average gross return, gross margin and net return of brinjal were found to be Tk 358190/ha, Tk 190505/ha, and Tk 140212/ha, respectively. Average benefit cost ratio was found to be 1.64 on the basis of total cost. Among the areas, BCR were also highest in Jashore (1.68) followed by Rajshahi (1.65) and Jamalpur (1.60) which indicating that the brinjal was highly profitable crop in the study areas. The average cost of producing per kg of brinjal was Tk. 7.18 (Table 11.106).

Table 11.106: Per hectare returns from brinjal

Figure in Tk.

Particulars	Districts			
	Rajshahi	Jamalpur	Jashore	All Areas
Yield (ton)	29.56	30.25	31.28	30.36
Price (Tk/kg)	12.15	11.50	11.75	11.80
Gross return	359154	347875	367540	358190
Total variable cost (TVC)	166375	168769	167912	167685

Figure in Tk.

Particulars	Districts			
	Rajshahi	Jamalpur	Jashore	All Areas
Total fixed cost (TFC)	51460	48462	50957	50293
Total cost (TC)	217835	217231	218869	217978
Gross margin	192779	179106	199628	190505
Net return	141319	130644	148671	140212
BCR over total cost	1.65	1.60	1.68	1.64
Cost of production (Tk/kg)	7.37	7.18	7.00	7.18

Source: Author's own calculations from field survey data during 2018



Fig 11.22 Brinjal in the farmers field

11.23.4 Economic profitability of brinjal cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in brinjal relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of brinjal (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for brinjal for the year 2018-19 are presented in Table 11.107. The DRCs for brinjal was observed to be less than unity (0.094) implying that Bangladesh had comparative advantage in brinjal production for export promotion.

Table 11.107: Domestic resource cost (DRC) of brinjal (export parity)

Particulars	Districts			All Areas
	Rajshahi	Jamalpur	Jashore	
A. Traded input (Tk/MT)	1061	1071	1006	1045
Urea	299	306	293	299
TSP	543	546	501	530
MoP	219	219	212	216
B. Non-Traded inputs and domestic resources (Tk/MT)	6680	6500	6237	6472
Human labour	2842	2893	2697	2810
Land preparation	304	327	311	314
Seedlings	886	792	790	823
Manure	113	75	98	95
Pesticide	1132	1033	1037	1067

Particulars	Districts			All Areas
	Rajshahi	Jamalpur	Jashore	
Irrigation	574	613	600	596
Interest on operating capital	111	108	106	108
Land use cost	717	660	598	658
C. Output price (Tk/MT)	69538	69551	69546	69545
D. Value added (Tradable) (Tk/MT) (C-A)	68477	68481	68542	68500
E. DRC (B/D)-Export parity	0.098	0.095	0.091	0.094

Source: Author's own calculations

11.23.5 Problems of brinjal cultivation

Although the farmers in the study areas are cultivating brinjal, there are several problems to its higher production. The main constraint for brinjal in the study areas was low market price at harvesting time (68%). They mentioned that due to severe infestation of insect (57%) and diseases (45%), yield was reduced and it leads to substantial amount of loss to the growers. They also mentioned adulterated seed (25%), adulterated fertilizer (14%), high price of fertilizer (10%), crisis of labour at harvesting time (13%) and high wage rate (8%) as the problems of brinjal cultivation in the study areas (Table 11.108).

Table 11.108: Problems of brinjal cultivation

Particulars	% Farmers responded			
	Rajshahi	Jamalpur	Jashore	All Areas
Seedling related problems				
High price of seedling	11	8	7	9
Adulterated seedling	25	24	27	25
Fertilizer related problems				
Adulterated fertilizer	14	12	15	14
High price of fertilizer	9	11	10	10
Insect/disease related problems				
Severe insect infestation	57	61	52	57
Disease infestation	41	46	47	45
Labour related problems				
Unavailability of labor in time	11	17	11	13
Higher wages	9	8	6	8
Loan related problems				
Unavailability of bank loan	6	5	9	7
Marketing related problems				
Low market price	67	77	61	68

11.23.6 Remedial measure for brinjal cultivation

- Government should take initiatives to ensure reasonable price of brinjal at harvesting time
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field so that, they can get valuable remedy for controlling insect and diseases and increasing productivity of brinjal.
- Good quality seedlings with reasonable price should be made available in time which will support the farmers to increase productivity of brinjal.

11.24 Financial and economic profitability of cauliflower

11.24.1 Pattern of input use for cauliflower cultivation

The average total number of human labour used for cauliflower production was found 235 man-days per ha in the study areas (Table 11.109). Farmers in Chattogram used more human labour (241 man-days/ha) compared to other two districts. On an average 23203 seedlings per hectare were used which were slightly higher in Chattogram (23952) than other two districts due to use less spacing. On an average the application of cowdung, Urea, TSP, MoP, Zinc Sulphate and boric acid were 1478 kg/ha, 183 kg/ha, 380 kg/ha, 199 kg/ha, 10 kg/ha and 8 kg/ha, respectively. Among the chemical fertilizers, TSP (380 kg/ha) was used at a higher rate for producing cauliflower in the study areas.

Table 11.109: Level of input use for per hectare cauliflower cultivation

Particulars	Districts			
	Dinajpur	Chuadanga	Chattogram	All Areas
Human labour (man-days)	230	233	241	235
Family	80	78	85	81
Hired	150	155	156	154
Seedlings (no.)	23203	22455	23952	23203
Cowdung (kg)	2035	1150	1250	1478
Urea (kg)	185	175	188	183
TSP (kg)	350	385	405	380
MoP (kg)	212	201	185	199
Zinc sulphate (kg)	11	10	9	10
Boric acid (kg)	10	7	7	8

Source: Field Survey during 2018-19

11.24.2 Cost of cauliflower cultivation

The cost of cauliflower production was calculated on the basis of total variable cost and total fixed cost. The average cost of cauliflower production was Tk 185189 per hectare of which 26% was fixed costs and 74% was variable cost (Table 11.110). Human labour (44%) and seedling (13%) were the major costs for producing cauliflower production.

Table 11.110: Per hectare cost of cauliflower

Particulars	Districts				% of total cost
	Dinajpur	Chuadanga	Chattogram	All Areas	
Variable cost					
Cost of land preparation	8981	9880	9730	9530	5.15
Hired labor	52500	54250	54600	53783	29.04
Seedlings	23203	22455	23952	23203	12.53
Cowdung	3053	1725	1875	2218	1.20
Urea	4070	3850	4136	4019	2.17
TSP	9100	10010	10530	9880	5.34
MoP	3392	3216	2960	3189	1.72
Zinc sulphate	1650	1500	1350	1500	0.81
Boric acid	1200	840	840	960	0.52

Figure in Tk.

Particulars	Districts				% of total cost
	Dinajpur	Chuadanga	Chattogram	All Areas	
Irrigation	8981	9850	8880	9237	4.99
Pesticides	15227	18250	16550	16676	9.00
Sub-total	131357	135826	135403	134195	72.46
Int. on oper. capital	2627	2717	2708	2684	1.45
Total variable cost	133984	138543	138111	136879	73.91
Fixed cost					
Family labor	28000	27300	29750	28350	15.31
Land use cost	21207	19960	18712	19960	10.78
Total fixed cost	49207	47260	48462	48310	26.09
Total cost	183191	185803	186573	185189	100.00

Source: Author's own calculations from field survey data during 2018-19

11.24.3 Financial profitability of cauliflower

The average head yield of cauliflower was recorded at 33.62 t/ha in the study areas while it was highest in Chattogram (35.62 t/ha) followed by Dinajpur (33.68 t/ha) and Chuadanga (31.56 t/ha) (Table 11.111). The average gross return, gross margin and net return of cauliflower were found to be Tk 318041/ha, Tk 181162/ha, and Tk 132852/ha, respectively. Average benefit cost ratio was found to be 1.72 on the basis of total cost. Among the areas, BCR was highest in Dinajpur (1.79) followed by Chattogram (1.75) and Chuadanga (1.61) which indicating that the cauliflower was highly profitable in the study areas. The average cost of producing per kg of cauliflower was Tk. 5.52 (Table 11.111).

Table 11.111: Per hectare returns from cauliflower

Figure in Tk.

Particulars	Districts			
	Dinajpur	Chuadanga	Chattogram	All Areas
Yield (ton)	33.68	31.56	35.62	33.62
Price (Tk/kg)	9.75	9.50	9.15	9.47
Gross Return	328380	299820	325923	318041
Total variable cost (TVC)	133984	138543	138111	136879
Total fixed cost (TFC)	49207	47260	48462	48310
Total cost (TC)	183191	185803	186573	185189
Gross Margin	194396	161277	187812	181162
Net Return	145189	114017	139350	132852
BCR over total cost	1.79	1.61	1.75	1.72
Cost of production (Tk/kg)	5.44	5.89	5.24	5.52

Source: Author's own calculations from field survey data during 2018-19



Fig 11.22 Cauliflower in the farmers field

Table 11.112: Domestic resource cost (DRC) cauliflower (export parity)

Particulars	Districts			All Areas
	Dinajpur	Chuadunga	Chattogram	
A. Traded input (Tk/MT)	784	862	785	810
Urea	176	178	170	175
TSP	423	496	462	460
MoP	185	187	153	175
B. Non-Traded inputs and domestic resources (Tk/MT)	4863	5272	4682	4939
Human labour	2390	2584	2368	2447
Land preparation	267	313	273	284
Seedlings	689	712	672	691
Manure	91	55	53	66
Pesticide	452	578	465	498
Irrigation	267	312	249	276
Interest on operating capital	78	86	76	80
Land use cost	630	632	525	596
C. Output price (Tk/MT)	57853	57858	57865	57859
D. Value added (Tradable) (Tk/MT) (C-A)	57069	56997	57080	57049
E. DRC (B/D)- Export parity	0.085	0.092	0.082	0.087

Source: Author's own calculations

11.24.4 Economic profitability of cauliflower cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in cauliflower relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of cauliflower (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRC for cauliflower for the year 2018-19 are presented in Table 11.112. The DRC for cauliflower was observed to be less than unity (0.087) implying that Bangladesh had comparative advantage in cauliflower production for export promotion.

11.24.5 Problems of cauliflower cultivation

Farmers in the study areas faced some problems in cultivating cauliflower. The first ranked problem they faced for cauliflower cultivation in the study areas was low market price at harvesting time (75%). They mentioned that due to severe infestation of insect (41%) and diseases (43%), cauliflower yield was reduced and it leads to significant amount of loss to the growers. They also mentioned lack of quality seed (32%), adulterated seed (20%), market syndicate (24%), adulterated fertilizer (21%), crisis of labour at harvesting time (23%), high wage rate (13%) were the noticeable problems in cauliflower cultivation in the study areas (Table 11.113).

Table 11.113: Problems of cauliflower cultivation

Particulars	% Farmers responded			
	Dinajpur	Chuadunga	Chattogram	All Areas
Seedlings related problem				
Lack of good quality seedlings	33	26	36	32
High price of seedlings	10	12	15	12

Particulars	% Farmers responded			
	Dinajpur	Chuadunga	Chattogram	All Areas
Adulterated seedlings	21	20	19	20
Fertilizer related problems				
Adulterated fertilizer	21	19	22	21
Insect and disease related				
Infested with insect	36	43	44	41
Infected with disease	37	44	48	43
Labour related problems				
Crisis of labour	25	22	23	23
High wage of labour	13	14	12	13
Loan/Credit related problem				
Unavailability of bank loan	13	16	15	15
Marketing related problem				
Lower market price	74	76	74	75
Market syndicate	23	22	26	24

11.24.6 Remedial measure of cauliflower cultivation

- Government should take initiatives to ensure reasonable price of cauliflower at harvesting time so that, farmers can meet up their loss.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field so that, they can get valuable remedy for removing insect and diseases and increasing productivity of cauliflower.
- Good quality seedlings with reasonable price should be made available in time which will support the farmers to increase productivity of cauliflower.

11.25 Financial and economic profitability of cabbage

11.25.1 Pattern of input use for cabbage cultivation

In cultivating cabbage, farmers used on an average 225 man-days of human labour per hectare which was 230 man-days for Chuadanga, 223 man-days for Chattogram and 220 man-days for Dinajpur (Table 11.114). On an average 23453 seedling was used for producing cabbage which was higher (24700) in Chattogram than other two districts. On an average, farmers applied urea at the rate of 135 kg/ha, TSP 408 kg/ha and MoP 119 kg/ha for producing cabbage. Among the chemical fertilizers, TSP (408 kg/ha) was used at the higher rate in the study areas. Farmers also used 5 kg/ha zinc sulphate in their cabbage field.

Table 11.114: Level of input use per hectare for cabbage cultivation

Particulars	Districts			
	Dinajpur	Chuadanga	Chattogram	All Areas
Human labour (man-days)	220	230	223	225
Family	75	80	78	78
Hired	145	150	145	147
Seedlings (no.)	22455	23203	24700	23453
Cowdung (kg)	850	1040	1140	1010
Urea (kg)	145	125	135	135
TSP (kg)	435	385	405	408
MoP (kg)	130	112	115	119
Zinc sulphate (kg)	5	4	6	5

Source: Field Survey during 2018-19

11.25.2 Cost of cabbage cultivation

The analysis revealed that on an average total variable cost of cabbage cultivation were Tk.135449 per hectare which accounted 74% of the total cost of production. Among the cost items on an average human labour was the major cost item which accounted 43% of the total cost in the study areas (Table 11.115). The second highest cost item was pesticide which accounted for about 10% of the total cost. Among the variable costs, irrigation cost accounted for about 8% of the total cost and ranked third in the cost item. On an average the fixed cost item was Tk. 47143 per hectare which accounted for about 26% of the total cost of production (Table 11.115). On an average total cost of production for cabbage cultivation was Tk. 182592 per hectare of which 26% was fixed costs and 74% was variable cost (Table 11.115).

Table 11.115: Per hectare cost (Tk./ha) of cabbage

Particulars	Districts				Figure in Tk.
	Dinajpur	Chuadanga	Chattogram	All Areas	% of total cost
Variable cost					
Cost of land preparation	7860	7298	7185	7448	4.08
Hired labor	50750	52500	50750	51333	28.11
Seedlings	22455	23203	24700	23453	12.84
Cowdung	1275	1560	1710	1515	0.83
Urea	3190	2750	2970	2970	1.63
TSP	11310	10010	10530	10617	5.81
MoP	2080	1792	1840	1904	1.04
Zinc sulphate	750	600	900	750	0.41
Irrigation	14970	14550	15478	14999	8.21
Pesticides	18712	16450	18250	17804	9.75
Sub-total	133352	130713	134313	132793	72.73
Interest on operating capital	2667	2614	2686	2656	1.45
Total variable cost	136019	133327	136999	135449	74.18
Fixed cost					
Family labor	26250	28000	27300	27183	14.89
Land use cost	21207	19960	18712	19960	10.93
Total fixed cost	47457	47960	46012	47143	25.82
Total cost	183476	181287	183011	182592	100.00

Source: Author's own calculations from field survey data during 2018-19

11.25.3 Financial profitability of cabbage

The average yield of cabbage was 36.93 ton per hectare which was found to be slightly higher in Chattogram (38.45t/ha) compared to Dinajpur (36.55 t/ha) and Chuadanga (35.80 t/ha). The average gross return from cabbage production was Tk. 312431/ha which was also highest in Chattogram (Tk. 313368/ha) than that of other two districts due to higher yield of cabbage. Average gross margin was Tk.176982 and net return was Tk. 129839 per hectare in the study areas. The average benefit cost ratio (BCR) was 1.71 which was same in all areas. The average cost of producing per kg of cabbage was Tk. 4.95 (Table 11.116).

Table 11.116: Per hectare return of cabbage

Figure in Tk.

Particulars	Districts			
	Dinajpur	Chuadanga	Chattogram	All Areas
Yield (ton)	36.55	35.80	38.45	36.93
Price (Tk./kg)	8.50	8.75	8.15	8.47
Gross return	310675	313250	313368	312431
Total variable cost (TVC)	133327	136019	136999	135449
Total fixed cost (TFC)	47960	47457	46012	47143
Total cost (TC)	181287	183476	183011	182592
Gross margin	177348	177231	176368	176982
Net return	129388	129774	130356	129839
BCR over total cost	1.71	1.71	1.71	1.71
Cost of production (Tk./kg)	4.96	5.13	4.76	4.95

Source: Author's own calculations from field survey data during 2018-19



Fig 11.24 Cabbage in the farmers field

11.25.4 Economic profitability of cabbage cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in cabbage relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of cabbage (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for cabbage for the year 2018-19 are presented in Table 11.117. The DRCs for cabbage was observed to be less than unity (0.058) implying that Bangladesh had comparative advantage in cabbage production for export promotion.

Table 11.117: Domestic resource cost (DRC) of cabbage (export parity)

Particulars	Districts			All Areas
	Dinajpur	Chuadanga	Chattogram	
A. Traded input (Tk/MT)	716	641	629	662
Urea	127	112	113	117
TSP	484	437	428	450
MoP	105	92	88	95
B. Non-Traded inputs and domestic resources (Tk/MT)	4546	4641	4337	4508
Human labour	2107	2249	2030	2128
Land preparation	215	204	187	202
Seedlings	614	648	642	635

Particulars	Districts			All Areas
	Dinajpur	Chuadanga	Chattogram	
Manure	35	44	44	41
Pesticide	512	459	475	482
Irrigation	410	406	403	406
Macha (Trellis)	0	0	0	0
Interest on operating capital	73	73	70	72
Land use cost	580	558	487	541
C. Output price (Tk/MT)	78493	78488	78500	78493
D. Value added (Tradable) (Tk/MT) (C-A)	77777	77846	77870	77831
E. DRC (B/D)-Export parity	0.058	0.060	0.056	0.058

Source: Author's own calculations

11.25.5 Problems of cabbage cultivation

Although the farmers in the study areas are cultivating cabbage, there are several problems to its higher production. Majority of the farmers (71%) stated lower market price at harvesting time as a prime problem in the study areas. They mentioned that due to severe infestation of insect (48%) and diseases (50%), yield of cabbage decreased. They also mentioned that lack of quality seed (30%), adulterated seed (21%), market syndicate (23%) adulterated fertilizer (20%), crisis of labour at harvesting time (21%), high wage rate (14%) were the noticeable problems in cabbage cultivation in the study areas. (Table 11.118).

Table 11.118: Problems of cabbage cultivation

Particulars	Farmer responded (%)			
	Dinajpur	Chuadanga	Chattogram	All Areas
Seedlings related problem				
Lack of good quality seedlings	30	28	33	30
High price of seedlings	11	10	14	12
Adulterated seedlings	22	23	18	21
Fertilizer related problems				
Adulterated fertilizer	20	22	18	20
Insect and disease related				
Infected with insect	46	50	48	48
Infected with disease	47	55	49	50
Labour related problems				
Crisis of labour	22	20	21	21
High wage of labour	12	15	16	14
Loan/Credit related problem				
Unavailability of bank loan	14	15	18	16
Marketing related problem				
Lower market price	68	70	75	71
Market syndicate	22	23	25	23

11.25.6 Remedial measure of cabbage cultivation

- Government should take initiatives to ensure reasonable price of cabbage at harvesting time so that, farmers can meet up their loss.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field so that,

they can get valuable medication to get rid from insect infestation and diseases infection and increasing productivity of cabbage.

- Good quality seedlings with reasonable price should be made available in time which will support the farmers to increase productivity of cabbage.

11.26 Financial and economic profitability of tomato

11.26.1 Pattern of input use for tomato cultivation

Tomato cultivation needs different types of inputs such as labour, seed, manure, fertilizer, pesticides and irrigation. The human labour used for producing tomato was found on an average 285 man days per hectare of which 36% were family supplied (Table 11.119). The use of human labor was higher in Cumilla (289 man-days/ha) followed by Rajshahi (286 man-days/ha) and Dinajpur (281 man-days). The average no. of seedling used by the farmers was 24201/ha. On an average, farmers used 2227 kg of cow dung per hectare for producing tomato. Farmers used different types of chemical fertilizers in tomato field such as urea (371 kg/ha), TSP (290 kg/ha), MoP (188 kg/ha), zinc sulphate (8 kg/ha) and boric acid (6 kg/ha) in the study areas. Among the chemical fertilizers, Urea (371 kg/ha) was used highest for producing tomato in the study areas.

Table 11.119: Level of input use per hectare for tomato cultivation

Particulars	Districts			
	Dinajpur	Rajshahi	Cumilla	All Areas
Human labour (man-days)	281	286	289	285
Family	101	98	110	103
Hired	180	188	179	182
Seedlings (no.)	22454	23952	26197	24201
Cowdung (kg)	2250	1980	2450	2227
Urea (kg)	375	360	378	371
TSP (kg)	295	280	295	290
MoP (kg)	210	178	176	188
Zinc sulphate (kg)	8	9	8	8
Boric acid (kg)	7	6	5	6

Source: Field Survey during 2018-19

11.26.2 Cost of tomato cultivation

The analysis revealed that on an average total variable cost of tomato cultivation was Tk.145301 per hectare which was 72% of total cost of production (Table 11.120). The highest cost item was hired labour which accounted for about 32% of the total cost. Pesticides cost accounted for about 11% of total cost and ranked second in the study areas. The average cost of tomato production was Tk. 201311 per hectare of which 28% was fixed costs and 72% was variable cost (Table 11.120).

Table 11.120: Per hectare cost of tomato

Figure in Tk.

Particulars	Districts				% of total cost
	Dinajpur	Rajshahi	Cumilla	All Areas	
Variable cost					
Cost of land preparation	8981	9880	9730	9530	4.73
Hired labor	63000	65800	62650	63817	31.70
Seedlings	11227	11976	13099	12101	6.01
Cowdung	3375	2970	3675	3340	1.66

Figure in Tk.

Particulars	Districts				% of total cost
	Dinajpur	Rajshahi	Cumilla	All Areas	
Urea	8250	7920	8316	8162	4.05
TSP	7670	7280	7670	7540	3.75
MoP	3360	2848	2816	3008	1.49
Zinc sulphate	1200	1350	1200	1250	0.62
Boric acid	840	720	600	720	0.36
Irrigation	5617	6362	5988	5989	2.97
Bamboo stick	5421	4221	5680	5107	2.54
Pesticides	21957	20958	22750	21888	10.87
Sub-total	140898	142285	144174	142452	70.76
Interest on operating capital	2818	2846	2883	2849	1.42
Total variable cost	143716	145131	147057	145301	72.18
Fixed cost					
Family labor	35350	34300	38500	36050	17.91
Land use cost	21207	19960	18712	19960	9.91
Total fixed cost	56557	54260	57212	56010	27.82
Total cost	200273	199391	204269	201311	100.00

Source: Author's own calculations from field survey data during 2018-19

11.26.3 Financial profitability of tomato

The average yield of tomato was 38.74 ton per hectare which was highest in Rajshahi (39.56 t/h) followed by Dinajpur (38.75 t/h) and Cumilla (37.90 t/h) (Table 11.121). A slight yield difference was found among the studied districts. The variation of gross return was due to getting comparatively high yield of tomato in Rajshahi district though the farmer of Cumilla sold their tomato in slightly high price. The average gross margin was found to be Tk. 345994/ha. The average net return and BCR from tomato cultivation were Tk. 289985/ha and 2.44 respectively which indicated that tomato cultivation was highly profitable in the study areas. The average cost of producing per kg of tomato was Tk. 5.20 (Table 11.121).

Table 11.121: Per hectare return of tomato

Figure in Tk.

Particulars	Districts			
	Dinajpur	Rajshahi	Cumilla	All Areas
Yield (ton)	38.75	39.56	37.90	38.74
Price (Tk/kg)	12.60	12.70	12.75	12.68
Gross return	488250	502412	483225	491296
Total variable cost (TVC)	143716	145131	147057	145301
Total fixed cost (TFC)	56557	54260	57212	56010
Total cost (TC)	200273	199391	204269	201311
Gross margin	344534	357281	336168	345994
Net return	287977	303021	278956	289985
BCR over total cost	2.44	2.52	2.37	2.44
Cost of production (Tk/kg)	5.17	5.04	5.39	5.20

Source: Author's own calculations from field survey data during 2018-19



Fig 11.25 Tomato field, grading and packing

11.26.4 Economic profitability of tomato cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in tomato relative to other countries. The estimates of DRC for tomato for the year 2018-19 are presented in Table 11.122. The DRC for tomato was observed to be less than unity (0.097) implying that Bangladesh had comparative advantage in tomato production for export promotion.

Table 11.122: Domestic resource cost (DRC) of tomato (export parity)

Particulars	Districts			All Areas
	Dinajpur	Rajshahi	Cumilla	
A. Traded input (Tk/MT)	780	712	774	756
Urea	311	292	320	308
TSP	310	288	317	305
MoP	159	132	137	143
B. Non-Traded inputs and domestic resources (Tk/MT)	4618	4532	4846	4665
Human labour	2538	2530	2669	2579
Land preparation	232	250	257	246
Seedlings	290	303	346	313
Manure	87	75	97	86
Pesticide	567	530	600	566
Irrigation	145	161	158	155
Bamboo stick	140	107	150	132
Interest on operating capital	73	72	76	74
Land use cost	547	505	494	515
C. Output price (Tk/MT)	48752	48750	48749	48750
D. Value added (Tradable) (Tk/MT) (C-A)	47972	48037	47975	47995
E. DRC (B/D)- Export parity	0.096	0.094	0.101	0.097

Source: Author's own calculations

11.26.5 Problems of tomato cultivation

There are several difficulties to tomato production in the study areas. The first ranked problem for tomato in the study areas was low market price at harvesting time (74%). Farmers mentioned that due to severe infestation of insect (57%) and diseases (56%), tomato yield was drastically reduced and it leads to heavy loss to the growers. They also mentioned lack of quality seed (34%), high price of seed (17%), market syndicate (25%) adulterated fertilizer (24%), crisis of labour at harvesting time (27%) and unavailability of

bank loan (18%) as the difficulties of tomato cultivation in the study areas (Table 11.123).

Table 11.123: Problems of tomato cultivation

Particulars	% Farmers responded			
	Dinajpur	Rajshahi	Cumilla	All Areas
Seed lings related problem				
Lack of good quality seedlings	32	34	37	34
High price of seedlings	15	17	19	17
Adulterated seedlings	28	27	30	28
Fertilizer related problems				
Adulterated fertilizer	23	28	22	24
Insect and disease related				
Infested with insect	56	66	49	57
Infe cted with disease	49	59	60	56
Labour related problems				
Crisis of labour	27	26	29	27
High wage of labour	14	17	19	17
Loan/Credit related problem				
Unavailab ility of bank loan	21	14	19	18
Marketing related problem				
Low market price at harvest time	70	77	75	74
Market syndicate	24	22	28	25

11.26.6 Remedial measure for tomato cultivation

- Government should take initiatives to control market syndicate and ensure reasonable price of tomato at harvesting time which will be great supportive to the farmers.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field so that, they can get proper suggestions to get rid from insect infestation and diseases infection and increasing productivity of tomato.
- Good quality seedlings with reasonable price should be made available in time which will support the farmers to increase productivity of tomato.

11.27 Financial and economic profitability of country bean

11.27.1 Pattern of input use for country bean cultivation

In the selected districts, farmers employed different level of inputs for country bean cultivation. On an average, country bean producers applied Urea at the rate of 384 kg/ha, TSP 275 kg/ha, MoP 180 kg/ha, Zinc sulphate 6 kg/ha, Boric acid 4 kg/ha and cowdung 1208 kg/ha (Table 11.124). Country bean farmers used 256 man days per hectare of human labour (both family and hired labour) in the study areas. Among the chemical fertilizers, highest amount of Urea (384 kg/ha) was used in the study areas.

Table 11.124: Level of input use per hectare for country bean cultivation

Particulars	Districts			
	Jashore	Narshingdi	Chattogram	All Areas
Human labour (man-days)	255	256	257	256
Family	95	101	111	102
Hired	160	155	146	154
Seed (kg)	11	12	11.5	12
Cowdung (kg)	1050	1524	1050	1208
Urea (kg)	385	390	378	384
TSP (kg)	256	280	290	275
MoP (kg)	145	190	205	180
Zinc sulphate (kg)	5	7	6	6
Boric acid (kg)	4	4	4	4

Source: Field Survey during 2018-19

11.27.2 Cost of country bean cultivation

The analysis revealed that on an average total variable cost of country bean cultivation was Tk.156087 per hectare which accounted 74% of the total cost of production. Among the cost items on an average human labour (both family and hired) was the major cost item which accounted 42% of the total cost in the study areas (Table 11.125). The second highest cost item was fencing which accounted for about 16% of the total cost. For all variable costs, cost of pesticides accounted for about 8% of the total cost and ranked third in the cost item. On an average the fixed cost was Tk. 55776 per hectare which accounted for about 26% of the total cost of production (Table 11.125). On an average total cost of production for country bean cultivation was Tk. 211864 per hectare of which 26% was fixed costs and 74% was variable cost (Table 11.125).

Table 11.125: Per hectare cost of country bean cultivation

Figure in Tk.

Particulars	Districts				% of total cost
	Jashore	Narshingdi	Chattogram	All Areas	
Variable cost					
Cost of land preparation	8981	9430	9581	9331	4.40
Hired labor	56000	54250	51100	53783	25.39
Seed	4400	4800	4600	4600	2.17
Cowdung	1575	2286	1575	1812	0.86
Urea	8470	8580	8316	8455	3.99
TSP	6656	7280	7540	7159	3.38
MoP	2320	3040	3280	2880	1.36
Zinc sulphate	750	1050	900	900	0.42
Boric acid	480	480	480	480	0.23
Irrigation	11550	12480	11460	11830	5.58
Fencing/Macha	33550	33440	35550	34180	16.13
Pesticides	18550	16450	17850	17617	8.32
Sub total	153282	153566	152232	153027	72.23
Interest on operating capital	3066	3071	3045	3061	1.44
Total variable cost	156348	156637	155277	156087	73.67

Figure in Tk.

Particulars	Districts				% of total cost
	Jashore	Narshingdi	Chattogram	All Areas	
Fixed cost					
Family labor	33250	35350	38850	35817	16.91
Land use cost	21207	19960	18712	19960	9.42
Total fixed cost	54457	55310	57562	55776	26.33
Total cost	210805	211947	212839	211864	100.00

Source: Author's own calculations from field survey data during 2018-19

Table 11.126: Per hectare return of country bean

Figure in Tk.

Particulars	Districts			
	Jashore	Narshingdi	Chattogram	All Areas
Yield (ton)	25.45	26.42	28.60	26.82
Price (Tk./kg)	17.50	16.25	16.00	16.58
Gross return	445375	429325	457600	444100
Total variable cost (TVC)	152478	152384	151233	152032
Total fixed cost (TFC)	54457	55310	57562	55776
Total cost (TC)	206935	207694	208795	207808
Gross margin	292897	276941	306367	292068
Net return	238440	221631	248805	236292
BCR over total cost	2.15	2.07	2.19	2.14
Cost of production (Tk./kg)	8.13	7.86	7.30	7.76

Source: Author's own calculations from field survey data during 2018-19



Fig 11.26 Country bean in the farmers field

11.27.3 Financial profitability of countrybean

The average yield of country bean was 26.82 ton per hectare which was found to be slightly higher in Chattogram (28.60 t/ha) compared to Narshingdi (26.42 t/ha) and Jashore (25.45 t/ha). The average gross return from country bean production was Tk. 444100/ha which was also higher in Chattogram (Tk. 457600/ha) than that of other two districts which was due to higher yield of country bean in Chattogram. Average gross margin was Tk. 292068 and net return was Tk. 236292 per hectare in the study areas. The average benefit cost ratio (BCR) was 2.14 which was also slightly higher at Chattogram (2.19) compared to other two districts. The average cost of producing per kg of country bean was Tk. 7.76 (Table 11.126)

11.27.4 Economic profitability of country bean cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in country bean relative to other countries. The estimates of DRCs for country bean for the year 2018-19 are presented in Table 11.127. The DRC for country bean was observed to be less than unity (0.105) implying that Bangladesh had comparative advantage in country bean production for export promotion.

Table 11.127: Domestic resource cost (DRC) of country bean (export parity)

Particulars	Districts			All Areas
	Jashore	Narshingdi	Chattogram	
A. Traded input (Tk/MT)	1063	1117	1048	1077
Urea	486	474	425	462
TSP	409	431	412	418
MoP	168	212	211	197
B. Non-Traded inputs and domestic resources (Tk/MT)	7549	7249	6725	7174
Human labour	3507	3391	3145	3348
Land preparation	353	357	335	348
Seedlings	173	182	161	172
Manure	62	87	55	68
Irrigation	454	472	401	442
Macha	1318	1266	1243	1276
Int. on operating capital	120	116	106	114
Land use cost	833	755	654	748
C. Output price (Tk/MT)	69431	69456	69461	69450
D. Value added (Tradable) (Tk/MT) (C-A)	68369	68340	68414	68374
E. DRC (B/D)- Export parity	0.110	0.106	0.098	0.105

Source: Author's own calculations

11.27.5 Problems of country bean cultivation

There are several problems to country bean production in the study areas. Majority of the farmers opined low market price at harvesting time (68%), infestation of insect (55%) and diseases infection (49%) as the crucial problems of country bean production in the study areas. They also mentioned that lack of quality seed (29%), adulterated seed (24%), market syndicate (26%), adulterated fertilizers (22%), crisis of labour at harvesting time (24%) and unavailability of bank loan (16%) were the other difficulties of country bean production in the study areas (Table 11.128).

Table 11.128: Problems of country bean cultivation

Particulars	% Farmer s responded			
	Jashore	Narshingdi	Chattogram	All Areas
Seed related problem				
Lack of good quality seed	28	31	27	29
High price of seed	14	13	17	15
Adulterated seed	22	25	26	24

Particulars	% Farmer s responded			
	Jashore	Narshingdi	Chattogram	All Areas
Fertilizer related problems				
Adulterated fertilizer	21	24	20	22
Insect and disease related				
Infested with insect	55	58	52	55
Infe cted with disease	47	49	52	49
Labour related problems				
Crisis of labour	25	22	25	24
High wage of labour	12	14	17	14
Loan/Credit related problem				
Unavailab ility of bank loan	22	12	14	16
Marketing related problem				
Lower market price	66	68	70	68
Market syndicate	25	28	26	26

11.27.6 Remedial measure for country bean cultivation

- Government should take initiatives to control market syndicate and ensure reasonable price of country bean at harvesting time which will be great supportive to the farmers.
- Research organizations and DAE should work together to control insect infestation and diseases infection of country bean.
- Good quality seed with reasonable price should be made available in time which will be supportive for the farmers to increase productivity of country bean.

11.28 Financial and economic profitability of pumpkin

11.28.1 Pattern of input use for pumpkin cultivation

In the selected districts, farmers used different types of inputs for pumpkin cultivation. An attempt was made to estimate the level of inputs used and benefits obtained by the farmers of selected districts. Human labour was measured in terms of man-day, consisted of 8 hours. It was employed for land preparation, bed making, seedling transplanting, fertilizing, weeding, pesticide use, and harvesting etc. Farmers used on an average 176 man-days per hectare of total human labour for pumkin cultivation, which was 185 man-days for Jashore district, 175 man-days for Cumilla district and 167 man-days for Rangpur district. On an average, farmers applied Urea at the rate of 244 kg/ha, TSP 188 kg/ha, and MoP 162 kg/ha. It was observed that among the chemical fertilizers, farmers used highest amount of urea in the study areas (Table 11.129). In the study areas, farmers applied also Zinc sulphate for pumpkin cultivation.

Table 11.129: Level of input use per hectare of pumpkin

Particulars	Districts			
	Rangpur	Jashore	Cumilla	All Areas
Human labour (man-days)	167	185	175	176
Family	65	75	70	70
Hired	102	110	105	106
Seed (kg)	2.15	2.25	2.5	2

Particulars	Districts			
	Rangpur	Jashore	Cumilla	All Areas
Cowdung (kg)	6500	8500	7500	7500
Urea (kg)	165	255	312	244
TSP (kg)	142	209	212	188
MoP (kg)	110	190	185	162
Zinc sulphate(kg)	5	9	8	7

Source: Field Survey during 2018-19

11.28.2 Cost of pumpkin production

On an average the estimated total variable cost for pumpkin production was Tk.106937 per hectare which shared 73% of total cost of production. The highest variable cost was incurred by the Cumilla district (Tk. 117160/ha) due to use highest level of inputs. Among the cost items, human labour was the major cost item which shared 42% of the total cost in the study areas (Table 11.130). The second highest cost item was irrigation which accounted for about 15% of the total cost. Among the variable costs, both bio-fertilizer (cowdung) and pesticides cost accounted for about 8% of the total cost and ranked third in cost item. Pesticides cost for the selected districts were more or less same except Rangpur district. Rental value of land was considered as fixed cost of production for pumpkin. The cost of this item was Tk. 16052 per hectare which accounted for about 11% of total cost (Table 11.130). Total cost of production included variable costs and fixed costs incurred for pumpkin cultivation. On an average total cost of production for pumpkin cultivation was Tk. 147489 per hectare of which 27% was fixed costs and 73% was variable cost (Table 11.130). It was observed that the total cost of production of pumpkin was highest (Tk. 162867 and Tk. 162516 per hectare) in Cumilla and Jashore district respectively compared to Rangpur district due to use of higher amount of inputs.

Table 11.130: Per hectare cost of pumpkin cultivation

Figure in Tk.

Particulars	Districts			All Areas	% of total cost
	Rangpur	Jashore	Cumilla		
Variable cost					
Cost of land preparation	1850	8980	9880	6903	4.68
Hired labor	35700	38500	36750	36983	25.08
Seed	1419	1463	1750	1544	1.05
Cowdung	9750	12750	11250	11250	7.63
Urea	3630	5610	6864	5368	3.64
TSP	3692	5434	5512	4879	3.31
MoP	1760	3040	2960	2587	1.75
Zink sulphate	750	1350	1200	1100	0.75
Irrigation	18336	22447	26347	22377	15.17
Pesticides	8745	14452	12350	11849	8.03
Sub-total	85632	114026	114863	104840	71.08
Interest on operating capital	1713	2281	2297	2097	1.42
Total variable cost	87345	116306	117160	106937	72.51
Fixed cost					
Family labor	22750	26250	24500	24500	16.61
Land use cost	6990	19960	21207	16052	10.88
Total fixed cost	29740	46210	45707	40552	27.49
Total cost	117085	162516	162867	147489	100.00

Source: Author's own calculations from field survey data during 2018-19

11.28.3 Financial profitability of pumpkin

The average yield of pumpkin was 28.63 t/ha in the study areas which was highest in Jashore (29.65 t/ha) than Cumilla (28.6 t/ha) and Rangpur (27.65 t/ha) district (Table 11.131). On an average gross return was Tk. 259428/ha. Highest gross return was also obtained in Jashore district (Tk. 278710/ha) than that of other two districts. Gross margin was obtained by deducting total variable cost from gross revenue. On an average, gross margin was Tk.152491/ per hectare which was also highest in Jashore district (Tk. 162404 per hectare). The net return was Tk. 111939 per hectare on an average which was highest in Rangpur district (Tk. 117940 per hectare) compared to other two districts due to less cost of production. The benefit cost ratio (BCR) was 1.78 which was slightly higher in Rangpur (2.01). On the basis of total cost, the cost of production per kilogram of pumpkin was Tk. 5.14 in the study areas (Table 11.131).

Table 11.131: Per hectare returns from pumpkin

Figure in Tk.

Particulars	Districts			All Areas
	Rangpur	Jashore	Cumilla	
Yield (ton)	27.65	29.65	28.6	28.63
Price (Tk./kg)	8.5	9.4	9.25	9.05
Gross return	235025	278710	264550	259428
Total variable cost (TVC)	87345	116306	117160	106937
Total fixed cost (TFC)	29740	46210	45707	40552
Total cost (TC)	117085	162516	162867	147489
Gross margin	147680	162404	147390	152491
Net return	117940	116194	101683	111939
BCR over total cost	2.01	1.71	1.62	1.78
Cost of production (Tk./kg)	4.23	5.48	5.69	5.14

Source: Author's own calculations from field survey data during 2018-19



Fig 11.27 Pumpkin in the farmers field

11.28.4 Economic profitability of pumpkin cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in pumpkin relative to other countries. The estimates of DRC for pumpkin for the year 2018-19 are presented in Table 11.132. The DRC for pumpkin was observed to be less than unity (0.060) implying that Bangladesh had comparative advantage in pumpkin production for export promotion.

Table 11.132: Domestic resource cost (DRC) of pumpkin (export parity)

Particulars	Districts			All Areas
	Rangpur	Jashore	Cumilla	
A. Traded input (Tk/MT)	518	751	841	704
Urea	192	276	350	273
TSP	209	287	301	266
MoP	117	188	190	165
B. Non -Traded inputs and domestic resources (Tk/MT)	3879	4961	5116	4652
Human labour	2114	2184	2142	2146
Land preparation	67	303	345	238
Seedlings	51	49	61	54
Manure	353	430	393	392
Pesticide	316	487	432	412
Irrigation	663	757	921	780
Macha	0	0	0	0
Int. on oprating capital	62	77	80	73
Land use cost	253	673	742	556
C. Output price (Tk/MT)	77922	77904	77907	77911.24
D. Value added (Tradable) (Tk/MT) (C-A)	77405	77153	77065	77208
E. DRC (B/D)- Export parity	0.050	0.064	0.066	0.060

11.28.5 Problems of pumpkin cultivation

There are several problems to pumpkin production in the study areas. Majority of the farmers opined low market price at harvesting time (55%), infestation of insect (54%) and diseases infection (49%) as the key problems of pumpkin production in the study areas. They also mentioned that lack of quality seed (22%), adulterated seed (20%), market syndicate (17%), adulterated fertilizers (23%), crisis of labour at harvesting time (26%) and unavailability of bank loan (20%) were the other difficulties of pumpkin production in the study areas. (Table 11.133).

Table 11.133: Problems of pumpkin cultivation

Particulars	% Farmers responded			
	Rangpur	Jashore	Cumilla	All Areas
Seed related problem				
Lack of good quality seed	22	23	20	22
High price of seed	10	11	10	10
Adulterated seed	19	20	21	20
Fertilizer related problems				
Adulterated fertilizer	25	23	20	23
Insect and disease related				
Infested with insect	57	54	52	54
Infected with disease	48	52	46	49

Particulars	% Farmers responded			
	Rangpur	Jashore	Cumilla	All Areas
Labour related problems				
Crisis of labour	28	27	22	26
High wage of labour	14	16	17	16
Loan/Credit related problem				
Unavailability of bank loan	21	22	18	20
Marketing related problem				
Lower market price	54	55	56	55
Market syndicate	15	14	21	17

11.28.6 Remedial measure for pumpkin cultivation

- Government should take initiatives to ensure reasonable price of pumpkin at harvesting time so that, farmers can meet up their loss.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field so that, they can get valuable medication to get rid from insect infestation and diseases infection and increasing productivity of pumpkin.
- Good quality seedlings with reasonable price should be made available in time which will support the farmers to increase productivity of pumpkin.
- Government should form monitoring team to control quality of fertilizers in local market.

11.29 Financial and economic profitability of bottle gourd

11.29.1 Input use pattern for bottle gourd cultivation

Different type of inputs were used in the selected districts for bottle gourd production. On an average, farmers applied Urea 274 kg/ha, TSP 238 kg/ha, MoP 168 kg/ha and cowdung 2010 kg/ha. It was observed that among the chemical fertilizers, farmers used highest amount of urea in the selected areas (Table 11.134). Sample farmers also used Zinc sulphate and Boric acid for bottle gourd production. The cultivation of bottle gourd required on an average 239 man days per hectare and number of seedling required 1408 per hectare in the study areas.

Table 11.134: Level of input use per hectare of bottle gourd

Particulars	Districts			
	Dhaka (Savar)	Narshingdi	Cumilla	All Areas
Human labour (man-days)	235	235	246	239
Family	90	80	96	89
Hired	145	155	150	150
Seedlings (no.)	1235	1530	1460	1408
Cowdung (kg)	450	2250	3330	2010
Urea (kg)	229	295	298	274
TSP (kg)	202	255	256	238
MoP (kg)	155	165	185	168
Zinc sulphate (kg)	4	5	4	4
Boric acid (kg)	5	5	4	5

Source: Field Survey during 2018-19

11.29.2 Cost of bottle gourd production

On an average the estimated total variable cost for bottle gourd production was Tk.160600 per hectare in the selected study areas. These costs shared 76% of the total cost of production. Among the cost items, human labour was the main cost item which shared 39% of the total cost in the study areas (Table 11.135). The second highest cost item was fencing which accounted for about 17% of the total cost. Among the variable costs, irrigation cost accounted for about 11% of the total cost. Pesticides cost for the selected districts were Tk. 14056/ha which accounted for about 7% of the total cost (Table 11.135). On an average total cost of bottle gourd cultivation was Tk. 211593 per hectare of which 24% was fixed costs and 76% was variable cost (Table 11.135).

Table 11.135: Per hectare cost of bottle gourd cultivation

Figure in Tk.

Particulars	Districts			All areas	% of total cost
	Dhaka (Savar)	Narshingdi	Cumilla		
Variable cost					
Cost of land preparation	7859	11115	7859	8944	4.23
Hired labor	50750	54250	52500	52500	24.81
Seedlings	4323	5355	5110	4929	2.33
Cowdung	675	3375	4995	3015	1.42
Urea	5038	6490	6556	6028	2.85
TSP	5252	6630	6656	6179	2.92
MoP	2480	2640	2960	2693	1.27
Zinc sulphate	600	750	600	650	0.31
Boric acid	600	600	480	560	0.26
Irrigation	18336	22447	26347	22377	10.58
Fencing/Macha	34580	38550	33427	35519	16.79
Pesticides	14820	10806	16542	14056	6.64
Sub total	145313	163008	164032	157451	74.41
Interest on operating capital	2906	3260	3281	3149	1.49
Total variable cost	148219	166268	167313	160600	75.90
Fixed cost					
Family labor	31500	28000	33600	31033	14.67
Land use cost	21207	19960	18712	19960	9.43
Total fixed cost	52707	47960	52312	50993	24.10
Total cost	200926	214228	219625	211593	100.00

Source: Author's own calculations from field survey data during 2018-19

11.29.3 Financial profitability of bottle gourd cultivation

The average yield of bottle gourd was 43 t/ha which was highest in Narshingdi (46 t/ha) than Cumilla (42 t/ha) and Savar (40 t/ha) (Table 11.136). On an average gross return was Tk. 345026/ha. Highest gross return was also obtained from Narshingdi district (Tk. 354175/ha) than that of other two districts. On an average, gross margin was Tk. 184426/ per hectare which was also highest in Narshingdi district (Tk. 187907 per hectare). The net return was Tk. 133433 per hectare on an average which was also highest in Narshingdi district (Tk. 139947/ha). The benefit cost ratio (BCR) was 1.63 which was slightly higher for Savar (1.67) due to lowest production cost. On the basis of total cost, the cost of production per kilogram of bottle gourd was Tk. 5.0 in the study areas (Table 11.136).

Table 11.136: Per hectare returns from bottle gourd

Figure in Tk.

Particulars	Districts			
	Dhaka (Savar)	Narshingdi	Cumilla	All areas
Yield (ton)	39.5	45.7	42.35	42.52
Price (Tk./kg)	8.5	7.75	8.15	8.13
Gross return	335750	354175	345153	345026
Total variable cost (TVC)	148219	166268	167313	160600
Total fixed cost (TFC)	52707	47960	52312	50993
Total cost (TC)	200926	214228	219625	211593
Gross margin	187531	187907	177840	184426
Net return	134824	139947	125528	133433
BCR over total cost	1.67	1.65	1.57	1.63
Cost of production (Tk./kg)	5.09	4.69	5.19	4.99

Source: Author's own calculations from field survey data during 2018-19



Fig 11.28 Bottle gourd in the farmers field

11.29.4 Economic profitability of bottlegourd cultivation

Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in bottle gourd relative to other countries. The estimates of DRC for bottle gourd for the year 2018-19 are presented in Table 11.137. The DRC for bottle gourd was observed to be less than unity (0.060) implying that Bangladesh had comparative advantage in bottle gourd production for export promotion.

Table 11.137: Domestic resource cost (DRC) of bottle gourd (export parity)

Particulars	Districts			All areas
	Rangpur	Jashore	Cumilla	
A. Traded input (Tk/MT)	509	540	600	550
Urea	186	207	226	207
TSP	208	227	246	227
MoP	115	106	128	117
B. Non-Traded inputs and domestic resources (Tk/MT)	4733	4313	4779	4608
Human labour	2082	1800	2033	1972
Land preparation	199	243	186	209
Seedlings	109	117	121	116
Manure	17	74	118	70

Particulars	Districts			All areas
	Rangpur	Jashore	Cumilla	
Pesticide	375	236	391	334
Irrigation	464	491	622	526
Macha	875	844	789	836
Interest on oprating capital	74	71	77	74
Land use cost	537	437	442	472
C. Output price (Tk/MT)	77922	77942	77929	77931
D. Value added (Tradable) (Tk/MT) (C-A)	77413	77402	77329	77381
E. DRC (B/D)-Export parity	0.061	0.056	0.062	0.060

Source: Author's own calculations

11.29.5 Problems of bottle gourd cultivation

Farmers in the study areas faced some problems to bottle gourd production. The commonly faced problems for bottle gourd cultivation in the study areas were low market price at harvesting time (56%) and market syndicate (11%). They mentioned that due to severe infestation of insect (52%) and diseases (47%), bottle gourd yield reduced and it leads to considerable amount of loss to the growers. They also mentioned that lack of quality seedlings (24%), fertilizer not working properly (20%) might be due to adulterations, crisis of labour at harvesting time (29%) and high wage of labour (12%) were the problems bottle gourd production in the study areas (Table 11.138).

Table 11.138: Problems of bottlegourd cultivation

Particulars	% Farmers opined			
	Dhaka	Narshingdi	Cumilla	All areas
Seedlings related problem				
Lack of good quality seedlings	25	28	20	24
High price of seedlings	9	8	8	8
Adulterated seedlings	15	20	22	19
Fertilizer related problems				
Adulterated fertilizer	22	20	18	20
Insect and disease related				
Infested with insect	55	50	52	52
Infected with disease	44	50	48	47
Labour related problems				
Crisis of labour	29	30	28	29
High wage of labour	11	14	12	12
Loan/Credit related problem				
Unavailability of bank loan	8	8	7	8
Marketing related problem				
Lower market price	55	58	56	56
Market syndicate	11	10	11	11

11.29.6 Remedial measure for bottle gourd cultivation

- Government should take initiatives to ensure reasonable price of bottle gourd at harvesting time so that, farmers can meet up their losses.
- Collaboration among research organizations and DAE is necessary to control insects' infestations and disease infection so that production of bottle gourd can be increased.
- Good quality seedlings should be made available to the farmers for increasing productivity of bottle gourd.
- Government should form monitoring team to control quality of fertilizers in local market.

11.30 Financial profitability of red amaranth

11.30.1 Pattern of input use for red amaranths cultivation

In cultivating red amaranths, farmers used 198 man-days of human labour per hectare which was 210 man-days for Cumilla, 195 man-days for Narshingdi, and 190 man-days for Jashore in the study areas (Table 11.139). Seed was required 0.30 kg/ha for producing red amaranths. On an average, farmers applied Urea at the rate of 148 kg/ha, TSP 230 kg/ha and MoP 148 kg/ha and DAP 137 kg/ha for producing red amaranths. Among the chemical fertilizer TSP was used highest in the study areas. Farmers also used Boric acid in their red amaranths field.

Table 11.139: Level of input use per hectare for red amaranths cultivation

Particulars	Districts			
	Jashore	Narsingdi	Cumilla	All areas
Human labour (man-day)	190	195	210	198
Family	65	60	65	63
Hired	125	135	145	135
Seed (kg)	0.33	0.28	0.30	0.30
Cowdung (kg)	950	1050	1125	1042
Urea (kg)	150	148	145	148
TSP (kg)	225	230	235	230
MoP (kg)	149	145	149	148
DAP (kg)	150	135	125	137
Boric acid (kg)	7	8	6	7

Source: Field Survey during 2018-19

11.30.2 Cost of red amaranths production

The cost of red amaranths production was calculated on the basis of total variable cost and total fixed cost. The average cost of red amaranths production was Tk 132931 per hectare of which 32% was fixed costs and 68% was variable cost (Table 11.140). Human labour was the major costs (53% of total cost) for producing red amaranths production in the study areas. Both bio and chemical fertilizers covered 12% of total cost.

Table 11.140: Per hectare cost of red amaranths

Figure in Tk.

Particulars	Districts				% of total cost
	Jashore	Narshingdi	Cumilla	All areas	
Variable cost					
Cost of land preparation	8981	9880	9730	9530	7.17
Hired labor	43750	47250	50750	47250	35.54
Seed	6900	6670	6900	6823	5.13
Cowdung	1425	1575	1688	1563	1.18
Urea	3300	3256	3190	3249	2.44
TSP	5850	5980	6110	5980	4.50
MoP	2384	2320	2384	2363	1.78
DAP	2400	2160	2000	2187	1.64
Boric acid	840	960	720	840	0.63
Irrigation	3742	3550	3758	3683	2.77
Pesticides	6240	5480	4950	5557	4.18
Sub total	85812	89081	92180	89024	66.97
Interest on operating capital	1716	1782	1844	1780	1.34
Total variable cost	87528	90863	94023	90805	68.31
Fixed cost					
Family labor	22750	21000	22750	22167	16.68
Land use cost	21207	19960	18712	19960	15.02
Total fixed cost	43957	40960	41462	42126	31.69
Total cost	131485	131823	135485	132931	100.00

Source: Author's own calculations from field survey data during 2018-19

11.30.3 Financial profitability of red amaranths

The average head yield of red amaranths was recorded 19.30 t/ha in all study areas while it was highest in Cumilla (20.20 t/ha) followed by Narshingdi (19.30 t/ha) and Jashore (18.60 t/ha) (Table 11.141). The average gross return, gross margin and net return of red amaranths were found to be Tk. 234875/ha, Tk. 144070/ha, and Tk. 101944/ha, respectively. Average benefit cost ratio was found to be 1.77 on the basis of total cost. According to areas, BCR were slightly higher in Narshingdi (1.83) followed by Cumilla (1.75) and Jashore (1.73) which indicates that the red amaranths is highly profitable crop in the study areas. The average cost of producing per kg of red amaranths was Tk. 6.89 (Table 11.141).

Table 11.141: Per hectare return of red amaranths production

Figure in Tk.

Particulars	Districts			
	Jashore	Narshingdi	Cumilla	All areas
Yield (ton)	18.6	19.3	20.2	19.3
Price (Tk/kg)	12.3	12.5	11.8	12.2
Gross return	227238	240625	236763	234875
Total variable cost (TVC)	87528	90863	94023	90805
Total fixed cost (TFC)	43957	40960	41462	42126
Total cost (TC)	131485	131823	135485	132931
Gross margin	139709	149762	142739	144070
Net return	95752	108802	101277	101944
BCR over total cost	1.73	1.83	1.75	1.77
Cost of production (Tk/kg)	7.09	6.85	6.72	6.89

Source: Author's own calculations from field survey data during 2018-19



Fig 11.29 Red amaranths in the farmers field

11.30.4 Problems of red amaranths cultivation

There are several problems to red amaranths production in the study areas. The main problem for red amaranths cultivation in the study areas were infestation of insect (40%) and diseases infection (35%). Farmers mentioned that low market price at harvesting time (31%) and market syndicate (4%), lack of quality seed (16%), adulterated seed (12%), and adulterated fertilizer (24%) were the major problems of red amaranth cultivation in the study areas. (Table 11.142).

Table 11.142: Problems in red amaranths cultivation

Particulars	% Farmers opined			
	Jashore	Narshingdi	Cumilla	All areas
Seed related problem				
Lack of good quality seed	18	15	16	16
High price of seed	4	6	6	5
Adulterated seed	12	10	15	12
Fertilizer related problems				
Adulterated fertilizer	22	24	26	24
Insect and disease related				
Insect infestation	42	40	38	40
Disease infection	36	33	37	35
Labour related problems				
Crisis of labour	6	7	6	6
High wage of labour	6	7	8	7
Loan/Credit related problem				
Unavailability of govt. loan	3	4	3	3
Marketing related problem				
Lower market price	33	32	27	31
Market syndicate	4	3	4	4

11.30.5 Remedial measure for red amaranths cultivation

- Collaboration among research organizations and DAE is necessary to control insects' infestations and disease infection so that production of red amaranths can be increased.
- Government should take initiatives so that farmers can get reasonable price of red amaranths at harvesting time and meet up their losses.
- Good quality seeds should be made available to the farmers in time for increasing productivity of red amaranths.
- Government should form monitoring team to control quality of fertilizers in local market.

Fruit crops

11.31 Financial profitability of banana

11.31.1 Pattern of inputs use for banana cultivation

The human labour used for producing banana was found to be 263 man days per hectare of which 41% were family supplied (Table 11.143). The use of human labor was highest in Jhenaidha (275 man-days/ha) followed by Tangail (257 man-days/ha) and Narshingdi (256 man-days/ha). The average number of sucker used by the farmers was 2625/ha. On average, farmers used cow dung 10.17 ton/ha and used oilcake at the rate of 271 kg/ha. They also used chemical fertilizers like urea (261 kg/ha), TSP (361 kg/ha), MoP (273 kg/ha), DAP (218 kg/ha) and gypsum (111 kg/ha) in the study areas.

Table 11.143: Level of input use per hectare for banana cultivation

Particulars	Districts			
	Narsingdi	Jhenaidha	Tangail	All areas
Human labour (man-day)	256	275	257	263
Family	101	110	115	109
Hired	155	165	142	154
Sucker (no.)	2625	2630	2620	2625
Cowdung (kg)	9500	10000	11000	10167
Oilcake (kg)	250	265	299	271
Urea (kg)	260	268	255	261
TSP (kg)	370	345	369	361
MoP (kg)	275	278	265	273
DAP (kg)	230	200	225	218
Gypsum (kg)	118	101	115	111
Zinc Sulphate (kg)	6	7	5	6
Boric Acid (kg)	8	6	7	7

Source: Field Survey during 2018-19

11.31.2 Cost of banana cultivation

Total cost of banana production included variable costs (summation of all cash and non-cash expenses) and fixed costs incurred for banana cultivation. On an average, total cost of production was Tk. 273923 per hectare where 39% were fixed costs and 61% were variable cost (Table 11.144). The total cost of production in Jhenaidha district was found slightly higher (Tk. 275270/ha) compared to that of other two districts.

Table 11.144: Per hectare cost of banana cultivation

Figure in Tk.

Particulars	Districts				% of total cost
	Narshingdi	Jhenaidha	Tangail	All areas	
Variable cost					
Cost of land preparation	8982	7860	7485	8109	2.96
Hired labour	54250	57750	49700	53900	19.68
Cost of sucker	15750	15780	15720	15750	5.75
Cow dung	11875	12500	13750	12708	4.64
Oil cake	5000	5300	5980	5427	1.98
Urea	5720	5896	5610	5742	2.10
TSP	9620	8970	9594	9395	3.43
MoP	4400	4448	4240	4363	1.59

Figure in Tk.

Particulars	Districts				% of total cost
	Narshingdi	Jhenaidha	Tangail	All areas	
DAP	3680	3200	3600	3493	1.28
Gypsum	1298	1111	1265	1225	0.45
Zinc Sulphate	840	980	700	840	0.31
Boric Acid	960	720	840	840	0.31
Insecticide	1575	1845	1748	1723	0.63
Fungicides	354	385	405	381	0.14
Bamboo stick	1545	1258	1225	1343	0.49
Cost of irrigation	32455	30478	31780	31571	11.53
Sub-total	158304	158481	153642	156809	57.25
IOC @ 6% for 1 year	9498	9509	9219	9409	3.43
Total variable cost	167802	167990	162861	166218	60.68
Family labour	35350	38500	40250	38033	13.88
Land use cost	70450	68780	69785	69672	25.43
Total fixed cost	105800	107280	110035	107705	39.32
Total cost	273602	275270	272896	273923	100.00

Source: Author's own calculations from field survey data during 2018-19

11.31.3 Financial profitability of banana

The average yield of banana was recorded 41.76 t/ha in all study areas while it was highest in Jhenaidha (42.55 t/ha) followed by Narshingdi (42.35 t/ha) and Tangail (40.38 t/ha) (Table 11.145). The average gross return, gross margin and net return of banana were found to be Tk. 600726/ha, Tk. 434508/ha, and Tk. 326803/ha, respectively. Average benefit cost ratio was found to be 2.19 on the basis of total cost. The average cost of producing per kg of banana was Tk. 6.56 (Table 11.145).

Table 11.145: Per hectare returns from banana

Figure in Tk.

Particulars	Districts			
	Narshingdi	Jhenaidha	Tangail	All areas
Yield (ton)	42.35	42.55	40.38	41.76
Price (Tk./kg)	14.45	13.5	15.25	14.4
Gross return	611958	574425	615795	600726
Total variable cost (TVC)	167802	162861	167990	166218
Total fixed cost (TFC)	105800	110035	107280	107705
Total cost (TC)	273602	272896	275270	273923
Gross margin	444155	411564	447805	434508
Net return	338355	301529	340525	326803
BCR over total cost	2.24	2.10	2.24	2.19
Cost of production (Tk./kg)	6.46	6.41	6.82	6.56

Source: Author's own calculations from field survey data during 2018-19



Fig 11.30 Banana gardens

11.31.4 Problems of banana cultivation

Farmers in the study areas faced a number of problems to banana production. The first ranked limitation for banana cultivation was low market price at harvesting time (61%) and market syndicate (23%). They also faced the problems of insect infestations (59%) and diseases infection (53%) in banana cultivation which leads to yield loss to the growers. They also mentioned unavailability of HYV banana sucker (39%), high price of sucker (20%) adulterated fertilizer (15%) and unavailability of bank loan as the problems of banana cultivation in the study areas. (Table 11.146).

Table 11.146: Problems of banana cultivation

Particulars	% Farmers opined			
	Narshingdi	Jhenaidha	Tangail	All areas
Seed related problems				
Unavailability of HYV banana sucker	34	46	37	39
High price of sucker	18	22	21	20
Fertilizer related problems				
Adulterated fertilizer	15	17	12	15
High price of fertilizer	16	14	12	14
Insect/disease related problems				
Insect infestation	55	58	65	59
Disease infection	50	52	58	53
Labour related problems				
Unavailability of labor in time	13	16	17	15
High wage rate (some time)	5	8	7	7
Loan related problems				
Unavailability of govt. bank loan	16	24	18	19
Marketing related problems				
Low market price at harvesting time	58	62	63	61
Market syndicate	23	26	21	23

11.31.5 Remedial measure for banana cultivation

- Government should take initiatives so that farmers can get reasonable price of banana at harvesting time and meet up their losses.
- Collaboration between research organization and DAE is necessary to control insects' infestations and disease infection of banana.

- HYV variety of banana should be developed. In this aspect fruit section of HRC, BARI should strengthen their research on banana
- Government should form monitoring team to control quality of fertilizers in local market.

11.32 Financial profitability of mango

11.32.1 Pattern of inputs use for mango cultivation

The level of input used by the farmers in mango production in the study areas are presented in Table 11.147. On an average, mango farmers used 226 man-days of human labour per hectare of which 28% were family supplied and 72% were hired. Huge number of labour is required for guarding of mango tree before harvesting. Farmers used on an average, 135 nos. of saplings per hectare. The amount of manures used in mango cultivation was 4.03 ton per hectare. On an average, 144 kg Urea per hectare used for producing mango which was the highest at Rangpur district (155 kg/ha) followed by Chapai Nawabganj (140 kg/ha) and Rajshahi district (136 kg/ha). The use of TSP was also found higher at Rangpur district (200 kg/ha) followed by Chapai Nawabganj (190 kg/ha) and Rajshahi district (180 kg/ha). On the other hand, farmers used MoP at the rate of 110 kg/ha and they also used DAP (29 kg/ha), Gypsum (27 kg/ha) and Zinc sulphate (6 kg/ha) in the study areas for mango production.

Table 11.147: Level of input use per hectare for mango cultivation

Particulars	Districts			
	Rajshahi	Chapai Nawabganj	Rangpur	All areas
Human labour (man-day)	215	220	245	226
Family	55	65	70	63
Hired	160	155	175	163
Sapling (No./ha)	135	136	134	135
Cowdung (kg)	4025	4000	4077	4034
Urea (kg)	136	140	155	144
TSP (kg)	180	190	200	190
MoP (kg)	105	110	115	110
DAP (kg)	27	30	29	29
Gypsum(kg)	26	25	30	27
Zinc sulphate (kg)	5	6	7	6

Source: Field Survey during 2018-19

11.32.2 Cost of mango production

The average total cost of mango cultivation in all years was found Tk. 212262 per hectare of which 57% were variable cost and the rest 43% were fixed cost. Human labour cost was the lion share (37%) of total cost followed by sapling and pesticide cost (7%) in the study areas (Table 11.148).

Table 11.148: Per hectare cost of mango production

Figure in Tk.

Particulars	Districts			All areas	% of total cost
	Rajshahi	Chapai Nababgonj	Rangpur		
Variable cost					
Cost of land Preparation	4536	4655	4785	4659	2.19
Hired labor	56000	54250	61250	57167	26.93

Figure in Tk.

Particulars	Districts			All areas	% of total cost
	Rajshahi	Chapai Nababgonj	Rangpur		
Variable cost					
Sapling	14310	14416	14204	14310	6.74
Manures	6038	6000	6116	6051	2.85
Urea	2992	3080	3410	3161	1.49
TSP	4680	4940	5200	4940	2.33
MoP	1680	1760	1840	1760	0.83
DAP	432	480	464	459	0.22
Gypsum	286	275	330	297	0.14
Zink sulphate	700	840	980	840	0.40
Irrigation	3302	2788	3354	3148	1.48
Pesticides	14755	15445	14780	14993	7.06
Bamboo stick	1114	1578	2522	1738	0.82
Sub-total	110825	110507	119235	113522	53.48
Interest on operating capital	6649	6630	7154	6811	3.21
Total variable cost	117474	117137	126389	120333	56.69
Fixed cost					
Family labor	19250	22750	24500	22167	10.44
Land use cost	71885	70555	66845	69762	32.87
Total fixed cost	91135	93305	91345	91928	43.31
Total cost	208609	210442	217734	212262	100.00

Source: Author's own calculations from field survey data during 2018-19

11.32.3 Financial profitability of mango

The average yield of mango was recorded 21.12 t/ha in all study areas while it was highest in Chapai Nababgonj (21.85 t/ha) followed by Rajshahi (21.76 t/ha) and Rangpur (19.75 t/ha) (Table 4.158). The average gross return, gross margin and net return of mango were found to be Tk 569570/ha, Tk 449237/ha, and Tk 357308/ha, respectively. Average benefit cost ratio was found to be 2.69 on the basis of total cost. The average cost of producing per kg of mango was Tk. 10.0 (Table 11.149).

Table 11.149: Per hectare returns from mango

Figure in Tk.

Particulars	Districts			
	Rajshahi	Chapai Nababgonj	Rangpur	All areas
Yield (ton)	21.76	21.85	19.75	21.12
Price (Tk./kg)	26	27	28	27
Gross return	565760	589950	553000	569570
Total variable cost (TVC)	117474	117137	126389	120333
Total fixed cost (TFC)	91135	93305	91345	91928
Total cost (TC)	208609	210442	217734	212262

Figure in Tk.

Particulars	Districts			
	Rajshahi	Chapai Nababgonj	Rangpur	All areas
Gross margin	448286	472813	426611	449237
Net return	357151	379508	335266	357308
BCR over total cost	2.71	2.80	2.54	2.69
Cost of production (Tk./kg)	10	10	11	10

Source: Author's own calculations from field survey data during 2018-19



Fig 11.31 Mango gardens

11.32.4 Problems of mango cultivation

Majority of the mango farmers mentioned low market price at harvesting time (63%) and market syndicate (23%) as acute problems. Other problems for mango cultivation were infestation of insects (60%) and diseases infection (44%), unavailability of HYV mango saplings (16%), adulterated fertilizer (15%) lack of labour (11%) and unavailability of bank loan (17%) (Table 11.150).

Table 11.150: Problems of mango cultivation

Particulars	% Farmers opined			
	Rajshahi	Chapai Nababgonj	Rangpur	All areas
Seed related problems				
Unavailability of HYV mango saplings	16	14	17	16
Fertilizer related problems				
Adulterated fertilizer	12	15	17	15
High price of fertilizer	14	16	16	15
Insect/disease related problems				
Insect infestation	57	60	64	60
Disease infection	42	47	44	44
Labour related problems				
Lack of labor in time	11	10	13	11
High wage rate (some time)	6	6	8	7
Loan related problems				
Unavailability of bank loan	15	17	18	17
Marketing related problems				
Low market price at harvesting time	59	65	66	63
Market syndicate	25	23	22	23

11.32.5 Remedial measure for mango cultivation

- It is time to take initiatives for ensuring reasonable price of mango at harvesting time.
- Collaboration between research organization and DAE is necessary to control insects' infestations and disease infection of mango.
- Mechanization should be popularized in case of mango harvesting for minimization of post-harvest loss and to meet up labour crisis
- High yielding variety of mango needs to be made available to the farmers.

11.33 Financial profitability of guava

11.33.1 Pattern of inputs use for guava cultivation

The human labour used for producing guava was found to be 308 man days per hectare of which 36% were family supplied (Table 11.151). The use of human labor was more or less same in Narshingdi (309 man-days/ha), Rajshahi (308 man-days/ha) and Gazipur (305 man-days/ha). The average number of seedling used by the farmers was 130/ha. On an average, farmers used cowdung 3.65 ton/ha. They also used chemical fertilizers like urea (148 kg/ha), TSP (180 kg/ha), MoP (110 kg/ha), DAP and gypsum (27 kg/ha) in the study areas. Among the chemical fertilizers, TSP was used highest for guava cultivation in the selected study areas.

Table 11.151: Level of input use per hectare for guava cultivation

Particulars	Districts			
	Gazipur	Narshingdi	Rajshahi	All areas
Human labour (man-day)	305	309	308	308
Family	110	109	116	112
Hired	195	200	192	196
Seedling (no.)	131	128	130	130
Cowdung (kg)	3028	3845	4077	3650
Urea (kg)	135	142	166	148
TSP (kg)	185	175	180	180
MoP (kg)	105	110	115	110
DAP (kg)	25	28	29	27
Gypsum(kg)	26	25	30	27
Zinc Sulphate (kg)	5	6	7	6

Source: Field Survey during 2018-19

11.33.2 Cost of guava production

Total cost of guava production included variable costs (summation of all cash and non-cash expenses) and fixed costs incurred for guava cultivation. On an average, total cost of production was Tk. 280554 per hectare where 39% were fixed costs and 61% were variable cost (Table 11.152). The total cost of production in Rajshahi district was found slightly higher (Tk. 293299/ha) compared to other two districts in the study areas.

Table 11.152: Per hectare cost of guava cultivation

Particulars	Districts				Figure in Tk. % of total cost
	Gazipur	Narshingdi	Rajshahi	All areas	
Variable cost					
Cost of land preparation	7725	8744	8525	8331	2.97
Hired labour	68250	70000	67200	68483	24.41

Figure in Tk.

Particulars	Districts				% of total cost
	Gazipur	Narshingdi	Rajshahi	All areas	
Cost of sapling	13624	13312	13520	13485	4.81
Cow dung	4542	5768	6116	5475	1.95
Urea	4810	4550	4680	4680	1.67
TSP	1680	1760	1840	1760	0.63
MoP	400	448	464	437	0.16
DAP	286	275	330	297	0.11
Gypsum	700	840	980	840	0.30
Zinc Sulphate	15780	20250	22450	19493	6.95
Irrigation	16780	18450	22455	19228	6.85
Insecticides	11455	15780	18750	15328	5.46
Bamboo stick	149002	163301	170962	161088	57.42
Sub-total	8940	9798	10258	9665	3.45
IOC@ 6% for 1 year	157942	173099	181219	170753	60.86
Total variable cost					
Family labour	38500	38150	40600	39083	13.93
Land use cost	71885	68788	71480	70718	25.21
Total fixed cost	110385	106938	112080	109801	39.14
Total cost	268327	280037	293299	280554	100.00

Source: Author's own calculations from field survey data during 2018-19

11.33.3 Financial profitability of guava

The average yield of guava was recorded 17.91 t/ha in all study areas while it was highest in Narshingdi (18.25 t/ha) followed by Gazipur (17.75 t/ha) and Rajshahi (17.72 t/ha) (Table 11.153). The average gross return, gross margin and net return of guava were found to be Tk 537114/ha, Tk 366361/ha, and Tk 256560/ha, respectively. Average benefit cost ratio was found to be 1.92 on the basis of total cost. The average cost of producing per kg of guava was Tk. 15.67 (Table 11.153).

Table 11.153: Per hectare returns from guava

Figure in Tk.

Particulars	Districts			
	Gazipur	Narshingdi	Rajshahi	All areas
Yield (ton)	17.75	18.25	17.72	17.91
Price (Tk./kg)	30.25	29.5	30.25	30.00
Gross return	536938	538375	536030	537114
Total variable cost (TVC)	157942	173099	181219	170753
Total fixed cost (TFC)	110385	106938	112080	109801
Total cost (TC)	268327	280037	293299	280554
Gross margin	378995	365276	354811	366361
Net return	268610	258338	242731	256560
BCR over total cost	2.00	1.92	1.83	1.92
Cost of production (Tk./kg)	15.12	15.34	16.55	15.67

Source: Author's own calculations from field survey data during 2018-19



Fig 11.32 Guava gardens

11.33.4 Problems of guava cultivation

Although guava is a profitable crop in the study areas, there are some constraints to its higher production (Table 11.154). Insect infestation (54%) was the commonly faced problems in guava cultivation. About half of the famers mentioned low market price at harvesting time as a problem of guava cultivation. They also mentioned about unavailability of HYV guava seedlings (9%) and high price of seedlings (9%). The other problems were fertilizer not working properly (16%) might be due to adulterations, crisis of labour at harvesting time and high wage of labour in the study areas (Table 11.154).

Table 11.154: Problems of guava cultivation

Particulars	% Farmers opined			
	Gazipur	Narshingdi	Rajshahi	All areas
Seed related problems				
Unavailability of HYV guava seedlings	8	8	10	9
High price of seedlings	10	8	9	9
Fertilizer related problems				
Adulterated fertilizer	12	17	19	16
High price of fertilizer	7	6	7	7
Insect/disease related problems				
Insect infestation	55	54	54	54
Disease infection	39	38	37	38
Labour related problems				
Unavailability of labor in time	12	11	12	12
High wage rate (some time)	8	8	9	8
Loan related problems				
Unavailability of bank loan	10	11	10	10
Marketing related problems				
Low market price	44	43	44	44
Market syndicate	12	11	10	11

11.33.5 Remedial measures for guava

- To control insect and disease of guava DAE personnel should give proper suggestions to the farmers.
- Government should take initiatives for ensuring reasonable price of guava.

11.34 Financial profitability of litchi

11.34.1 Pattern of inputs use for litchi cultivation

The level of input used by the litchi farmers in the selected areas are presented in Table 11.155. On an average, litchi farmers used 187 man-days of human labour per hectare of which 36% were family supplied and 64% were hired. In litchi field, a huge amount of labour is required for guarding of litchi garden before harvesting. The amount of manures used in litchi cultivation was 2365 kg per hectare and on an average 118 saplings were used per hectare. Farmers used on average 99 kg/ha Urea, 138 kg/ha TSP, 106 kg/ha MoP and 31 kg/ha Gypsum for producing litchi in the study areas.

Table 11.155: Level of input use per hectare for litchi cultivation

Particulars	Districts			
	Dinajpur	Pabna	Rajshahi	All areas
Human labour (man-day)	166	195	200	187
Family	65	70	65	67
Hired	101	125	135	120
Sapling (no.)	115	120	118	118
Cowdung (Kg/ha)	2745	2204	2145	2365
Urea (Kg/ha)	95	101	101	99
TSP (Kg/ha)	135	138	140	138
MoP (Kg/ha)	105	99	115	106
Gypsum (Kg/ha)	33	30	29	31

Source: Field Survey during 2018-19

11.34.2 Cost of litchi production

The cost of litchi cultivation was calculated on the basis of total variable cost and total cost. The average cost of litchi production was estimated at Tk 199520 per hectare which accounted about 63% of variable cost and 37% of fixed cost (Table 11.156). Human labour cost was the lion share (33%) of total cost and it is followed by sapling (12%) and pesticide cost (8%) in the study areas.

Table 11.156: Per hectare cost of litchi

Figure in Tk.

Particulars	Districts				% of total cost
	Dinajpur	Pabna	Rajshahi	All areas	
Variable cost					
Cost of land preparation	8520	7895	8225	8213	4.12
Hired labor	35350	43750	47250	42117	21.11
Sapling	23690	24720	24308	24239	12.15
Cowdung	4117.5	3306	3217.5	3547	1.78
Urea	2090	2222	2222	2178	1.09
TSP	3510	3588	3640	3579	1.79
MoP	1680	1584	1840	1701	0.85
Gypsum	528	480	464	491	0.25
Irrigation	9233	8245	9550	9009	4.52
Pesticides	14755	15445	14780	14993	7.51
Bamboo stick	7450	8560	7565	7858	3.94

Figure in Tk.

Particulars	Districts				% of total cost
	Dinajpur	Pabna	Rajshahi	All areas	
Sub-total	110924	119795	123062	117927	59.11
Interest on operating capital	6655.41	7187.7	7383.69	7076	3.55
Total variable cost	117579	126983	130445	125002	62.65
Fixed cost					
Family labor	22750	24500	22750	23333	11.69
Land use cost	49875	51225	52452	51184	25.65
Total fixed cost	72625	75725	75202	74517	37.35
Total cost	190204	202708	205647	199520	100.00

Source: Author's own calculations from field survey data during 2018-19

11.34.3 Financial profitability of litchi

The average yield of litchi was recorded 7.62 t/ha in all study areas while it was highest in Pabna (8.64 t/ha) followed by Dinajpur (7.29 t/ha) and Rajshahi (6.93 t/ha) (Table 11.157). The average gross return, gross margin and net return of litchi were found to be Tk 671556/ha, Tk 546554/ha, and Tk 472036/ha, respectively. Average benefit cost ratio was found to be 3.37 on the basis of total cost. The average cost of producing per kg of litchi was Tk. 26.41 (Table 11.157).

Table 11.157: Per hectare return of litchi

Particulars	Districts			
	Dinajpur	Pabna	Rajshahi	All areas
Yield (ton)	7.29	8.64	6.93	7.62
Price (Tk./kg)	85.5	88.45	90.5	88.15
Gross return	623295	764208	627165	671556
Total variable cost (TVC)	117579	126983	130445	125002
Total fixed cost (TFC)	72625	75725	75202	74517
Total cost (TC)	190204	202708	205647	199520
Gross margin	505716	637225	496720	546554
Net return	433091	561500	421518	472036
BCR over total cost	3.28	3.77	3.05	3.37
Cost of production (Tk./kg)	26.09	23.46	29.67	26.41

Source: Author's own calculations from field survey data during 2018-19



Fig 11.33 Litchi gardens

11.34.4 Problems of litchi cultivation

Although litchi is a profitable crop in the study areas, there are some constraints to its higher production (Table 11.158). The commonly faced problems of litchi cultivation in all the areas were insect (56%) and disease infestation (46%). About 23% farmers pointed out that high price of quality saplings was one of the severe problems at farm level for cultivating litchi. Labour crisis (13%) and higher wage rate of labour (9%) were mentioned as the problems of litchi cultivation. About 14% farmers mentioned that, they faced financial crisis because bank loan was not available (Table 11.158).

Table 11.158: Problems of litchi cultivation

Particulars	% Farmers opined			
	Dinajpur	Pabna	Rajshahi	All areas
Seed related problems				
Unavailability of HYV seedlings	11	10	10	10
High price of seedlings	22	23	23	23
Fertilizer related problems				
Adulterated fertilizer	14	11	10	12
High price of fertilizer	9	9	7	8
Insect/disease related problems				
Insect infestation	58	56	54	56
Disease infestation	44	47	47	46
Labour related problems				
Unavailability of labor in time	15	12	12	13
High wage rate (some time)	9	8	9	9
Loan related problems				
Unavailability of bank loan	14	12	15	14
Marketing related problems				
Low market price at harvesting time	55	50	52	52
Market syndicate	11	12	14	12

11.34.5 Remedial measure

- Research organizations and DAE should work together to control insect infestation and diseases infection of litchi.
- Mechanization should be introduced in case of litchi harvesting for minimization of post-harvest loss and to meet up labour crisis
- Quality sapling of high yielding variety of litchi with reasonable price should be made available to the farmers.

11.35 Financial profitability of malta cultivation

11.35.1 Pattern of inputs use for malta cultivation

The level of input used by the malta farmers in selected areas are presented in Table 11.159. On an average, malta farmers used 410 man-days of human labour per hectare of which 29% were family supplied and 71% were hired. In malta field, a huge amount of labour is required for guarding of malta garden before harvesting. Farmers used on an average 1118 pieces of saplings per hectare. The amount of manures used in malta cultivation was 8469 kg per hectare. Farmers used on average 403 kg/ha urea, 342 kg/ha TSP, 257 kg/ha MoP and 26 kg/ha DAP & Gypsum and 8 kg/ha zinc sulphate for producing malta in the study areas.

Table 11.159: Level of input use per hectare for malta cultivation

Particulars	Districts			
	Panchagor	Rajshahi	Chapai Nababgonj	All areas
Human labour (man-day)	392	414	424	410
Family	111	115	126	117
Hired	281	299	298	293
Sapling (no.)	1124	1085	1145	1118
Cowdung (kg)	7805	8752	8850	8469
Urea (kg)	380	405	425	403
TSP (kg)	325	355	345	342
MoP (kg)	250	255	265	257
DAP (kg)	26	25	28	26
Gypsum(kg)	28	24	26	26
Zinc sulphate (kg)	8	7	8	8

Source: Field Survey during 2018-19

11.35.2 Cost of malta cultivation

Planting materials, land preparation, input cost (FYM, fertilizers, plant growth regulators, plant protection chemicals etc.), labour cost, power cost, harvesting, packing and transportation charges were the main cost components for malta cultivation. The average cost of malta production was estimated at Tk 393926 per hectare which accounted about 75% of variable cost and 25% of fixed cost (Table 11.160). Human labour cost was the lion share (38%) of total cost and it followed by sapling (19%) and pesticide cost (5%) in the study areas.

Table 11.160: Per hectare cost of malta

Figure in Tk.

Particulars	Districts			All areas	% of total cost
	Panchagor	Rajshahi	Chapai Nababgonj		
Variable cost					
Cost of land preparation	6780	7258	7650	7229	1.89
Hired labour	98350	104650	104300	102433	26.78
Cost of sapling	73060	70525	74425	72670	19.00
Cow dung	11708	13128	13275	12704	3.32
Urea	8360	8910	9350	8873	2.32
TSP	8450	9230	8970	8883	2.32
MoP	4000	4080	4240	4107	1.07
DAP	416	400	448	421	0.11
Gypsum	308	264	286	286	0.07
Zinc Sulphate	1120	980	1120	1073	0.28
Irrigation	15780	17540	16750	16690	4.36
Insecticides	18780	22145	20225	20383	5.33
Bamboo stick	14580	15780	18750	16370	4.28
Sub-total	261692	274890	279789	272124	71.13
IOC@ 6% for 1 year	15701	16493	16787	16327	4.27

Figure in Tk.

Particulars	Districts			All areas	% of total cost
	Panchagor	Rajshahi	Chapai Nababgonj		
Total variable cost	277393	291383	296576	288451	75.40
Family labour	38850	40250	44100	41067	10.74
Land use cost	50420	55420	53250	53030	13.86
Total fixed cost	89270	95670	97350	94097	24.60
Total cost	366663	387053	393926	382548	100.00

Source: Author's own calculations from field survey data during 2018-19

11.35.3 Financial profitability of malta

The average yield of malta was recorded 16.22 t/ha in all study areas while it was highest in Panchagor (16.55 t/ha) followed by Chapai Nababgonj (16.25 t/ha) and Rajshahi (15.85 t/ha) (Table 5.123). The average gross return, gross margin and net return of malta were found to be Tk 1124125/ha, Tk 835674/ha, and Tk 741577/ha, respectively. Average benefit cost ratio was found to be 2.94 on the basis of total cost. The average cost of producing per kg of malta was Tk. 23.61 (Table 11.161).

Table 11.161: Per hectare return of malta

Figure in Tk.

Particulars	Districts			
	Panchagor	Rajshahi	Chapai Nababgonj	All areas
Yield (ton)	16.55	15.85	16.25	16.22
Price (Tk./kg)	68.25	70.25	69.50	69.33
Gross return	1129538	1113463	1129375	1124125
Total variable cost (TVC)	277393	291383	296576	288451
Total fixed cost (TFC)	89270	95670	97350	94097
Total cost (TC)	366663	387053	393926	382548
Gross margin	852145	822079	832799	835674
Net return	762875	726409	735449	741577
BCR over total cost	3.08	2.88	2.87	2.94
Cost of production (Tk./kg)	22.15	24.42	24.24	23.61

Source: Author's own calculations from field survey data during 2018-19



Fig 11.34 Malta gardens

11.35.4 Problems of malta cultivation

Malta is comparatively new fruit crop grown in Bangladesh. Farmers were cultivating malta due to its high profitability. But they faced some problems to cultivate it. Over the half of the farmers mentioned they did not get quality sapling and 43% farmers pointed out that price of sapling was high. About 44% farmers said that they get lower price of malta. Insect (11%) and disease infestation (25%) were the other considerable problems farmers faced in malta cultivation. As higher amount of capital is needed to cultivate malta, farmers looked for bank loan to meet up the production cost. Approximately 14% farmers mentioned bank loan is not available to them.

Table 11.162: Problems of malta cultivation

Particulars	% Farmers opined			
	Panchagor	Rajshahi	Chapai Nawabgonj	All areas
Seed related problems				
Lack of quality saplings	49	54	55	53
High price of saplings	43	42	45	43
Fertilizer related problems				
Adulterated fertilizer	11	12	11	11
High price of fertilizer	8	7	8	8
Insect/disease related problems				
Insect infestation	10	12	11	11
Disease infestation	25	22	28	25
Labour related problems				
Unavailability of labor in time	11	10	12	11
High wage rate (some time)	7	8	7	7
Loan related problems				
Unavailability of bank loan	12	14	15	14
Marketing related Problems				
Low market price at harvesting time	44	43	45	44

11.35.5 Remedial measure for malta cultivation

- Quality sapling of malta with lower price should be made locally available to increase area and production of malta
- Government should ensure credit facilities for interested farmers through both institutional and non-institutional sources for malta cultivation.
- To popularize its cultivation, regular training program on production technology should be arranged for the farmers.

11.36 Financial profitability of lemon

11.36.1 Pattern of inputs use for lemon cultivation

On average 295 man-days/ha was required for lemon cultivation and 1398 saplings were required for producing lemon per hectare. Manure and fertilizer is essential for better production for lemon. In the survey area farmer applied cowdung 5968 kg/ha, TSP 358 kg/ha, MoP 268 kg/ha, DAP 181 kg/ha, Gypsum 26 kg/ha and Zinc sulphate 27 kg/ha for producing lemon (Table 11.163). Farmers did not use any urea for lemon cultivation in the study areas.

11.36.2 Cost of lemon production

Cost of lemon production included human labour, seedling/saplings, manures, fertilizers, pesticides, land development, irrigation and pillar/support etc. The average cost of lemon production was estimated at Tk 256451 per hectare of which about 71% was variable cost and 29% was fixed cost (Table 11.164). Human labour cost was the lion share (43%) of total cost and it followed by sapling (9%), pesticide (6%) and irrigation cost (6%) in the study areas.

Table 11.163: Level of input use per hectare for lemon cultivation

Particulars	Districts			
	Gazipur	Narshingdi	Dhaka	All areas
Human labour (man-day)	280	304	301	295
Family	99	105	116	107
Hired	181	199	185	188
Seedling (no.)	1224	1425	1545	1398
Cowdung (kg)	5580	6545	5780	5968
Urea (kg)	0	0	0	0
TSP (kg)	355	342	378	358
MoP (kg)	285	275	245	268
DAP (kg)	178	180	185	181
Gypsum (kg)	25	28	24	26
Zinc Sulphate (kg)	26	25	30	27

Source: Field Survey during 2018-19

Table 11.164: Per hectare cost of lemon

Figure in Tk.

Particulars	Districts				% of total cost
	Gazipur	Narshingdi	Dhaka	All areas	
Variable cost					
Cost of land prep.	6780	7258	7650	7229	2.82
Hired labour	63350	69650	64750	65917	25.70
Cost of sapling	19584	22800	24720	22368	8.72
Cow dung	8370	9818	8670	8953	3.49
Urea	7410	7150	6370	6977	2.72
TSP	2848	2880	2960	2896	1.13
MoP	400	448	384	411	0.16
DAP	286	275	330	297	0.12
Gypsum	980	1120	980	1027	0.40
Zinc Sulphate	15780	17540	16750	16690	6.51
Irrigation	14850	15780	16550	15727	6.13
Insecticides	14580	15780	18750	16370	6.38
Bamboo stick	7810	7524	8316	7882	3.07
Sub-total	163028	178023	177180	172744	67.36
IOC@ 6% for 1 year	9782	10681	10631	10365	4.04
Total variable cost	172810	188704	187811	183108	71.40
Family labour	34650	36750	40600	37333	14.56
Land use cost	35480	36870	35680	36010	14.04
Total fixed cost	70130	73620	76280	73343	28.60
Total cost	242940	262324	264091	256451	100.00

Source: Author's own calculations from field survey data during 2018-19.

11.36.3 Financial profitability of lemon

The average yield of lemon was recorded 14.68 t/ha in all study areas while it was highest in Dhaka (15.25 t/ha) followed by Narsingdi (14.55 t/ha) and Gazipur (14.25 t/ha) (Table 11.165). The average gross return, gross margin and net return of lemon were found to be Tk 429488/ha, Tk 246379/ha, and Tk 173036/ha, respectively. Average benefit cost ratio was found to be 1.68 on the basis of total cost. The average cost of producing per kg of lemon was Tk. 17.46 (Table 11.165).

Table 11.165: Per hectare returns from lemon

Figure in Tk.

Particulars	Districts			
	Gazipur	Narshingdi	Dhaka	All areas
Yield (ton)	14.25	14.55	15.25	14.68
Price (Tk./kg)	29.25	29.25	29.25	29.25
Gross return	416813	425588	446063	429488
Total variable cost (TVC)	172810	188704	187811	183108
Total fixed cost (TFC)	70130	73620	76280	73343
Total cost (TC)	242940	262324	264091	256451
Gross margin	244003	236884	258252	246379
Net return	173873	163264	181972	173036
BCR over total cost	1.72	1.62	1.69	1.68
Cost of production (Tk./kg)	17.05	18.03	17.32	17.46

Source: Author's own calculations from field survey data during 2018-19



Fig 11.35 Lemon gardens

11.36.4 Problems of lemon cultivation

Farmers in the study areas faced several problems in lemon cultivation. Insect infestation (52%) and disease infection (44%) were acute problems of lemon cultivation. Lemon farmers (42%) reported that low market price was also a severe problem for them. About 31% farmers mentioned that, there was high price of quality sapling. Besides, some farmers mentioned that adulteration and high price of fertilizer, unavailability of bank loan, lack of quality sapling were also the problems of lemon cultivation.

Table 11.166: Problems of lemon cultivation

Particulars	% Farmers opined			
	Gazipur	Narshingdi	Dhaka	All areas
Seed related problems				
Unavailability of HYV seedlings	8	9	9	9
High price of seedlings	32	33	28	31
Fertilizer related problems				
Adulterated fertilizer	12	14	12	13

Particulars	% Farmers opined			
	Gazipur	Narshingdi	Dhaka	All areas
High price of fertilizer	7	8	8	8
Insect/disease related problems				
Insect infestation	53	54	50	52
Disease infection	42	44	45	44
Labour related problems				
Unavailability of labor in time	8	5	7	7
High wage rate (some time)	6	8	6	7
Loan related problems				
Unavailability of bank loan	10	8	8	9
Marketing related problems				
Low market price at harvesting time	42	44	40	42

11.36.5 Remedial measure for lemon cultivation

- To control insect and disease of guava DAE personnel should give proper suggestions to the farmers.
- Quality sapling of lemon with lower price should be made locally available to increase area and production of lemon.
- Government should take initiatives to ensure fair price of lemon for the farmers.

BINA Component

Oil seed crops

11.2 Financial and economic profitability of Mustard

11.2.1 Pattern of input use for mustard cultivation

Farmers in the study areas used various inputs for mustard cultivation. Farmers used on an average 51 man-days per hectare of total human labour for mustard cultivation where family labour was 26 man-days and hired labour was 25 man-days.

Table 11.1: Level of input use per hectare of mustard cultivation

Particulars	Districts			
	Sirajganj	Tangail	Jashore	All
Human labour (man-days)	48	53	50	51
Hired	25	26	25	25
Family	23	29	25	26
Seed (kg/ha)	9	10	8	9
Urea	210	190	184	195
TSP	188	160	155	168
MoP	111	96	108	105
Gypsum	42	34	52	43
Zn	3	3	3	3
Boron	9	4	6	6

Source: Field Survey during 2018-19

On an average, they used 9 kg seed per hectare of land. They applied Urea at the rate of 195 kg/ha, TSP 168 kg/ha, and MoP 105 kg/ha. It was observed that among the chemical fertilizers, farmers used highest amount of urea for mustard production (Table 11.1). In the study areas, farmers also applied Gypsum (43 kg/ha), zinc (3 kg/ha) and Boron (6 kg/ha) for mustard cultivation.

11.2.2 Cost of Mustard Cultivation

The analysis revealed that total variable cost of mustard cultivation was Tk. 31233 per hectare which was 61% of total cost of production (Table 11.2). The highest cost item was human labour which accounted for about 20 % of the total cost. Land use cost accounted for about 19% of total cost and ranked second cost item. Family labour and rental value of land was considered as fixed cost of production. The family labour and land use cost were Tk. 10380 and Tk. 9780 per hectare which accounted for about 20% and 19 % of total cost respectively (Table 11.2). Total cost of production included variable costs and fixed costs incurred for mustard cultivation. On an average, the total cost of production was Tk. 51394 per hectare where 39% was fixed costs and 61% was variable cost (Table 11.2).

Table 11.2: Per hectare cost of mustard cultivation

Figure in Tk.

Particulars	District				
	Sirajganj	Tangail	Jashore	All	
	(Tk/ha)	(Tk/ha)	(Tk/ha)	(Tk/ha)	%
Variable Cost					
Cost of land preparation	6312	7367	6267	6649	13
Hired labor	10111	10451	10094	10219	20
Seed	682	699	725	702	1
Cowdung	831	333	225	463	1
Urea	3358	3228	2951	3179	6
TSP	5653	4640	4353	4882	9
MoP	1770	1631	1733	1711	3
Gypsum	471	369	490	443	1
Zn	591	308	577	492	1
Boron	1452	604	974	1010	2
Cost of irrigation	1069	782	337	729	1
Cost of insecticide pesticide	575	488	153	405	1
Sub-total	32875	30799	28880	30851	0
Interest on operating capital	410	374	361	382	1
Total variable cost	33286	31173	29241	31233	61
Fixed Cost					
Family labor	9183	11712	10246	10380	20
Land use cost	10120	9887	9333	9780	19
Total fixed cost	19303	21599	19579	20160	39
Total cost	52590	52771	48820	51394	100

Source: Author's own calculations from field survey data during 2018-19

11.2.3 Financial profitability of mustard

Profitability is one of the major criteria for determination of acceptance of a crop. Financial profitability (FP) is based on calculation of market prices of inputs and outputs that farmers actually pay or receive for producing a crop, along with the quantities used of each. Farmers allocate land and other resources in the

production of different crops on the basis of relative financial profitability. The production cost, gross return, gross margin, benefit cost ratio, etc. for mustard cultivation at different locations are discussed below:

Per hectare average yield of mustard was 1.31 ton and per kg average price was about Tk. 47. The average gross return and gross margin of mustard cultivation were found Tk. 66170 ha⁻¹ and Tk. 34936 ha⁻¹ respectively. Per hectare average net return was Tk. 14776 which was found to be highest in Sirajganj (Tk. 16440) followed by Jashore (Tk. 16417) and Tangail (Tk. 11471). BCR on total cost basis was found 1.29 which was the highest in Jashore 1.34 and less in Tangail districts 1.22. It was estimated that, to produce one kilogram of mustard, total cost incurred Tk. 39 (Table 11.3).

Table 11.3: Per hectare return from mustard

Figure in Tk.

Particulars	Districts			
	Sirajganj	Tangail	Jashore	All
Yield (Ton)	1.36	1.24	1.33	1.31
Price (Tk./kg)	47.23	47.36	44.79	47
Return from Mustard	64218	58807	59696	60907
Return from by-product	4811	5437	5541	5263
Gross Return	69029	64243	65237	66170
Total variable cost (TVC)	33286	31173	29241	31233
Total fixed cost (TFC)	19303	21599	19579	20160
Total cost (TC)	52589	52772	48820	51394
Gross Margin	35743	33070	35996	34936
Net Return	16440	11471	16417	14776
BCR over total cost	1.31	1.22	1.34	1.29
Cost of production (Tk./kg)	38.69	42.51	36.61	39.27

Source: Author's own calculations from field survey data during 2018-19



Fig 11.1 Mustard in the farmers field

11.2.4 Economic profitability in mustard production

In most developing countries, including Bangladesh, social or economic profitability of most production ventures deviates from private profitability because of distortions in input and output markets, import and export duties, externalities and government policy interventions that tend to distort relative prices. Bangladesh, as a member of WTO, is committed to the rules and regulations that the Uruguay Round (UR) applied to agriculture. The commitments cover a wide range of topics including those in the area of domestic support, market access and export subsidies in agriculture. The potential benefits of the UR Agreements for Bangladesh would emerge from the trading regime in its present form and the potential trading opportunities for both import substitution and export promotion in Bangladesh. However,

eventually, whether or not a country can take advantage of the new trading opportunities would depend upon its comparative advantage, without subsidies or with limited subsidies that are permitted for all trading partners by the rules governing the new trading environment. Therefore, an assessment of comparative advantage of crop production either for import substitution or export can be helpful in this respect.

The Domestic Resource Cost (DRC) value for mustard found to be less than one (0.66) indicating that Bangladesh had comparative advantage in producing mustard for import substitution (Table 11.4). This is plausibly attributed to the higher yield of hybrid mustard which resulting to the lower cost of production of per unit of land. Besides, there is more scope for efficient production of mustard due to higher demand in the domestic market. The result is similar to the result found by Rashid et al. (2009).

Table 11.4: Domestic resource cost (DRC) of mustard (Import parity)

Items	Districts			All
	Sirajganj	Tangail	Jashore	
A. Traded input (Tk/MT)	12246	12758	10839	11948
Urea	4865	5025	4323	4738
TSP	5024	5313	4128	4822
MoP	2357	2419	2388	2388
B. Non-Traded inputs and domestic resources (Tk/MT)	24546	29488	25218	26417
Human labour	14187	17873	15293	15784
Land preparation	4641	5941	4712	5098
Seed	501	564	545	537
Manure	333	143	101	193
Pesticide	231	210	69	170
Irrigation	429	337	151	306
Interest on operating capital	164	161	162	162
Land use cost	4059	4258	4185	4168
C. Output price (Tk/MT)	51917	51917	51917	51917
D. Value added (Tradable) (Tk/MT) (C-A)	39671	39159	41078	39969
E. DRC (B/D)- Import parity	0.62	0.75	0.61	0.66

Source: Author's own calculations

11.2.5 Problems faced by the farmers in mustard cultivation

Although the farmers in the study areas are cultivating oilseed, but there are several problems to its higher production. The first and the foremost constraint for oilseed mustard variety in all areas were the labour crisis and high price at harvesting time (47%). They mentioned other constraints that; due to severe infestation of insect (37%) followed by adulterated fertilizer (34%), alternaria blight diseases (31%) lack of quality seeds at appropriate time (29%), low market price at harvesting time, adulterated seed (18%), unavailability of bank loan (9%) etc. (Table 11.5).

Table 11.5: Problems faced by the farmers in mustard cultivation Farmer responded (%)

Particulars	Tangail	Jashore	Sirajganj	All
Seed related problems				
Lack of quality seeds at appropriate time	39	28	21	29

Farmer responded (%)

Particulars	Tangail	Jashore	Sirajganj	All
Seed related problems				
Adulterated seed	15	18	22	18
Fertilizer related problems				
low quality fertilizer	41	36	26	34
Insect/disease related problems				
Insect infestation (aphid)	45	34	33	37
Alternaria Blight Diseases	35	28	32	31
Labour related problems				
Labour crisis and high price in harvesting time	66	42	35	47
Loan related problems				
Unavailability of bank loan	16	3	8	9
Store related problems				
Moisture	11	5	7	8
Marketing related problems				
Low market price at harvesting time	38	25	20	28
Distance of market is high	10	5	9	8

11.2.6 Remedial measure for mustard cultivation

- The government should take initiatives regarding the supply of quality seed at the proper time with a reasonable price, and should ensure the supply and availability of adulterated fertilizer in the market.
- More emphasis should be given on developing new varieties with short-duration, stress-tolerance, and other characteristics.
- Government should fix/control labour wage rate during harvesting time.

11.3 Financial and economic profitability of groundnut

11.3.1 Pattern of input use for groundnut cultivation

In the selected districts, farmers employed different level of inputs for groundnut cultivation. Farmers used on an average 74 man-days per hectare of total human labour for groundnut cultivation where family labour was 31 man-days and hired labour was 44 man-days. On an average, they used 111 kg seed per hectare of land. They applied Urea at the rate of 32 kg/ha, TSP 103 kg/ha, and MoP 114 kg/ha. In the study areas, farmers also applied Gypsum (130 kg/ha), Cowdung (3674 kg/ha) and Boric Acid (3 kg/ha) for groundnut cultivation. It was observed that among the chemical fertilizers, farmers used highest amount of Gypsum for the sample districts (Table 11.6).

Table 11.6: Level of input use per hectare of groundnut cultivation

Particulars	Districts			
	Noakhali	Panchagarh	Faridpur	All
Human labour (man-days)	72	77	74	74
Hired	44	45	42	44
Family	28	33	31	31
Seed (kg)	116	111	105	111

Particulars	Districts			
	Noakhali	Panchagarh	Faridpur	All
Cowdung (Kg)	3000	3867	4155	3674
Urea (Kg)	29	28	38	32
TSP (Kg)	104	96	110	103
MoP (Kg)	108	107	128	114
Gypsum (Kg)	148	113	130	130
Boric Acid (kg)	3	3	3	3

Source: Field Survey during 2019-20

11.3.2 Cost of groundnut cultivation

The analysis revealed that total variable cost of groundnut cultivation was Tk. 54957 per hectare which was 66% of total cost of production (Table 11.7). The highest cost item was hired labour which accounted for about 22% of the total cost. Seed cost accounted for about 16% of total cost and ranked as second cost item. Family labour and rental value of land was considered as fixed cost of groundnut production. The family labour and land use cost were Tk. 12710 and Tk. 15823 per hectare which accounted for about 15% and 19% of total cost respectively (Table 11.7). Total cost of production included variable costs and fixed costs incurred for groundnut cultivation. On an average, the total cost of groundnut production was Tk. 83490 per hectare where 34% was fixed costs and 66% was variable cost (Table 11.7).

Table 11.7: Per hectare cost of groundnut cultivation

Figure in Tk./ha

Particulars	District				%
	Noakhali	Faridpur	Panchagarh	All	
Variable Cost					
Cost of land preparation	7527	5359	7238	6708	8
Hired labor	18419	18270	17545	18078	22
Seed	13967	13348	12542	13286	16
Cowdung	1500	1934	2077	1837	2
Urea	488	500	650	546	1
TSP	2383	2209	2538	2377	3
MoP	1727	1705	2042	1825	2
Gypsum	1624	1238	1431	1431	2
Boric acid	518	430	538	495	1
Cost of irrigation	-	4000	5000	4500	5
Cost of insecticide pesticide	1150	1089	1220	1153	1
Sub-total	49303	50082	52822	50735	-
Interest on operating capital	3796	5002	5832	4877	1
Total variable cost	52433	54450	57988	54957	66
Fixed Cost					
Family labor	11704	13364	13062	12710	15
Land use cost	16120	15300	16050	15823	19
Total fixed cost	27824	28664	29112	28533	34
Total cost	80256	83114	87099	83490	100

Source: Author's own calculations from field survey data during 2019-20

11.3.3 Financial Profitability of Groundnut

Per hectare average yield of groundnut was 2.05 ton and per kg average price was about Tk. 76. The average gross return and gross margin of groundnut cultivation were found Tk. 168238/ha and Tk. 113281/ha respectively. Per hectare average net return was Tk. 84748 which was found to be highest in Panchagarh (Tk. 91776) followed by Noakhali (Tk. 81599) and Faridpur (Tk. 80870). BCR on total cost basis was found 2.01 which was more or less similar among the districts. It was estimated that, to produce one kilogram of groundnut, total cost was Tk. 41 (Table 11.8).

Table 11.8: Per hectare return from groundnut

Figure in Tk.

Particulars	Districts			
	Noakhali	Faridpur	Panchagarh	All
Yield (Ton)	2.02	1.95	2.17	2.05
Price (Tk./kg)	74	78	77	76
Return from Groundnut	149682	152529	165776	155996
Return from by-product	12173	11455	13100	12243
Gross Return	161855	163984	178876	168238
Total variable cost (TVC)	52433	54450	57988	54957
Total fixed cost (TFC)	27824	28664	29112	28533
Total cost (TC)	80256	83114	87099	83490
Gross Margin	109422	109534	120888	113281
Net Return	81599	80870	91776	84748
BCR over total cost	2.02	1.97	2.05	2.01
Cost of production (Tk./kg)	39.73	42.62	40.19	40.81

Source: Author's own calculations from field survey data during 2019-20



Fig 11.2 Groundnut in the farmers field

11.3.4 Economic profitability of groundnut

The DRC value for groundnut found to be less than one (0.35) indicating that Bangladesh had comparative advantage in producing groundnut for import substitution (Table 11.9). This is plausibly attributed to the higher yield of hybrid groundnut which resulting to the lower cost of production of per unit of land. Furthermore, due to higher demand in the local market, there is greater scope for efficient groundnut production. The result is similar to the result found by Rashid et al. (2009).

Table 11.9: Domestic resource cost (DRC) of groundnut (Import parity)

Items	Districts			All
	Noakhali	Faridpur	Panchagarh	
A. Traded input (Tk/MT)	5177	6071	4598	5281
Urea	604	824	562	663

Items	Districts			All
	Noakhali	Faridpur	Panchagarh	
TSP	3000	3316	2586	2967
MoP	1572	1931	1450	1651
B. Non-Traded inputs and domestic resources (Tk/MT)	36724	39829	37127	37893
Human labour	14912	16223	14105	15080
Land preparation	3726	2748	3335	3270
Seed	6914	6845	5780	6513
Manure	743	992	957	897
Pesticide	569	558	562	563
Irrigation	0	2051	2304	1452
Int. on operating capital	1879	2565	2688	2377
Land use cost	7980	7846	7396	7741
C. Output price (Tk/MT)	112481	112481	112481	112481
D. Value added (Tradable) (Tk/MT) (C-A)	107305	106411	107882	107199
E. DRC (B/D- Import parity)	0.342	0.374	0.344	0.354

Source: Author's own calculations

11.3.5 Problems faced by the farmers in groundnut cultivation

The first and the foremost constraint for groundnut cultivation in all areas were the labour crisis and high price at harvesting time (56%). They mentioned some other constraints as: lack of quality seeds at appropriate time (43%) followed by adulterated fertilizer/ fertilizer not working properly (41%), low market price at harvesting time (34%), Insect infestation (27%), Lack of drainage system (19%), adulterated seed & root rot disease (13%), unavailability of bank loan (12%) etc. (Table 11.10).

Table 11.10: Problems faced by the farmers in groundnut cultivation

Particulars	Farmer responded (%)			
	Noakhali	Panchagor	Faridpur	All
Seed related problems				
Lack of quality seeds at appropriate time	64	37	28	43
High price of seed	15	11	12	13
Fertilizer related problems				
Adulterated fertilizer	50	43	32	41
Insect/disease related problems				
Insect infestation (aphid, cutter pillar)	45	24	13	27
Disease (root rot)	12	18	9	13
Labour related problems				
Labour crisis and high price in harvesting time	71	54	42	56
Loan related problems				

Particulars	Farmer responded (%)			
	Noakhali	Panchagor	Faridpur	All
Harasement of getting loan	22	10	4	12
Marketing related problems				
Low market price at harvesting time	44	31	26	34
Distance of market is high	10	4	9	8
Lack of drainage system	22	14	20	19

11.3.6 Remedial measure for groundnut cultivation

- The government should take initiatives regarding the supply of quality seed at the proper time with a reasonable price, and should control and restrict the supply and availability of adulterated fertilizer from the market.
- More emphasis should be given on developing of new short-duration varieties.
- Government should fix labour price take at harvesting time.
- Drainage system should be developed to reduce the loss of groundnut production.

11.4 Financial and economic profitability of sesame

11.4.1 Pattern of input use for sesame cultivation

Farmers in the study areas used various inputs for sesame cultivation. Farmers used on an average 62 man-days per hectare of total human labour for sesame cultivation where family labour was 28 man-days and hired labour was 35 man-days. On an average, they used 11 kg seed per hectare of land. They applied Urea at the rate of 99 kg/ha, TSP 140 kg/ha, and MoP 90 kg/ha. It was observed that among the chemical fertilizer, farmers used highest amount of TSP in sesame plots under the sample districts (Table 11.11). Farmers also applied Gypsum (50 kg/ha) and Boron (8 kg/ha) for sesame cultivation.

Table 11.11: Level of input use per hectare of sesame cultivation

Particulars	Districts			
	Tangail	Jashore	Barisal	All
Human labour (man-days)	57	67	62	62
Hired	32	37	35	35
Family	25	30	27	28
Seed (kg/ha)	11	11	10	11
Urea	92	119	87	99
TSP	129	145	146	140
MoP	71	108	90	90
Gypsum	46	60	44	50
Boron	7	8	8	8

Source: Field Survey during 2019-20

11.4.2 Cost of Sesame Cultivation

The analysis revealed that total variable cost of sesame cultivation was Tk. 33233 per hectare which was 54% of total cost of production (Table 11.12). The highest variable cost item was hired labour which accounted for about 25% of the total cost. Land preparation cost accounted for about 12% of total cost and ranked second variable cost item. Family labour and rental value of land was considered as fixed cost of production. The family labour and land use cost were Tk. 11732 and Tk. 14656 per hectare which accounted for about 20% and 25 % of total costs, respectively (Table 11.12). Total cost of production included variable costs and fixed costs incurred for sesame cultivation. On an average, the total cost of production was Tk. 59621 per hectare where 44% was fixed costs and 56% was variable cost (Table 11.12).

Table 11.12: Per hectare cost of sesame cultivation

Figure in Tk.

Particulars	District				
	Tangail	Jashore	Barisal	All	%
Variable Cost					
Cost of land preparation	6835	7315	6739	6963	12
Hired labor	13397	15977	14626	14667	25
Seed	781	783	679	747	1
Cowdung	-	500	700	600	1
Urea	1559	2028	1485	1691	3
TSP	2845	3191	3215	3084	5
MoP	1142	1732	1442	1439	2
Gypsum	509	660	488	552	1
Boron	1253	1476	1379	1369	2
Cost of insecticide pesticide	980	1140	1010	1043	2
Sub-total	29301	34801	31764	31955	54
Interest on operating capital	1172	1392	1271	1278	2
Total variable cost	30473	36193	33034	33233	56
Fixed Cost					
Family labor	10828	12882	11485	11732	20
Land use cost	14159	15883	13925	14656	25
Total fixed cost	24987	28765	25410	26387	44
Total cost	55460	64958	58444	59621	100

Source: Author's own calculations from field survey data during 2019-20

11.4.3 Financial Profitability of Sesame

Per hectare average yield of sesame was 1.34 ton and per kg average price was about Tk. 62. The average gross return and gross margin of sesame cultivation were found Tk. 90044 ha⁻¹ and Tk. 56811 ha⁻¹ respectively. Per hectare average net return was Tk. 30423 which was found to be highest in Jashore (Tk. 36817) followed by Barishal (Tk. 28479) and Tangail (Tk. 25975). BCR on total cost basis was found 1.51 which was the highest in Jashore 1.57 and lowest in Tangail districts 1.47. It was estimated that, to produce one kilogram of sesame, total cost incurred Tk.44 (Table 11.13).

Table 11.13 Per hectare return from sesame

Figure in Tk.

Particulars	Districts			
	Tangail	Jashore	Barisal	All
Yield (Ton)	1.25	1.44	1.33	1.34
Price (Tk./kg)	60	65	61	62
Return from Sesame	74600	93917	80625	83047
Return from by-product	6834	7858	6298	6997
Gross Return	81434	101775	86923	90044
Total variable cost (TVC)	30473	36193	33034	33233
Total fixed cost (TFC)	24987	28765	25410	26387
Total cost (TC)	55460	64958	58444	59621
Gross Margin	50961	65582	53888	56811
Net Return	25975	36817	28479	30423

Figure in Tk.

Particulars	Districts			
	Tangail	Jashore	Barisal	All
BCR over total cost	1.47	1.57	1.49	1.51
Cost of production (Tk./kg)	44.37	45.11	43.94	44.47

Source: Author's own calculations from field survey data during 2019-20



Fig 11.3 Sesame crops in the farmers field

11.4.4 Economic profitability of sesame cultivation

The DRC value for sesame found to be less than one (0.29) indicating that Bangladesh had comparative advantage in producing sesame for import substitution (Table 11.14). This is plausibly attributed to the higher yield of hybrid sesame resulting to the lower cost of production of per unit of land. Moreover, higher demand for sesame in the oil industries led to efficient production of sesame. The result is similar to the result found by Rashid et al. (2009).

Table 11.14 Domestic Resource Cost (DRC) of Sesame (Import parity)

Items	Tangail	Jashore	Barishal	All
A. Traded input (Tk/MT)	7784	8362	8025	8057
Urea	2364	2654	2101	2373
TSP	4197	4095	4465	4252
MoP	1223	1613	1459	1432
B. Non-Traded inputs and domestic resources (Tk/MT)	38522	38800	37921	38414
Human labour	19380	20041	19632	19684
Land preparation	5468	5080	5067	5205
Seed	625	544	511	560
Manure	0	347	526	291
Pesticide	784	792	759	778
Interest on operating capital	938	967	956	953
Land use cost	11327	11030	10470	10942
C. Output price (Tk/MT)	141292	141292	141292	141292
D. Value added (Tradable) (Tk/MT) (C-A)	133508	132929	133267	133235
E. DRC (B/D)_Import parity	0.289	0.292	0.285	0.288

Source: Author's own calculations

11.4.5 Problems faced by the farmers in sesame cultivation

In table 11.15, the first constraint for oilseed sesame variety in all areas were the lack of quality seeds at appropriate time. Other problems were insect infestation (37%) followed by water logging condition (22%), adulterated seed & fertilizer (13%) labour crisis and high price at harvesting time (10%). They also mentioned about lack of training facilities and low market price at harvesting time (9%).

Table 11.15: Problems faced by the farmers in sesame cultivation

Particulars	Farmer responded (%)			
	Tangail	Barishal	Jashore	All
Seed related problems				
Lack of quality seeds at appropriate time	53	35	25	37
Adulterated seed	15	11	12	13
Fertilizer related problems				
Adulterated fertilizer	19	6	16	13
Insect/disease related problems				
Insect infestation (Cutter piller)	45	34	33	37
Labour related problems				
Labour crisis and high price in harvesting time	21	6	4	10
Lack of training facilities	14	6	8	9
Water logging condition	10	30	25	22
Marketing related problems				
Low market price at harvesting time	12	9	5	9
Distance of Market is high	10	25	6	14

11.4.6 Remedial measure for sesame cultivation

- The government should take initiatives regarding the supply of quality seed at the proper time with a reasonable price, and should control the supply and availability of adulterated fertilizer from the market.
- More emphasis should be given on developing new varieties with short-duration, stress-tolerance, and other characteristics.
- Frequent interaction was needed among farmers, extension personnel and sesame growers. Hand-on training on improved sesame cultivation and crop management practices for the sesame growing farmers is also important.
- Ensuring labor supply timely to sesame growers to a greater extent during cultivation and harvest time to reduce yield loss.

12. Research highlight

Title of the sub-project: Cost and Return Analysis of Selected Crops in Bangladesh

Background: Reliable data on costs and returns of crop production are needed to understand the underlying processes that influence the output and productivity of crop sector, and how these are impacted by new policies and regulations. Cost-return data can serve as a means of understanding and assessing farm operations. It allows producers to question their own operations and to benchmark it against the best practices of farms in the same region with similar physical characteristics. This in turn can lead to better farm-level decisions and improved market efficiency and performance. Resource scarcity has led the production economists to think about the reallocation of existing resources to have more output with given level of input combinations or to produce a prescribed level of output with the minimum cost without changing the production technology. But there is a lack of information about the efficient use of inputs in crops production. Similarly, measurement of productive efficiency in agricultural production is an important issue, because it gives pertinent information for making sound management decision in resource allocation. Except for a few descriptive studies, econometric analysis has yet to be conducted to examine the production function for crops cultivation and its potential for future improvement. To formulate appropriate planning for the sustainable development of agriculture sector, reliable data on crop production are urgently needed. The present study aimed to generate socioeconomic information on major agricultural crops' cultivation at farm level, which can be used by policy makers, researchers, and extension personnel to fill up the knowledge gap in the crop sector.

Objectives:

- i. to determine the level of input use and estimate the cost and return of selected crops cultivation at the farm level;
- ii. to estimate the economic returns and competitiveness of some selected crops in Bangladesh; and
- iii. to identify problems and opportunities related to crop cultivation at the farm level.

Methodology: The sub-project was coordinated by Agricultural Economics and Rural Sociology Division, Bangladesh Agricultural Research Council, with two implementing parts: i. Agricultural Economics Division, Bangladesh Agricultural Research Institute, and ii. Agricultural Economics Division, Bangladesh Institute of Nuclear Agriculture. In addition to coordinating activities, AERS division, BARC acted as an implementing part for collecting data on jute cultivation. Accordingly, 900 sample jute farmers were interviewed in different study areas. Agricultural Economics Division, BARI, was responsible for data collection of 35 types of crops. Hence, a total of 14,490 sample farmers were interviewed from different areas around Bangladesh. Similarly, Agricultural Economics Division, BINA, collected data on three major oilseed crops mustard, groundnut, and sesame, from a total of 1,350 samples of oilseed farmers. Under the sub-project, altogether 39 types of crops were studied, including cereals, pulses, oilseeds, tuber crops, spices, vegetables, fruits, and fiber crops, and a total of 16,740 sample farmers were interviewed for the cost-return analysis.

Principal Investigators (PI) of the concerned organizations were responsible for implementing the project activities. The yearly progress of planned activities was reviewed in the workshop organized by the coordination component BARC at the end of each year. All concerned stakeholders, scientists, teachers, extension personnel, experts, policymakers, and media personnel were invited to attend the workshop.

Primary data were collected through extensive farm-survey in distinct regions of Bangladesh. The farm surveys were carried out for various crops by applying both multi-stage and random sampling techniques to select sample farm households for the purpose of collecting primary data and information. At the first stage, priority in the selection of study areas was specified to the intensity of area coverage by respective crops and regional differences in Agro-ecological zones. At stage two, for selecting the Upazilla, data on the cultivated area for the selected crops and total cropped area in each Upazilla under the district were collected from the district office of the Department of the Agricultural Extension (DAE). Then, the highest crop concentration Upazillas were selected for administering farm surveys for the selected crops. At the

third stage, union and block-wise information for the specified crops and total cropped area of each union and block were taken from the Upazilla office of the DAE for selecting the union and block. The union and block were also selected based on the highest crop concentration for the selected crop. Finally, the sample farmers were selected randomly from the highest crop concentrated village. The per hectare profitability of growing crop from the viewpoints of individual farmers was calculated in terms of gross return, gross margin, and net return.

The performance of the financial and economic profitability of various crops, including an assessment of comparative advantage using domestic resource cost (DRC), is presented in the following sub-sequent sections in brief.

Key Findings

Fibre crop: As reported, farmers received a net return of Tk.30,672 on per hectare basis in Tossa jute, with a total cost of Tk.1,09,936. The benefit-cost ratio over the total cost basis was calculated at 1.28. Similarly, the net return for *Deshi* jute production was estimated at Tk.20,853 per hectare under farmers' conditions, with a total cost of production of Tk.94,974, and a computed benefit-cost ratio of 1.22 on a total cost basis. The cost of production per kilogram of Tossa and *Deshi* jute was Tk.46.28 and Tk.47.82, respectively. The value of domestic resource cost (DRC) for jute under export parity price was less than one (0.947), indicating that the crop has a comparative advantage in terms of the efficiency of domestic production for export promotion.

Cereals: Data was collected from two cereal crops, viz., wheat and maize, from various study locations around Bangladesh under BARI component. The analyses revealed that total cost of wheat cultivation was Tk.74,447 per hectare, with an average net return of Tk.19,313 per hectare. The benefit-cost ratio on a total cost basis was found to be 1.26. The cost of per kilogram wheat was Tk.17.88. For maize, the total cost of production and net return were Tk.1,10,119 and Tk.95,110 per hectare respectively. The benefit-cost ratio on a total cost basis was 1.86 and the per kilogram cost of production stood at Tk.10.05. The values of domestic resource cost (DRC) for wheat and maize under import parity prices were less than one (0.69 and 0.50, respectively), indicating that Bangladesh had a comparative advantage for both crops in terms of the efficiency of domestic production for import substitution.

Pulses: Under the component, data on two pulse crops, lentil and mungbean, was collected from various survey areas. Results revealed that, on average, the total cost of production of lentil and mungbean was Tk.52,744 and Tk.46,791 per hectare, respectively. The estimated net returns were Tk.33,409 for lentil and Tk.26,144 for mungbean, with a benefit-cost ratio of 1.63 and 1.56, respectively, on a total cost basis. The per kilogram production costs for lentil and mungbean were Tk. 37.14 and Tk. 36.58 respectively. DRC values were less than unity for both crops (0.62 for lentils and 0.63 for mungbean) implying that the country had a comparative advantage in these crops for import substitution.

Spices: Four spice crops onion, garlic, green chilli, and betal leaf were selected for survey under the component. Farmers received an average net return of Tk.1,30,179, Tk.1,57,163, Tk.1,56,348, and Tk.2,58,683 for onion, garlic, green chilli, and betal leaf per hectare, respectively. The per hectare total cost of production was estimated at Tk.1,74,171 for onion, Tk.2,20,637 for garlic, Tk.1,89,701 for green chilli, and Tk.9,52,567 for betal leaf production. The benefit-cost ratio over the total cost basis was calculated at 1.74 for onion, 1.71 for garlic, 1.83 for green chilli, and 1.27 for betal leaf. However, the per kg costs of production of onion, garlic, green chilli, and betal leaf were Tk.11.76, Tk.27.69, Tk.11.98, and Tk.98.00 respectively. DRC analysis implies that Bangladesh had a comparative advantage for import substitution since the values of DRC's are less than unity in producing onion, garlic, and green chilli (0.39, 0.27, and 0.12, respectively).

Tuber crops: Three tuber crops namely potato, sweet potato, and aroid were considered for analysing their profitabilities and comparative advantages under the project. Potato, sweet potato, and aroid had a total cost of production of Tk.2,30,357, Tk.1,43,396, and Tk.2,23,241 per hectare, respectively, resulting in an average net return of Tk.90,437, Tk.1,54,707, and Tk.2,17,385 per hectare respectively. On a total cost basis, the benefit-cost ratios for potato, sweet potato and aroid were estimated to be 1.39, 2.14, and 1.97,

respectively. The entire cost of producing one kilogram of potato, sweet potato, and aroid required Tk.8.12, Tk.5.99, and Tk.6.45 respectively. Under export parity prices, all values of domestic resource cost (DRC) for potato and sweet potato were less than one (0.53 and 0.46, respectively), indicating that the country had a comparative advantage in terms of domestic production efficiency for export promotion for these crops.

Vegetables: A total of nine different Kharif vegetables, namely pointed gourd, okra, bitter gourd, cucumber, ash gourd, snake gourd, teasel gourd, ridge gourd, and sponge gourd, were selected in the study. The average total cost of production (per hectare) for pointed gourd was Tk.2,19,838, whereas it was Tk.2,02,642 for okra, Tk.2,26,384 for bitter gourd, Tk.1,99,633 for cucumber, Tk.2,19,741 for ash gourd, Tk.2,23,463 for snake gourd, Tk.2,19,741 for teasel gourd, Tk.2,09,555 for ridge gourd, and Tk.1,99,628 for sponge gourd. The net return was estimated at Tk.1,39,672 for pointed gourd, Tk.2,15,538 for okra, Tk.1,89,947 for bitter gourd, Tk.1,57,971 for cucumber, Tk.1,58,790 for ash gourd, Tk.1,88,058 for snake gourd, Tk.1,28,984 for teasel gourd, Tk.1,42,640 for ridge gourd, and Tk.1,29,251 for sponge gourd production. On a total cost basis, the calculated benefit-cost ratio for okra (2.07) was the highest among Kharif vegetables and the lowest for teasel gourd (1.59). Per kg production costs for all these Kharif vegetables ranged from Tk. 4.84 to Tk. 9.49. DRC values were found to be less than unity for studied vegetables, implying that the country had a comparative advantage in these vegetables for export promotion.

Among the Rabi vegetables, yard-long beans, brinjal, cauliflower, cabbage, tomato, country bean, pumpkin, bottle gourd, and red amaranth were studied under the project. The cost-return scenario revealed that the total cost of yard-long bean cultivation was Tk.2,33,274 per hectare, which was Tk.2,17,978 for brinjal, Tk.1,85,189 for cauliflower, Tk.1,82,592 for cabbage, Tk.2,01,311 for tomato, Tk.2,11,864 for country bean, Tk.1,47,489 for pumpkin, Tk.2,11,593 for bottle gourd, and Tk.1,32,931 for red amaranth. Vegetable farmers received net returns of Tk.1,62,159 from yard-long beans, Tk.1,40,212 from brinjal, Tk.1,32,852 from cauliflower, Tk.1,29,839 from cabbage, Tk.2,89,985 from tomato, Tk.2,36,292 from country beans, Tk.1,11,939 from pumpkin, Tk.1,33,433 from bottle gourd, and Tk.1,01,944 from red amaranth cultivation. Among the vegetables, the calculated benefit-cost ratio on a total cost basis was maximum (2.44) for tomato and minimum (1.63) for bottle gourd. The per kg cost of vegetable (Rabi) production ranged from Tk.4.95 to Tk.9.49 among these vegetables. The country had a comparative advantage for export promotion as DRC values for all rabi vegetables were less than unity, similar to kharif vegetables.

Fruits: Fruit crops under the study included banana, mango, guava, litchi, malta, and lemon. As reported, the total cost per hectare was estimated at Tk.2,73,923 in banana, Tk.2,12,262 in mango, Tk. 2,80,554 in guava, Tk.1,99,520 in litchi, Tk.3,82,548 in malta, and Tk.2,56,451 in lemon cultivation. The average net returns per hectare were estimated at Tk.3,26,803 in banana, Tk.3,57,308 in mango, Tk.2,56,560 in guava, Tk. 4,72,036 in litchi, Tk.7,41,577 in malta, and Tk.1,73,036 in lemon production. The benefit-cost ratio over the total cost was calculated at 2.19 for banana, 2.69 for mango, 1.92 for guava, 3.37 for litchi, 2.94 for malta, and 1.68 for lemon. The per kg cost of production was Tk. 6.56 for banana, Tk. 10.00 for mango, Tk. 5.67 for guava, Tk. 26.41 for litchi, Tk. 23.61 for malta, and Tk. 17.46 for lemon production.

Oilseed crops: Three important oil crops such as mustard, groundnut, and sesame were considered for analyzing the costs and returns of their farm level cultivation under BINA component. The overall cost scenario revealed that the total costs of production of mustard, groundnut, and sesame were Tk.51,394, Tk.83,490, and Tk.59,621 per hectare, respectively. The average net returns of the aforesaid crops were Tk.14,776, Tk.84,748, and Tk.30,423 per hectare respectively. The benefit-cost ratio over total cost was calculated at 1.29 for mustard, 2.01 for groundnut, and 1.51 for sesame. The analysis further revealed that the production of one kilogram mustard, groundnut, and sesame required Tk. 39.27, Tk.40.81, and Tk.44.47 respectively. Under import parity prices, all the values of domestic resource cost (DRC) for mustard, groundnut, and sesame were less than one (0.66, 0.35, and 0.29, respectively), indicating that the country had a comparative advantage in producing these oilseed crops for import substitution.

It is concluded that all the crops under study were found to be profitable, and fruits and vegetables were more profitable compared to other studied crops. Again, all the crops have a comparative advantage in domestic production for import substitution or export promotion. In spite of having profitable nature of all the crops, farmers faced some problems during their cultivations. Farmers mentioned seasonal price fluctuations, lack of quality seed, adulterated seed and fertilizer, insect and disease infestations, high wages, and labor shortages in harvesting time as major issues in the crop cultivation process. In order to improve the crop production environment at the farm level, farmers are of the view that minimum prices should be fixed and necessary initiatives should be taken by the government to address low or unreasonable prices of crops as well as marketing problems. They also stated that necessary initiatives should be taken by DAE and agricultural research institutes to solve problems with insects and diseases in crop fields. They urged strengthening mechanization at the farm level to meet labor crisis situations. Other problems related to the availability of quality seed, removing adulterated seed and fertilizers from the market can be solved with proper initiatives by the government and concerned organizations like BADC. The farmers, in particular, and the country as a whole will definitely benefit if these problems are minimized or solved to some extent.

Keywords: Cost and return, Financial profitability, Economic profitability, DRC, Import parity, Export parity.

B. Implementation Status

1. Procurement (Component wise):

A. BARC Component

Description of equipment and capital items	PP Target		Achievement		Remarks
	Physical (No.)	Financial (Tk.)	Physical (No.)	Financial (Tk.)	
(a) Office equipment	15	4,06,000	15	4,00,600	100%
(b) Lab & field equipment	22	3,54,500	22	3,51,939	100%
(c) Other capital items	-	-	-	-	-

B. BARI Component

Description of equipment and capital items	PP Target		Achievement		Remarks
	Physical (No.)	Financial (Tk.)	Physical (No.)	Financial (Tk.)	
(a) Office equipment	14	398000	14	398000	100%
(b) Lab & field equipment	16	184000	16	184000	100%
(c) Other capital items	-	-	-	-	-

C. BINA Component

Description of equipment and capital items	PP Target		Achievement		Remarks
	Physical (No.)	Financial (Tk.)	Physical (No.)	Financial (Tk.)	
(a) Office equipment	10	270496	10	270496	100%
(b) Lab & field equipment	14	172930	14	172930	100%
(c) Other capital items	-	-	-	-	-

2. Establishment/renovation facilities: *Not applicable*

Description of facilities	Newly established		Upgraded/refurbished		Remarks
	PP Target	Achievement	PP Target	Achievement	

3. Training/study tour/ seminar/workshop/conference organized:

Description	Number of participant			Duration (Days/weeks/ months)	Remarks
	Male	Female	Total		
(a) Training	-	-	-	-	-
(b) Workshop	202	19	221	3 times (1 day each)	-
(c) Others (if any)	-	-	-	-	-

C. Financial and Physical Progress (Combined & Component wise)

A. Combined of all Components

Fig in Tk

Items of expenditure/ activities	Total approved budget	Fund received	Actual expenditure	Balance/ unspent	Physical progress (%)	Reasons for deviation
a. Contractual staff salary	6441155	5730412	5710449	19963	99	-
b. Field research/lab expenses and supplies	3137200	3021782	2950900	70882	98	-
c. Operating expenses	4811700	4727200	4657709	69491	99	-
d. Vehicle hire and fuel, oil & maintenance	5298532	5276082	5274318	1764	99	-
e. Training/ work - shop/seminar etc.	638000	557500	439900	117600	79	-
f. Publications and printing	366300	216300	65800	150500	30	-
g. Miscellaneous	711409	675585	655573	20012	97	-
h. Capital expenses	1777965	1777965	1777965	0	100	-
Total	23182261	21982826	21532614	450212	98	-

B. BARC Component

Fig in Tk

Items of expenditure/ activities	Total approved budget	Fund received	Actual expenditure	Balance/ unspent	Physical progress (%)	Reasons for deviation
a. Contractual staff salary	5389335	4678902	4658939	19963	99	-
b. Field research/lab expenses and supplies	475100	475100	406300	68800	86	-
c. Operating expenses	1105933	1048433	993572	54861	95	-
d. Vehicle hire and fuel, oil & maintenance	462032	450032	439912	10120	98	-

Fig in Tk

Items of expenditure/ activities	Total approved budget	Fund received	Actual expenditure	Balance/ unspent	Physical progress (%)	Reasons for deviation
e. Training/ work - shop/seminar etc.	638000	557500	439900	117600	79	-
f. Publications and printing	366300	216300	65800	150500	30	-
g. Miscellaneous	400230	365230	354218	20012	97	-
h. Capital expenses	752539	752539	752539	0	100	-
Total	9589469	8544036	8102180	441856	95	-

C. BARI Component

Fig in Tk

Items of expenditure/ activities	Total approved budget	Fund received	Actual expenditure	Balance/ unspent	Physical progress (%)	Reasons for deviation
a. Contractual staff salary	709440	709440	709440	0	100	-
b. Field research/lab expenses and supplies	2292500	2178500	2178500	0	100	-
c. Operating expenses	3245413	3218413	3218413	0	100	-
d. Vehicle hire and fuel, oil & maintenance	4243000	4241400	4241400	0	100	-
e. Training/ work - shop/seminar etc.	0	0	0	0	0	-
f. Publications and printing	0	0	0	0	0	-
g. Miscellaneous	277182	276055	276055	0	100	-
h. Capital expenses	582000	582000	582000	0	100	-
Total	11349535	11205808	11205808	0	100	-

D. BINA Component

Items of expenditure/ activities	Total approved budget	Fund received	Actual expenditure	Balance/ unspent	Physical progress (%)	Reasons for deviation
a. Contractual staff salary	342070	342070	342070	0	100	-
b. Field research/lab expenses and supplies	369600	368182	366100	2082	99	-

Items of expenditure/ activities	Total approved budget	Fund received	Actual expenditure	Balance/ unspent	Physical progress (%)	Reasons for deviation
c. Operating expenses	460354	460354	445724	14630	97	-
d. Vehicle hire and fuel, oil & maintenance	593500	584650	593006	-8356	101	-
e. Training/ work - shop/seminar etc.	0	0	0	0	0	-
f. Publications and printing	0	0	0	0	0	-
g. Miscellaneous	34300	34300	34300	0	100	-
h. Capital expenses	443426	443426	443426	0	100	-
Total	2243250	2232982	2224626	8356	99	-

D. Achievement of Sub-Project by Objectives (Tangible form): Technology Generated/Developed: *Not applicable*

Description of facilities	Newly established		Upgraded/refurbished		Remarks
	PP Target	Achievement	PP Target	Achievement	

E: Information/knowledge Generated/Policy Generated

General/specific objectives of the sub -project	Major technical activities performed in respect of the set objectives	Output	Outcome term effect of the research)
To estimate the economic returns and competitiveness of selected crops in Bangladesh	Domestic Resource Cost (DRC) analysis through Import and Export parity analysis.	DRC values of all selected crops were less than unity	Bangladesh had comparative advantage of cereals and pulse crops production for import substitution and vegetables production for export promotion.

F. Materials Development/Publication made under the Sub-project: *Not applicable*

Publication	Number of publication		Remarks (e.g. paper title, name of journal, conference name, etc.)
	Under preparation	Under preparation	
Technology bulletin/ booklet/leaflet/flyer etc.			
Journal publication			
Video clip/TV program			
News Paper/Popular Article			
Other publications, if any			

G. Description of Generated Technology/Knowledge/Policy: *Not applicable*

- i. **Technology fact sheet (title, introduction, description, suitable location/ecosystem, benefits, name and contact address of author)**
- ii. **Effectiveness in policy support (if applicable)**

H. Technology/knowledge Generation/Policy Support (as applied):

- i. **Immediate impact on generated technology (commodity & non-commodity)**
- ii. **Generation of new knowledge that help in developing more technology in future**
- iii. **Technology transferred that help increased agricultural productivity and farmers' income**
- iv. **Policy Support**

Selected vegetables and fibre crop studied under the Sub-project could be expanded for export promotion by applying more improved technologies as country's demand. Therefore, emphasis should be given to local production of studied vegetables and the fibre crop as the export parity is favourable for the country.

The study also implied that production of cereals, spices, pulses and oilseeds would be highly efficient for import substitution as estimated DRCs were less than unity. Therefore, domestic production should be expanded and imports of these crops should be discouraged.

I. Information Regarding Desk and Field Monitoring

- i. **Desk Monitoring (description & output of consultation meeting, monitoring workshops/seminars etc.):**

Started from the beginning of the project and continued up to the end of the project period. Number of desk monitoring conducted: 25 and number of seminar/workshops conducted: 3. Feedback information for inclusion in the research program of the project for improvement.

- ii. **Field Monitoring (date & no. of visit, name and addresses of team visit and output):**

Started from the beginning of the project and continued up to the end of the project period, maintaining the scheduled time frame as per project proposal. Number of field monitoring conducted: 26. Progress and problems identification of effective measures taken for further improvement and promotion of the project activities.

iii. Weather data, flood/salinity/drought level (if applicable) and natural calamities: Not applicable

J. Sub-project Auditing (covers all types of audit performed)

Types of audit	Major observation/ issues/ objections raised; if any	Amount of Audit (Tk.)	Status at the sub-project end	Remarks
Govt. (by FAPAD)	No objections raised	3 (three)	Year-1 (2018-19) Year-2 (2019-20) and Year-3 (2020-21)	-
Internal (by MI & Co.)	No objections raised	2 (two)	Year-1 (2018-19) and Year-2 (2019-20)	-

K. Lessons Learned:

1. Crop production technology, especially in input use pattern under farmers' management.
2. Profitability of the crop.
3. Problems and related remedial measures of the crop production process.
4. Prospect of domestic cultivation and export promotion.

L. Challenges (if any):

Normal project operations, such as primary data collection, focus group discussions, and other farm level field activities, have been disrupted, delayed, and even suspended due to the COVID-19 pandemic. Working at the office has also been impacted due to the continuing circumstances.

M. Suggestions for future planning (if any):

The study generated cost and return data/information for thirty nine selected crops all over Bangladesh. Input-output data for every year of those crops will be needed to upgrade the existing data/information. Hence, financial support is essential for collecting the required data/information regularly either undertaking crop season based short-term projects or through annexation as regular activities of BARC.

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Signature of the Coordinator/PI

Date
Seal
Dr. Md. Mosharraf Uddin Molla
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Counter signature of the Head of the organization/authorized representative

Date
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Apendices

A. BARC Component

1. Profile of Tossa jute growers' in the study areas

Particulars	Areas			All areas
	Faridpur	Pabna	Jamalpur	
1. Age (% of farmers)				
Below 25 years	6	6	4	5
26-50 years	60	60	63	61
Above years	34	33	33	33
2. Literacy status (% of farmers)				
Illeterate	3	12	7	11
Can sign only	32	41	33	35
Primary (Class I-V)	28	14	16	19
Secondary (Class VI-SSC)	21	20	27	23
Higher Secondary (HSC)	5	9	9	8
Degree and above	1	4	8	4
3. Occupation (% of farmers)				
<i>Main occupation</i>				
Agriculture	100	100	100	100
<i>Subsidiary occupation</i>				
Petty business	10	15	4	10
Wage labours/Others	3	9	3	5
4. Experience in farming (% of farmers)				
Below 15 years	24	23	28	25
16-30 years	40	49	43	44
Above 30 years	36	28	29	31
5. Farm size (% of farmers)				
Marginal (below 0.19 ha)	5	4	8	6
Small (0.19 -0.99 ha)	66	54	75	65
Medium ((1.00 -3.03 ha)	27	38	16	27
Large (Above 3.03 ha)	1	4	1	2
6. Number of family members				
Children (Under 12 years)	1	1	1	1
Male	2	3	2	2

Particulars	Areas			All areas
	Faridpur	Pabna	Jamalpur	
Female	2	2	2	2
Total	5	6	5	5
7. Family member (no.) involved in Agriculture				
1	73	79	78	77
2	21	17	19	19
3	3	2	2	2
4	3	1	1	2

2. Distribution of cropping patterns followed by the farmers in Tossa jute cultivation in the study areas

SL No.	Cropping Patterns	% farms followed			
		Faridpur	Pabna	Jamalpur	All Areas
1	Wheat-Jute-Rice	25	14	17	19
2	Lentil-Jute-Rice	35	5	-	13
3	Onion-Jute-Rice	11	26	-	12
4	Rice-Jute-Rice	3	-	18	7
5	Maize-Jute-Rice	-	-	18	6
6	Khesari (Grass pea)-Jute-Rice	10	5	-	5
7	Chilli-Jute-Rice	-	-	12	4
8	Coriander-Jute-Rice	11	-	-	4
9	Mustard-Jute-Rice	-	6	3	3
10	Onion-Jute-Fallow	-	8	-	3
11	Wheat/Chilli/Maize-Jute-Chilli	-	-	8	3
12	Lentil-Jute-Maskalai	-	8	-	3
13	Mustard-Jute-Chilli	-	-	5	2
14	Maskalai-Jute-Rice	3	1	1	2
15	Garlic-Jute-Rice	-	3	-	1
16	Rice/Fallow-Rice-Rice/Fallow	2	21	15	13
17	Onion-Rice-Rice	-	2	-	1
18	Sugarcane-Sugarcane-Sugarcane	-	-	2	1
		100	100	100	100

3. Competitive crops of Tossa jute cultivation in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Faridpur	Pabna	Jamalpur	All Areas
1.	Rice	79	66	73	72
2.	Vegetables	6	11	12	10

Sl. No.	Competitive crops	% farmers responded			
		Faridpur	Pabna	Jamalpur	All Areas
3.	Maize	6	-	4	3
4.	Till	7	20	-	9
5.	Kalai/Mugh	2	3	-	2
6.	Dhaincha	-	-	8	3
7.	Sugarcane	-	-	3	1
		100	100	100	100

4. Profile of *Deshi* jute growers' in the study areas

Particulars	Areas			
	Mymensingh	Shariatpur	Rangpur	All areas
1. Age (% of farmers)				
Below 25 years	8	3	3	4
26-50 years	59	65	57	60
Above 51 years	33	32	40	35
2. Literacy status (% of farmers)				
Illiterate	17	3	5	8
Can sign only	23	17	21	20
Primary (Class I-V)	28	43	23	31
Secondary (Class VI-SSC)	21	32	28	27
Higher secondary (HSC)	8	4	16	9
Degree and above	3	1	7	4
3. Occupation (% of farmers)				
Main occupation				
Agriculture	100	100	100	100
Subsidiary occupation				
Petty business	20	9	20	16
Wage labour/Others	3	-	-	1
4. Experience in farming (% of farmers)				
Below 15 years	-	-	-	-
16-30 years	17	5	7	10
Above 30 years	83	95	93	90
5. Farm size (% of farmers)				
Marginal (below 0.19 ha)	9	8	5	8
Small (0.19-0.99 ha)	67	59	47	57
Medium (1.00-3.03 ha)	20	32	47	33
Large (above 3.03 ha)	4	1	1	2
6. Number of family member				
Children (under 12 years)	2	1	1	1

Particulars	Areas			
	Mymensingh	Shariatpur	Rangpur	All areas
Male	3	3	2	3
Female	2	3	2	2
Total	7	7	5	6
7. Family member (no.) involved in agriculture				
1	67	71	60	66
2	27	21	28	25
3	4	4	9	6
4	2	4	3	3

5. Distribution of cropping patterns followed by the farmers in *Deshi* jute cultivation in the study areas.

SL No.	Cropping Patterns	% farms followed			
		Mymensingh	Shariatpur	Rangpur	All Areas
1	Chili-Jute-Rice	8	5	-	4
2	Kalai-Jute-Rice	5	-	-	2
3	Lentil-Jute-Rice	4	1	-	2
4	Mustard-Jute-Rice	2	28	1	10
5	Rice-Jute-Rice	34	8	20	21
6	Potato-Jute-Rice	6	28	28	21
7	Tobacco-Jute-Rice	-	-	4	1
8	Vegetables-Jute-Rice	39	18	14	24
9	Wheat-Jute-Rice	2	12	8	7
10	Maize-Jute-Rice	-	-	17	6
11	Rice-Rice-Rice	-	-	8	3
		100	100	100	100

6. Competitive crops of *Deshi* jute cultivation in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Mymensingh	Shariatpur	Rangpur	All areas
1.	Rice	80	91	45	72
2.	Vegetables	20	9	13	14
3.	Groundnut	-	-	9	3
4.	Maize	-	-	27	9
5.	Tobacco	-	-	5	2
		100	100	100	100

B. BARI Component

1. Profile of the wheat growers' in the study areas

Particulars	% farmers responded			
	Faridpur	Pabna	Thakurgaon	All areas
1. Age				
15-29 years	9	12	21	14
30-44 years	29	40	36	35
45-59 years	43	38	29	37
60-74 years	18	9	12	13
75-89 years	1	1	2	1
2. Literacy status				
Illiterate	3	4	-	2
Can sign	27	19	9	19
Primary (Class I-V)	37	36	33	35
Secondary (Class VI-SSC)	30	27	41	33
Higher secondary (HSC)	1	8	9	6
Degree and above	1	6	8	5
3. Occupation				
Main occupation				
Agriculture	98	94	90	94
Business	-	1	1	-
Service	2	5	6	4
Others	1	1	4	2
Subsidiary occupation				
No Profession	82	72	76	77
Agriculture	2	6	10	6
Business	16	22	14	17
4. Experience in farming				
2-15 years	28	37	43	36
16-29 years	29	37	27	31
30-43 years	35	23	23	27
44-57 years	8	3	7	6
5. Farm size (%)				
Marginal (below 0.19 ha)	1	2	7	3
Small (0.19-0.99 ha)	79	70	56	68
Medium (1.00-3.03 ha)	20	27	33	27
Large (above 3.03 ha)	-	1	4	2
6. Number of family member				
2-4	27	49	41	39
5-7	59	43	48	50
8-10	12	8	9	10

Particulars	% farmers responded			
	Faridpur	Pabna	Thakurgaon	All areas
11-13	2	-	2	1
7. Family member involved in agriculture				
1	52	76	44	57
2	42	20	38	34
3	5	3	14	7
4	1	1	4	2

2. Distribution of different cropping patterns followed by the farmers in wheat cultivation

Sl. No.	Cropping pattern	% farmers followed			All areas
		Faridpur	Pabna	Thakurgaon	
1.	Wheat-Jute-Aman	94	78	20	64
2.	Wheat-Maize-Aman	1	2	61	22
3.	Wheat-Fallow-Aman	2	4	9	5
4.	Wheat-Mung-Aman	1	3	8	4
5.	Wheat-Aus-Aman	-	6	1	2
6.	Wheat-Sesame-Aman	1	6	-	2
7.	Wheat-Boro-Aman	1	1	1	1
	Total	100	100	100	100

3. Competitive crops of wheat grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Faridpur	Pabna	Thakurgaon	All areas
1.	Mustard	4	34	36	25
2.	Boro	3	23	45	24
3.	Potato	-	1	61	21
4.	Lentil	39	21	-	20
5.	Garlic	-	56	-	19
6.	Grass pea	21	33	-	18
7.	Black cumin	47	2	-	16
8.	Onion	19	22	5	16
9.	Coriander	42	1	-	14
10.	Chilli	-	1	36	12
11.	Maize	1	-	11	4
12.	Pea	-	7	-	2
13.	Sugarcane	-	-	6	2
14.	Radish	-	-	3	1

4. Profile of the maize growers' in the study areas

Particulars	% farmers responded			
	Chuadanga	Dinajpur	Manikganj	All areas
1. Age				
15-29 years	17	17	9	15
30-44 years	43	46	31	40
45-59 years	29	31	39	33
60-74 years	9	4	20	11
75-90 years	1	2	-	1
2. Literacy status				
Illiterate	17	11	17	15
Can sign	28	7	19	18
Primary (Class I-V)	17	27	29	24
Secondary (Class VI-SSC)	29	41	26	32
Higher secondary (HSC)	7	12	8	9
Degree and above	2	3	1	2
3. Occupation				
Main occupation				
Agriculture	99	97	99	99
Business	-	2	-	0.5
Service	-	1	1	0.5
Others	1	-	-	-
Subsidiary occupation				
No Profession	72	60	61	64
Agriculture	1	3	1	2
Business	17	29	26	24
Others	10	8	12	10
4. Experience in farming				
1-15 years	44	45	32	40
16-30 years	39	41	38	39
31-45 years	16	12	25	17
46-60 years	1	3	4	3
5. Farm size (%)				
Marginal (below 0.19 ha)	6	1	1	3
Small (0.19-0.99 ha)	81	42	79	67
Medium (1.00-3.03 ha)	13	52	18	27
Large (above 3.03 ha)	1	5	2	2
6. Number of family member				
2-4	53	29	39	40

Particulars	% farmers responded			
	Chuadanga	Dinajpur	Manikganj	All areas
5-7	41	54	48	48
8-10	5	11	9	8
11-13	1	4	3	3
14-16	-	2	1	1
7. Family member involved in agriculture				
1	66	58	63	62
2	31	31	31	31
3	1	6	4	4
4	2	5	2	3

5. Distribution of different cropping patterns followed by the farmers in maize cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Chuadanga	Dinajpur	Manikganj	All areas
1.	Maize-Aus-Fallow	88	-	37	42
2.	Maize-Fallow-Aman	-	90	2	31
3.	Maize-Jute-Fallow	6	-	31	12
4.	Maize-Maize-Fallow	-	-	18	6
6.	Maize-Jute-Aman	-	7	1	2
7.	Maize-Aus-Aman	1	3	4	3
8.	Maize-Fallow-Fallow	2	-	7	3
10.	Maize-Cucumber-Aman	3	-	-	1
	Total	100	100	100	100

6. Competitive crops of maize grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Chuadanga	Dinajpur	Manikganj	All areas
1.	Mustard	69	68	98	79
2.	Wheat	67	81	44	64
3.	Potato	34	69	15	39
4.	Lentil	57	-	1	19
5.	Garlic	8	38	-	15
6.	Boro	6	6	28	14
7.	Onion	8	7	3	6
8.	Chickpea	16	-	-	5
9.	Brinjal	12	2	1	5

7. Profile of the lentil growers' in the study areas

Particulars	% farmers responded			
	Faridpur	Jashore	Natore	All areas
1. Age				
15-29 years	11	18	14	14
30-44 years	30	34	31	31
45-59 years	37	33	37	36
60-74 years	21	14	17	17
75-89 years	1	1	2	1
2. Literacy status				
Illiterate	18	9	7	11
Can sign	17	11	23	17
Primary (Class I-V)	26	28	19	24
Secondary (Class VI-SSC)	34	38	30	34
Higher secondary (HSC)	3	9	17	9
Degree and above	2	4	4	3
3. Occupation				
Main occupation				
Agriculture	100	98	100	99
Business	-	1	-	0.5
Others	-	1	-	0.5
Subsidiary occupation				
No Profession	82	85	76	81
Agriculture	-	2	-	1
Business	15	12	17	15
Others	3	1	7	3
4. Experience in farming				
1-15 years	26	43	27	32
16-30 years	41	37	46	42
31-45 years	28	17	22	22
46-60 years	5	3	5	4
5. Farm size (%)				
Marginal (below 0.19 ha)	2	3	1	2
Small (0.19-0.99 ha)	76	78	66	73
Medium (1.00-3.03 ha)	22	19	31	24
Large (above 3.03 ha)	1	1	2	1
6. Number of family member				
2-4	27	44	50	40
5-7	60	48	41	50
8-10	12	7	8	9
11-13	1	2	2	1

Particulars	% farmers responded			
	Faridpur	Jashore	Natore	All areas
7. Family member involved in agriculture				
1	46	79	75	67
2	47	17	21	28
3	5	4	3	4
4	2	1	1	1

8. Distribution of different cropping patterns followed by the farmers in lentil cultivation in different areas

Sl. No.	Cropping pattern	% farmers followed			
		Faridpur	Jashore	Natore	All areas
1.	Lentil-Jute-Aman	85	72	18	58
2.	Lentil-Mung-Aman	-	4	32	12
3.	Lentil-Fallow-Aman	4	2	17	8
4.	Lentil-Maize-Aman	-	-	15	5
5.	Lentil-Sugarcane- Sugarcane	-	-	13	4
6.	Lentil-Jute-Fallow	-	13	6	6
7.	Lentil-Sesame-Aman	3	3	-	2
8.	Lentil-Aus-Aman	4	-	-	1
9.	Lentil-Chilli-Pumpkin	4	-	-	1
10.	Lentil-Pointed gourd- Pointed gourd	-	6	-	2
	Total	100	100	100	100

9. Competitive crops of lentil grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Faridpur	Jashore	Natore	All areas
1.	Wheat	47	61	21	43
2.	Grass pea	58	7	37	34
3.	Pea	49	2	46	32
4.	Mustard	4	56	12	24
5.	Potato	-	41	6	16
6.	Garlic	2	3	37	14
7.	Maize	-	17	15	11
8.	Onion	15	8	8	11
9.	Rice	15	2	-	6
10.	Chickpea	1	4	9	5
11.	Black cumin	9	-	2	4
12.	Coriander	4	-	1	2

10. Profile of the mungbean growers' in the study areas

Particulars	% farmers responded			
	Natore	Patuakhali	Bhola	All areas
1. Age				
15-29 years	10	7	7	8
30-44 years	35	30	33	32
45-59 years	41	45	39	41
60-74 years	15	18	20	18
75-89 years	-	-	1	-
2. Literacy status				
Illiterate	23	21	41	28
Can sign	0	0	0	0
Primary (Class I-V)	29	33	31	31
Secondary (Class VI-SSC)	32	37	25	32
Higher secondary (HSC)	9	7	1	6
Degree and above	7	1	1	3
3. Occupation				
Main occupation				
Agriculture	100	100	100	100
Business	-	-	-	-
Service	-	-	-	-
Others	-	-	-	-
Subsidiary occupation				
No Profession	57	54	57	56
Business	20	24	16	20
Others	23	22	27	24
4. Experience in farming				
2-15 years	37	24	25	28
16-29 years	29	31	33	31
30-43 years	31	36	35	34
44-57 years	4	9	8	7
5. Farm size (%)				
Marginal (below 0.19 ha)	5	3	3	3
Small (0.19-0.99 ha)	71	65	81	72
Medium (1.00-3.03 ha)	23	31	17	24
Large (above 3.03 ha)	1	1	-	1
6. Number of family member				
2-4	43	19	23	28
5-7	47	65	63	58
8-10	6	13	12	10
11-13	1	1	3	2

Particulars	% farmers responded			
	Natore	Patuakhali	Bhola	All areas
14-17	2	2	-	1
7. Family member involved in agriculture				
1	58	56	53	56
2	35	37	39	37
3	4	5	7	5
4	3	2	1	2

11. Distribution of different cropping patterns followed by the farmers in mungbean cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Natore	Patuakhali	Bhola	All areas
1.	Mung bean-Aus-Aman	-	11	88	33
2.	Mung bean-Fallow-Aman	-	89	4	31
3.	Garlic-Mung bean-Aman	45	-	-	15
4.	Wheat-Mung bean-Aman	40	-	-	13
5.	Fallow- Mung bean- Aman	-	-	5	2
6.	Pea-Mung bean-Aman	7	-	-	2
7.	Pea pod-Mung bean-Aman	5	-	1	2
8.	Kheshari-Mung bean-Aman	3	-	-	1
9.	Mustard-Mung bean-Aman	-	-	3	1
	Total	100	100	100	100

12. Competitive crops of mung bean grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Natore	Patuakhali	Bhola	All areas
1.	Maize	77	36	16	43
2.	Sesame	93	-	8	34
3.	Groundnut	9	45	42	32
4.	Jute	75	-	-	25
5.	Wheat	1	22	51	24
6.	Chilli	-	37	23	20
7.	Felon	-	14	40	18
8.	Khesari	-	27	11	13
9.	Sunflower	-	31	3	11
10.	Soybean	-	-	32	11
11.	Mustard	-	9	22	10
12.	Garlic	-	27	2	10
13.	Lentil	-	18	9	9

Sl. No.	Competitive crops	% farmers responded			
		Natore	Patuakhali	Bhola	All areas
14.	Potato	-	-	26	9
15.	Sweet potato	-	9	1	4
16.	Sugarcane	10	-	-	3
17.	Watermelon	-	7	-	2

13. Profile of the Onion growers' in the study areas

Particulars	% farmers responded			
	Faridpur	Pabna	Rajshahi	All areas
1. Age				
15-29 years	16	12	32	20
30-44 years	33	37	39	36
45-59 years	36	39	22	32
60-75 years	15	12	7	11
2. Literacy status				
Illiterate	16	8	3	9
Can sign	9	20	11	13
Primary (Class I-V)	37	32	24	31
Secondary (Class VI-SSC)	35	31	42	36
Higher secondary (HSC)	3	6	15	8
Degree and above	1	3	6	3
3. Occupation				
Main occupation				
Agriculture	96	93	99	96
Service	-	4	-	1
Others	4	3	1	3
Subsidiary occupation				
No Profession	77	66	81	75
Agriculture	4	7	1	4
Business	15	17	14	15
Others	3	11	5	6
4. Experience in farming				
2-15 years	32	34	52	39
16-29 years	27	28	24	26
30-43 years	37	32	22	30
44-57 years	4	6	2	4
5. Farm size (%)				
Marginal (below 0.19 ha)	3	2	4	3
Small (0.19-0.99 ha)	74	70	84	76
Medium (1.00-3.03 ha)	22	27	12	21
Large (above 3.03 ha)	1	1	-	-

Particulars	% farmers responded			
	Faridpur	Pabna	Rajshahi	All areas
6. Number of family member				
2-4	25	43	48	39
5-7	63	50	47	54
8-10	9	4	4	6
11-13	2	3	1	2
7. Family member involved in agriculture				
1	61	71	45	59
2	35	27	44	36
3	3	2	8	4
4	2	-	3	2

14. Distribution of different cropping patterns followed by the farmers in onion cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Faridpur	Pabna	Rajshahi	All areas
1.	Onion-Jute-Aman	50	11	84	48
2.	Onion-Jute-Fallow	47	50	6	34
3.	Onion-Fallow-Aman	-	22	-	7
4.	Onion-Aman-Fallow	3	4	-	2
4.	Onion-Sesame-Aman	-	6	-	2
5.	Onion-Maize-Aman	-	-	8	3
6.	Onion-Sweet gourd-Fallow	-	3	-	1
7.	Onion-Chilli-Fallow	-	1	2	1
8.	Onion-Sweet gourd-Aman	-	3	1	1
	Total	100	100	100	100

15. Competitive crops of Onion grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Faridpur	Pabna	Rajshahi	All areas
1.	Wheat	91	86	82	86
2.	Lentil	55	44	48	49
3.	Masturd	28	60	41	43
4.	Potato	17	-	26	14
5.	Garlic	7	-	34	14
6.	Maize	-	1	40	14
7.	Khesari	10	29	1	13
8.	Blackgram	1	23	3	9
9.	Boro	9	0	9	6
10.	Coriander	12	2	-	5
11.	Black cumin	12	-	-	4
12.	Sesame	-	7	-	2
13.	Barley	1	4	-	2
14.	Cauliflower	5	-	-	2

16. Profile of the Garlic growers' in the study areas

Particulars	% farmers responded			
	Natore	Pabna	Rajbari	All areas
1. Age				
15-29 years	4	12	11	9
30-44 years	46	43	42	44
45-59 years	41	35	37	38
60-75 years	10	9	10	10
2. Literacy status				
Illiterate	4	8	3	5
Can sign	19	17	15	17
Primary (Class I-V)	31	41	42	38
Secondary (Class VI-SSC)	36	22	33	30
Higher secondary (HSC)	8	8	4	7
Degree and above	3	4	3	3
3. Occupation				
Main occupation				
Agriculture	98	95	98	97
Business	-	1	1	1
Service	2	4	1	2
Subsidiary occupation				
No Profession	65	63	68	65
Agriculture	2	5	2	3
Business	23	19	21	21
Others	10	13	10	11
4. Experience in farming				
2-15 years	27	43	41	37
16-29 years	36	31	29	32
30-43 years	34	23	24	27
44-57 years	4	4	6	4
5. Farm size (%)				
Marginal (below 0.19 ha)	3	2	4	3
Small (0.19-0.99 ha)	74	70	84	76
Medium (1.00-3.03 ha)	22	27	12	21
Large (above 3.03 ha)	1	1	-	-
6. Number of family member				
2-4	44	50	34	43
5-7	48	43	57	49
8-10	6	7	7	7
11-13	1	-	1	1
7. Family member involved in agriculture				
1	78	77	63	72
2	19	19	33	24
3	2	4	3	3
4	1	1	1	1

17. Distribution of different cropping patterns followed by the farmers in Garlic cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Natore	Pabna	Rajbari	All areas
1.	Garlic-Jute-Aman	26	67	73	55
2.	Garlic-Aus-Aman	26	11	2	13
3.	Garlic-Jute-Fallow	1	2	25	9
4.	Garlic-Maize-Aman	27	-	-	9
5.	Garlic-Fallow-Aman	6	10	-	5
6.	Garlic-Mung-Aman	15	1	1	5
7.	Garlic-Sesame-Aman	-	8	-	3
8.	Garlic-Jute-BINA-7 rice	-	2	-	1
	Total	100	100	100	100

18. Competitive crops of Garlic grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Natore	Pabna	Rajbari	All areas
1.	Wheat	96	59	55	70
2.	Onion	32	20	82	45
3.	Lentil	36	21	51	36
4.	Mustard	12	37	18	22
5.	Maize	59	-	-	20
6.	Khesari	12	39	-	17
7.	Pea	19	12	8	13
8.	Boro	1	28	2	10
9.	Black cumin	4	4	4	4
10.	Potato	4	-	5	3

19. Profile of the Chilli growers' in the study areas

Particulars	% farmers responded			
	Bhola	Bogura	Jamalpur	All areas
1. Age				
15-29 years	9	14	6	9
30-44 years	33	27	33	31
45-59 years	38	27	41	36
60-74 years	20	31	19	23
75-89 years	-	1	1	-
2. Literacy status				
Illiterate	5	13	4	8

Particulars	% farmers responded			
	Bhola	Bogura	Jamalpur	All areas
Can sign	34	30	39	34
Primary (Class I-V)	34	18	26	26
Secondary (Class VI-SSC)	25	27	23	25
Higher secondary (HSC)	1	5	3	3
Degree and above	1	6	5	4
3. Occupation				
Main occupation				
Agriculture	100	100	100	100
Business	-	-	-	-
Service	-	-	-	-
Others	-	-	-	-
Subsidiary occupation				
No Profession	77	85	80	81
Business	15	8	7	10
Others	8	7	13	9
4. Experience in farming				
2-15 years	27	27	23	25
16-29 years	32	27	28	29
30-43 years	33	40	43	39
44-57 years	8	7	6	7
5. Farm size (%)				
Marginal (below 0.19 ha)	2	6	2	3
Small (0.19-0.99 ha)	78	79	84	80
Medium (1.00-3.03 ha)	19	14	13	16
Large (above 3.03 ha)	-	1	1	1
6. Number of family member				
2-4	22	49	35	35
5-7	65	47	54	56
8-10	11	3	9	8
11-13	2	1	2	1
7. Family member involved in agriculture				
1	54	80	69	67
2	38	19	26	28
3	6	1	4	4
4	1	-	1	1

20. Distribution of different cropping patterns followed by the farmers in Chilli cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Bhola	Bogura	Jamalpur	All areas
1.	Chilli-Jute-Fallow	-	93	70	52
2.	Chilli-Aus-Aman	87	-	-	31
3.	Chilli-Dhoincha-Chilli	-	-	11	4
4.	Chilli-Chilli-Aman	11	-	-	4
5.	Chilli-Jute-Aman	-	-	8	3
6.	Chilli-Jute-Jute	-	-	4	2
7.	Chilli-Dhoincha-Fallow	-	-	6	2
8.	Chilli-Aus-Jute	-	7	1	2
9.	Chilli-Fallow-Aman	2	-	-	1
	Total	100	100	100	100

21. Competitive crops of Chilli grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Bhola	Bogura	Jamalpur	All areas
1.	Brinjal	-	46	84	43
2.	Potato	42	26	58	42
3.	Wheat	52	41	31	41
4.	Groundnut	49	23	-	24
5.	Maize	19	39	7	22
6.	Mustard	18	6	31	18
7.	Onion	4	14	28	15
8.	Felon	41	-	-	14
9.	Soybean	42	-	-	14
10.	Khesari	4	31	-	12
11.	Tomato	-	26	8	11
12.	Boro	1	17	11	9
13.	Garlic	6	9	8	8
14.	Lentil	19	-	-	6
15.	Carrot	-	-	19	6
16.	Cauliflower	-	10	-	3

22. Profile of the potato growers' in the study areas

Particulars	% farmers responded			
	Cumilla	Munshiganj	Rangpur	All areas
1. Age				
15-29 years	15	8	18	14
30-44 years	32	34	35	34
45-59 years	33	36	31	33
60-74 years	18	20	14	17
75-90 years	1	2	2	2
2. Literacy status				
Illiterate	3	1	9	4
Can sign	13	20	13	15
Primary (Class I-V)	39	37	31	36
Secondary (Class VI-SSC)	37	39	29	35
Higher secondary (HSC)	5	2	6	4
Degree and above	3	2	12	5
3. Occupation				
Main occupation				
Agriculture	97	94	90	93
Business	-	-	-	-
Service	-	2	3	2
Others	3	4	7	5
Subsidiary occupation				
No Profession	71	78	72	74
Agriculture	3	5	11	6
Business	24	16	16	19
Others	2	1	1	1
4. Experience in farming				
1-15 years	36	39	39	38
16-30 years	37	32	36	35
31-45 years	24	24	19	22
46-60 years	3	5	6	4
5. Farm size (%)				
Marginal (below 0.19 ha)	8	7	10	9
Small (0.19-0.99 ha)	82	77	73	77
Medium (1.00-3.03 ha)	9	14	16	13
Large (above 3.03 ha)	1	1	2	1
6. Number of family member				
2-4	28	41	52	40
5-7	57	50	41	49

Particulars	% farmers responded			
	Cumilla	Munshiganj	Rangpur	All areas
8-10	10	7	7	8
11-13	2	1	1	1
7. Family member involved in agriculture				
1	72	72	80	75
2	20	23	16	20
3	7	2	4	4
4	1	1	0	1

23. Distribution of different cropping patterns followed by the farmers in potato cultivation

Sl. No.	Cropping pattern	% farmers folowed			
		Cumilla	Munshiganj	Rangpur	All areas
1.	Potato-Boro-Aman	-	-	72	24
2.	Potato-Aus-Aman	66	3	1	23
3.	Potato-Maize-Aman	11	23	2	12
4.	Potato-Fallow-Aman	6	28	-	11
5.	Potato-Jute-Fallow	-	23	-	8
6.	Potato-Maize-Fallow	13	8	4	9
7.	Potato-Jute-Aman	-	8	9	6
8.	Potato-Peanut-Aman	-	-	12	4
9.	Potato-Aus-Fallow	-	6	-	2
10.	Potato-Cucumber-Aman	4	-	-	1
	Total	100	100	100	100

24. Competitive crops of potato grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Cumilla	Munshiganj	Rangpur	All areas
1.	Wheat	40	61	67	56
2.	Mustard	36	56	65	52
3.	Cauliflower	33	36	5	25
4.	Tomato	38	31	1	23
5.	Maize	10	8	38	19
6.	Chilli	16	9	17	14
7.	Cabbage	27	-	1	9
8.	Onion	4	2	12	6
9.	Pumpkin	-	9	-	3
10.	Tobacco	-	6	1	2
11.	Cucumber	-	6	-	2
12.	Mung	2	6	-	2

25. Profile of the Sweet potato growers' in the study areas

Particulars	% farmers responded			
	Brahmanbaria	Kurigram	Noakhali	All areas
1. Age				
15-29 years	9	17	14	13
30-44 years	29	30	23	28
45-59 years	43	38	38	40
60-74 years	19	13	21	18
75-89 years	1	1	3	2
2. Literacy status				
Illiterate	4	20	11	12
Can sign	19	8	10	12
Primary (Class I-V)	53	49	46	49
Secondary (Class VI-SSC)	22	19	24	22
Higher secondary (HSC)	1	3	5	3
Degree and above	1	1	3	2
3. Occupation				
Main occupation				
Agriculture	84	79	93	85
Business	13	19	6	13
Service	1	1	1	1
Others	2	-	1	1
Subsidiary occupation				
No Profession	46	54	62	54
Agriculture	16	21	7	15
Business	32	21	26	26
Others	6	5	5	5
4. Experience in farming				
2-15 years	29	34	33	32
16-29 years	25	24	28	26
30-43 years	38	33	29	33
44-57 years	7	9	10	9
5. Farm size (%)				
Marginal (below 0.19 ha)	2	9	1	4
Small (0.19-0.99 ha)	70	79	57	69
Medium (1.00-3.03 ha)	27	11	35	25
Large (above 3.03 ha)	1	1	6	2
6. Number of family member				
2-4	19	36	25	27
5-7	49	52	61	54
8-10	27	10	11	16
11-13	3	2	2	2

Particulars	% farmers responded			
	Brahmanbaria	Kurigram	Noakhali	All areas
14-16	1	-	1	1
7. Family member involved in agriculture				
1	58	56	69	61
2	36	39	25	33
3	4	5	5	5
4	2	-	1	1

26. Distribution of different cropping patterns followed by the farmers in Sweet potato cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Brahmanbaria	Kurigram	Noakhali	All areas
1.	Sweet potato-Fallow-Aman	14	-	71	28
2.	Sweet potato-Jute-Aman	4	73	2	26
3.	Sweet potato-Jute-Fallow	58	24	4	29
4.	Sweet potato-Seed bed-Aman	-	1	8	3
5.	Sweet potato-Okra-Fallow	5	-	8	4
6.	Sweet potato-Sesame-Fallow	10	2	-	4
7.	Sweet potato-Aus-Aman	-	-	7	2
8.	Sweet potato-Dhoincha-Fallow	7	-	-	2
9.	Sweet potato-Stem-Aman	2	1	-	1
	Total	100	100	100	100

27. Competitive crops of Sweet potato grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Brahmanbaria	Kurigram	Noakhali	All areas
1.	Groundnut	59	59	61	59
2.	Wheat	45	37	10	31
3.	Watermelon	7	-	72	26
4.	Soybean	4	-	67	24
5.	Mustard	44	5	3	17
6.	Chilli	6	14	30	17
7.	Millet	-	50	-	17
8.	Tomato	28	16	1	15
9.	Maize	-	43	2	15
10.	Potato	27	3	1	10
11.	Pumpkin	9	21	1	10
12.	Cauliflower	19	5	3	9
13.	Brinjal	3	8	12	8
14.	Cabbage	14	4	-	6
15.	Felon	-	-	9	3

28. Profile of the Pointed gourds growers' in the study areas

Particulars	% farmers responded			
	Jashore	Pabna	Jhenaidah	All areas
1. Age				
15-29 years	13	23	15	17
30-44 years	42	38	47	42
45-59 years	34	28	23	28
60-75 years	12	12	15	13
2. Literacy status				
Illiterate	8	10	12	10
Can sign	33	26	29	29
Primary (Class I-V)	22	38	27	29
Secondary (Class VI-SSC)	28	18	21	22
Higher secondary (HSC)	8	7	8	8
Degree and above	2	2	3	2
3. Occupation				
Main occupation				
Agriculture	100	95	96	100
Business	-	3	2	-
Service	-	2	2	-
Subsidiary occupation				
No Profession	79	70	83	77
Agriculture	-	5	4	3
Business	13	22	9	15
Others	8	3	4	5
4. Experience in farming				
2-15 years	39	37	33	36
16-29 years	31	37	38	35
30-43 years	26	22	19	22
44-57 years	4	5	11	7
5. Farm size (%)				
Marginal (below 0.19 ha)	2	3	4	3
Small (0.19-0.99 ha)	86	60	80	75
Medium (1.00-3.03 ha)	13	33	14	20
Large (above 3.03 ha)	-	3	2	3
6. Number of family member				
2-4	51	33	47	44
5-7	47	58	48	51
8-10	2	5	3	3
11-13	1	4	2	2
7. Family member involved in agriculture				
1	71	68	65	68
2	28	28	21	25
3	2	4	10	5
4	-	1	4	3

29. Distribution of different cropping patterns followed by the farmers in Pointed gourds cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Jashore	Pabna	Jhenaidah	All areas
1.	Pointed gourd- Pointed gourd- Pointed gourd	100	3	71	57
2.	Pointed gourd- Pointed gourd- Fallow	-	38	21	20
3.	Pointed gourd- Pointed gourd- Aman	-	45	8	18
4.	Onion seed bed- Pointed gourd- Pointed gourd- Fallow	-	8	-	3
5.	Onion seed bed- Pointed gourd- Aman	-	4	-	1
6.	Onion-Pointed gourd-Aman	-	3	-	1
	Total	100	100	100	100

30. Competitive crops of Pointed gourd grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Jashore	Pabna	Jhenaidah	All areas
1.	Brinjal	79	47	74	67
2.	Cauliflower	67	-	65	44
3.	Teasel gourd	5	41	10	19
4.	Cucumber	8	37	12	19
5.	Chilli	6	38	8	17
6.	Cabbage	43	-	47	30
7.	Bean	30	7	33	23
8.	Mustard	10	19	8	13
9.	Khesari	12	15	11	13
10.	Wheat	-	26	-	9
11.	Groundnut	-	23	-	8
12.	Tomato	16	7	13	12
13.	Potato	13	-	10	8
14.	Radish	4	-	8	4

31. Profile of the okra growers' in the study areas

Particulars	% farmers responded			
	Chattogram	Pabna	Tangail	All areas
1. Age				
15-29 years	26	23	12	20
30-44 years	32	40	3	35
45-59 years	31	27	39	32
60-74 years	11	10	16	12
75-90 years	1	1	1	1

Particulars	% farmers responded			
	Chattogram	Pabna	Tangail	All areas
2. Literacy status				
Illiterate	3	2	3	3
Can sign	2	5	2	3
Primary (Class I-V)	13	19	17	16
Secondary (Class VI-SSC)	52	40	30	41
Higher secondary (HSC)	3	3	12	6
Degree and above	28	31	38	32
3. Occupation				
Main occupation				
Agriculture	98	96	98	97
Business	-	2	2	1
Service	1	1	-	1
Others	1	1	-	1
Subsidiary occupation				
No Profession	78	81	76	78
Agriculture	2	4	3	3
Business	17	11	18	15
Others	3	4	3	3
4. Experience in farming				
1-15 years	50	49	33	48
16-30 years	34	24	31	34
31-45 years	16	21	35	16
46-60 years	-	6	1	2
5. Farm size (%)				
Marginal (below 0.19 ha)	12	3	2	5
Small (0.19-0.99 ha)	76	76	92	81
Medium (1.00-3.03 ha)	13	20	6	13
Large (above 3.03 ha)	-	2	1	1
6. Number of family member				
2-4	18	38	48	34
5-7	60	56	48	54
8-10	15	4	3	8
11-13	3	2	-	1
14-16	5	-	2	2
7. Family member involved in agriculture				
1	65	53	69	63
2	29	35	28	31
3	5	11	3	6
4	1	1	-	1

32. Distribution of different cropping patterns followed by the farmers in okra cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Chattogram	Pabna	Tangail	All areas
1.	Red amaranth-Okra-Aman	31	-	12	14
2.	Boro-Okra-Aman	14	20	6	13
3.	Boro-Okra-Okra	-	12	18	10
4.	Mustard-Okra-Okra	-	14	12	9
5.	Tomato-Okra-Aman	31	-	-	10
6.	Mustard-Okra-Jute	-	14	8	7
7.	Brinjal-Okra-Brinjal	3	-	15	6
8.	Okra-Okra-Aman	-	7	11	6
9.	Mustard-Okra-Aman	-	16	-	5
10.	Cauliflower-Okra-Aman	16	-	-	5
11.	Yard long bean-Okra-Fallow	5	-	9	5
12.	Bottle gourd-Okra-Aman	-	-	8	3
13.	Boro-Okra-Mustard	-	8	-	3
14.	Mustard-Boro-Okra	-	10	-	3
	Total	100	100	100	100

33. Competitive crops of okra grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Chattogram	Pabna	Tangail	All areas
1.	Cucumber	2	54	64	40
2.	Basil	38	15	8	21
3.	Yard long bean	29	26	-	18
4.	Binjal	2	38	3	14
5.	Bitter gourd	31	3	5	13
6.	Sponge gourd	11	19	3	11
7.	Bottle gourd	-	8	22	10
8.	Parbal	-	5	16	7
9.	Stem	18	2	-	6
10.	Jute	8	-	8	6
11.	Bindweed	17	-	-	6
12.	Snake-gourd	4	1	4	3
13.	Cabbage	-	-	9	3

34. Profile of the bitter gourd growers' in the study areas

Particulars	% farmers responded			
	Bogura	Jashore	Mymensingh	All areas
1. Age				
15-29 years	14	19	10	14
30-44 years	34	45	43	41

Particulars	% farmers responded			
	Bogura	Jashore	Mymensingh	All areas
45-59 years	33	26	41	33
60-74 years	18	9	5	11
75-90 years	1	1	1	1
2. Literacy status				
Illiterate	7	12	13	10
Can sign	14	5	17	12
Primary (Class I-V)	39	47	24	37
Secondary (Class VI-SSC)	25	28	40	31
Higher secondary (HSC)	13	7	4	8
Degree and above	2	3	3	2
3. Occupation				
Main occupation				
Agriculture	97	96	98	97
Business	-	1	1	1
Service	-	-	1	-
Others	3	5		2
Subsidiary occupation				
No Profession	72	80	69	74
Agriculture	3	4	2	3
Business	13	12	23	16
Others	11	4	6	7
4. Experience in farming				
1-15 years	33	43	35	37
16-30 years	37	40	49	42
31-45 years	27	13	15	18
46-60 years	4	4	1	3
5. Farm size (%)				
Marginal (below 0.19 ha)	14	5	7	9
Small (0.19-0.99 ha)	79	77	87	81
Medium (1.00-3.03 ha)	7	18	7	11
6. Number of family member				
2-4	48	34	31	38
5-7	47	58	59	54
8-10	4	7	10	7
11-13	-	1	-	1
14-16	1	1	-	1
7. Family member involved in agriculture				
1	66	62	65	64
2	31	33	33	32
3	3	3	2	3
4	1	2	1	1

35. Distribution of different cropping patterns followed by the farmers in bitter gourd cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Bogura	Jashore	Mymensingh	All areas
1.	Country bean-Bitter gourd-fallow	38	-	-	13
2.	Potato-Bitter gourd-Cabbage	-	33	-	11
3.	Country bean-Bitter gourd- Country bean	25	7	-	11
4.	Bitter gourd-Ash gourd-fallow	-	-	38	13
5.	Bitter gourd-Sweet gourd-Ash gourd	8	10	-	6
6.	Potato-Bitter gourd-Yard long bean	-	12	-	4
7.	Bitter gourd-Boro-Aman	-	-	13	4
8.	Bitter gourd-Boro-Snake gourd	-	-	10	3
9.	Brinjal-Bitter gourd-Potato	-	9	-	3
10.	Bitter gourd-Fallow-Fallow	-	-	8	3
11.	Bitter gourd-Teasel gourd- Teasel gourd	-	-	10	3
12.	Brinjal-Bitter gourd-Yard long bean	-	7	0	2
13.	Bitter gourd-Fallow-Aman	-	-	7	2
14.	Bitter gourd-Bitter gourd- Cucumber	-	-	8	3
15.	Bitter gourd-Country bean- Sponge gourd	-	-	7	2
16.	Brinjal-Bitter gourd-Country bean	-	5	-	2
17.	Potato-Bitter gourd-Cucumber	11	12	-	8
18.	Lentil-Bitter gourd- Radish	-	5	-	2
20.	Potato-Bitter gourd-Fallow	5	-	-	2
21.	Fallow-Bitter gourd-Country bean	4	-	-	1
22.	Potato-Bitter gourd-Chilli	5	-	-	2
23.	Potato-Bitter gourd-Bitter gourd	4	-	-	1
	Total	100	100	100	100

36. Competitive crops of bitter gourd grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Bogura	Jashore	Mymensingh	All areas
1.	Ash gourd	100	1	-	34
2.	Brinjal	27	24	23	24
3.	Sponge gourd	38	30	4	24
4.	Cauliflower	2	-	51	18
5.	Cucumber	12	18	11	13
6.	Potato	28	1	33	41
7.	Tomato	-	-	31	10
8.	Snake gourd	-	28	-	9
9.	Jute	-	22	-	7
10.	Pointed gourd	16	5	-	7
11.	Bean	-	8	2	3
12.	Teasle gourd	-	4	2	2

37. Profile of the cucumber growers' in the study areas

Particulars	% farmers responded			
	Chattogram	Meherpur	Mymensingh	All areas
1. Age				
15-29 years	8	16	17	14
30-44 years	23	31	38	31
45-59 years	45	37	38	40
60-74 years	23	17	7	15
75-90 years	1	-	1	1
2. Literacy status				
Illiterate	4	23	8	12
Can sign	6	20	17	14
Primary (Class I-V)	55	18	33	35
Secondary (Class VI-SSC)	33	27	35	31
Higher secondary (HSC)	3	7	6	5
Degree and above	-	6	1	2
3. Occupation				
Main occupation				
Agriculture	97	94	95	95
Business	1	3	2	2
Service	1	-	1	1
Others	1	3	2	2
Subsidiary occupation				
No Profession	84	66	72	74
Agriculture	3	5	4	4
Business	8	25	18	17
Others	6	4	7	6
4. Experience in farming				
2-15 years	27	38	45	37
16-29 years	21	25	27	24
30-43 years	43	32	27	34
44-57 years	10	5	1	5
58-71 years	-	-	1	1
5. Farm size (%)				
Marginal (below 0.19 ha)	6	6	5	6
Small (0.19-0.99 ha)	66	83	67	72
Medium (1.00-3.03 ha)	28	12	28	23
Large (above 3.03 ha)	1	-	-	-

Particulars	% farmers responded			
	Chattogram	Meherpur	Mymensingh	All areas
6. Number of family member				
2-4	36	43	27	35
5-7	45	49	53	49
8-10	13	7	16	12
11-13	2	1	3	2
14-16	5	-	2	3
7. Family member involved in agriculture				
1	66	65	71	67
2	28	33	25	28
3	5	3	4	4
4	2	-	-	1

38. Distribution of different cropping patterns followed by the farmers in cucumber cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Chattogram	Meherpur	Mymensingh	All areas
1.	Wheat-Cucumber-Fallow	12	47	6	22
2.	Cucumber-Sweet gourd-Fallow	45	5	-	17
3.	Cucumber-Okra-Fallow	22	-	-	7
4.	Wheat-Cucumber-Aman	-	13	8	7
5.	Boro-Cucumber-Aman	-	-	20	7
6.	Lentil-Cucumber-Fallow	-	11	7	6
7.	Cucumber-Sesame-Fallow	9	9	-	6
8.	Cucumber-Fallow-Aman	-	-	11	4
9.	Cucumber-Chilli-Fallow	12	-	-	4
10.	Fallow -Cucumber-Aman	-	-	12	4
11.	Cucumber-Cucumber-Cucumber	-	10	3	4
12.	Cabbage-Cucumber-Aman	-	-	10	3
13.	Cucumber-Aus-Cucumber	-	-	6	2
14.	Onion-Cucumber-Fallow	-	6	1	2
15.	Country bean-Cucumber-Fallow	-	-	5	2
16.	Boro-Cucumber-Fallow	-	-	7	2
17.	Potato-Cucumber-Aman	-	-	6	2
	Total	100	100	100	100

39. Competitive crops of cucumber grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Chattogram	Meherpur	Mymensingh	All areas
1.	Potato	93	4	16	38
2.	Jute	-	82	23	35
3.	Bottle gourd	4	45	18	22
4.	Teasel gourd	-	23	38	20
5.	Chilli	48	3	9	20
6.	Brinjal	43	4	13	20
7.	Tomato	38	1	8	15
8.	Sponge gourd	-	27	9	12
9.	Mustard	29	1	5	12
10.	Boro	2	13	18	11
11.	Cauliflower	6	6	18	10
12.	Stem	3	-	23	9
13.	Okra	3	4	17	8
14.	Sweet gourd	2	1	14	6
15.	Banana	-	15	1	5
16.	Radish	8	-	2	3
17.	Tobacco	-	9	-	3

40. Profile of the brinjal growers' in the study areas

Particulars	% farmers responded			
	Jamalpur	Jashore	Rajshahi	All areas
1. Age				
15-29 years	5	14	27	15
30-44 years	33	49	46	43
45-59 years	41	30	23	31
60-74 years	21	7	5	11
2. Literacy status				
Illiterate	28	8	13	16
Can sign	17	8	10	12
Primary (Class I-V)	25	27	18	23
Secondary (Class VI-SSC)	21	44	33	33
Higher secondary (HSC)	9	10	21	13
Degree and above	1	3	4	3
3. Occupation				
Main occupation				
Agriculture	100	100	100	100
Business	-	-	-	-
Service	-	-	-	-
Others	-	-	-	-

Particulars	% farmers responded			
	Jamalpur	Jashore	Rajshahi	All areas
Subsidiary occupation				
No Profession	75	72	80	76
Business	13	19	10	14
Others	11	9	10	10
4. Experience in farming				
2-15 years	23	46	60	43
16-29 years	29	32	23	28
30-43 years	42	20	16	26
44-57 years	7	2	1	3
5. Farm size (%)				
Marginal (below 0.19 ha)	3	5	5	4
Small (0.19-0.99 ha)	82	75	87	81
Medium (1.00-3.03 ha)	14	19	8	14
Large (above 3.03 ha)	1	1	-	-
6. Number of family member				
2-4	39	55	53	49
5-7	50	41	41	44
8-10	9	3	6	6
11-13	2	1	-	1
7. Family member involved in agriculture				
1	71	75	45	64
2	23	23	45	30
3	4	3	9	5
4	1	-	-	-

41. Distribution of different cropping patterns followed by the farmers in brinjal cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Jamalpur	Jashore	Rajshahi	All areas
1.	Brinjal-Jute-Fallow	54	21	-	13
2.	Brinjal-Jute-Aman	5	6	42	11
3.	Brinjal-Fallow-Aman	1	29	6	11
4.	Brinjal-Brinjal-Jute	19	8	-	13
5.	Brinjal-Aman-Jute	-	1	17	6
6.	Brinjal-Dhoincha-Aman	13	1	3	4
7.	Brinjal-Ridge gourd-Aman	4	-	10	4
8.	Brinjal-Bitter gourd-Fallow	-	4	7	3
9.	Brinjal-Brinjal-Red amaranth	-	10	-	3
10.	Brinjal-Brinjal-Aman	-	8	-	3
11.	Brinjal-Maize-Aman	3	-	7	3

Sl. No.	Cropping pattern	% farmers followed			
		Jamalpur	Jashore	Rajshahi	All areas
12.	Brinjal-Chilli-Brinjal	-	-	7	2
13.	Brinjal-Fallow-Okra	-	6	-	2
14.	Brinjal-Fallow-Cauliflower	-	5	-	3
15.	Brinjal-Aus-Fallow	2	-	2	2
	Total	100	100	100	100

42. Competitive crops of brinjal grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Jamalpur	Jashore	Rajshahi	All areas
1.	Chilli	84	50	-	45
2.	Potato	50	63	11	41
3.	Wheat	30	-	82	37
4.	Onion	32	4	75	37
5.	Cauliflower	-	85	-	28
6.	Maize	25	-	43	23
7.	Cabbage	-	56	-	19
8.	Mustard	23	-	22	15
9.	Garlic	13	-	29	14
10.	Lentil	-	-	29	10
11.	Radish	5	18	-	8
12.	Pointed gourd	-	21	-	7
13.	Tomato	9	12	-	7
14.	Bottle gourd	7	11	-	6
15.	Carrot	11	-	-	4

43. Profile of the cauliflower growers' in the study areas

Particulars	% farmers responded			
	Cumilla	Dinajpur	Jashore	All areas
1. Age				
15-29 years	8	15	16	13
30-44 years	33	31	31	32
45-59 years	36	34	34	35
60-74 years	20	18	17	18
75-90 years	3	1	1	2
2. Literacy status				
Illiterate	1	9	2	4
Can sign	19	17	14	17
Primary (Class I-V)	39	31	39	36
Secondary (Class VI-SSC)	37	27	39	34
Higher secondary (HSC)	1	8	4	4
Degree and above	1	8	3	4

Particulars	% farmers responded			
	Cumilla	Dinajpur	Jashore	All areas
3. Occupation				
Main occupation				
Agriculture	95	97	96	96
Business	1	2	-	1
Service	2	1	-	1
Others	2	-	4	2
Subsidiary occupation				
No Profession	79	81	69	76
Agriculture	5	3	4	4
Business	13	15	25	18
Others	3	1	2	2
4. Experience in farming				
1-15 years	28	28	38	31
16-30 years	33	32	29	31
31-45 years	31	32	31	31
46-60 years	8	8	3	6
5. Farm size (%)				
Marginal (below 0.19 ha)	7	9	11	9
Small (0.19-0.99 ha)	79	71	82	77
Medium (1.00-3.03 ha)	13	17	7	12
Large (above 3.03 ha)	1	3	-	1
6. Number of family member				
2-4	41	44	33	39
5-7	50	43	57	50
8-10	8	9	7	8
11-13	1	4	3	3
7. Family member involved in agriculture				
1	76	82	65	74
2	20	13	26	20
3	3	5	7	5
4	1	-	2	1

44. Distribution of different cropping patterns followed by the farmers in cauliflower cultivation

Sl. No.	Cropping pattern	% farmers followed			All areas
		Cumilla	Dinajpur	Jashore	
1.	Cauliflower-Yard long Bean-Cucumber	4	9	51	21
2.	Cauliflower-Rice seedling-Bottle Gourd	13	13	17	14
3.	Cauliflower-Brinjal-Radish	-	39	-	13
4.	Cauliflower- Asparagus Bean –Aman	32	-	9	13
5.	Cauliflower-Coriander-Aman	29	-	-	10

Sl. No.	Cropping pattern	% farmers followed			All areas
		Cumilla	Dinajpur	Jashore	
6.	Cauliflower-Aus-Aman	7	17	-	8
7.	Cauliflower-Jute leaves-Aman	-	3	17	7
8.	Cauliflower-Coriander-Radish	-	15	-	5
9.	Cauliflower-Cucumber-Cucumber	7	4	6	6
10.	Cauliflower-Coriander-Jute leaves	6	-	-	2
11.	Cauliflower-Spinach-Jute leaves	2	-	-	1
	Total	100	100	100	100

45. Competitive crops of cauliflower grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Cumilla	Dinajpur	Jashore	All areas
1.	Wheat	57	57	49	54
2.	Mustard	51	53	53	52
3.	Tomato	37	20	27	28
4.	Maize	11	37	3	17
5.	Chilli	8	19	11	13
6.	Onion	1	11	7	6
7.	Pumpkin	11	-	-	4

46. Profile of the cabbage growers' in the study areas

Particulars	% farmers responded			
	Cumilla	Dinajpur	Jashore	All areas
1. Age				
15-29 years	23	28	16	22
30-44 years	38	51	33	41
45-59 years	25	14	34	24
60-74 years	13	8	13	11
75-90 years	-	-	3	1
2. Literacy status				
Illiterate	-	2	1	1
Can sign	28	3	23	18
Primary (Class I-V)	31	24	20	25
Secondary (Class VI-SSC)	37	53	40	43
Higher secondary (HSC)	3	13	9	8
Degree and above	2	6	8	5
3. Occupation				
Main occupation				
Agriculture	99	98	100	99
Business	1	1	-	1

Particulars	% farmers responded			
	Cumilla	Dinajpur	Jashore	All areas
Service	-	1	-	-
Subsidiary occupation				
No Profession	87	78	77	81
Agriculture	1	2	-	1
Business	11	20	18	16
Others	2	-	5	2
4. Experience in farming				
1-15 years	49	61	34	48
16-30 years	29	28	45	34
31-45 years	19	12	18	16
46-60 years	3	-	3	2
5. Farm size (%)				
Marginal (below 0.19 ha)	3	1	4	3
Small (0.19-0.99 ha)	93	43	78	72
Medium (1.00-3.03 ha)	4	50	16	23
Large (above 3.03 ha)	-	6	2	3
6. Number of family member				
2-4	33	40	35	36
5-7	53	44	56	51
8-10	8	8	8	8
11-13	5	3	1	3
14-16	2	5	-	1
7. Family member involved in agriculture				
1	58	68	56	61
2	35	18	39	31
3	5	4	1	3
4	2	10	4	5

47. Distribution of different cropping patterns (in %) followed by the farmers in cabbage cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Cumilla	Dinajpur	Jashore	All areas
1.	Cabbage-Maize-Fallow	-	63	-	21
2.	Cabbage-Fallow-Aman	40	-	-	13
3.	Cabbage-Jute-Cabbage	-	-	33	11
4.	Cabbage-Aus-Cabbage	-	-	32	11
5.	Cabbage-Coriander-Aman	24	-	-	8
6.	Potato-Jute-Cabbage	-	-	17	6
7.	Cabbage-Maize-Aman	-	21	-	7
8.	Cabbage-Maize-Fallow	-	9	-	3

Sl. No.	Cropping pattern	% farmers followed			
		Cumilla	Dinajpur	Jashore	All areas
9.	Cabbage-Okra-Aman	13	3	2	6
10.	Mustard-Jute-Cabbage	-	-	8	3
11.	Cabbage-Sweet gourd-Aman	9	-	3	4
12.	Cabbage-Jute-Aman	8	3	5	5
13.	Cabbage-Aus-Aman	6	-	1	2
	Total	100	100	100	100

48. Competitive crops of cabbage grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Cumilla	Dinajpur	Jashore	All areas
1.	Cauliflower	72	92	92	85
2.	Tomato	42	13	93	49
3.	Potato	16	65	3	28
4.	Bean	25	2	28	18
5.	Brinjal	24	28	1	18
6.	Radish	3	3	32	13
7.	Gourd	23	-	3	9
8.	Cucumber	-	7	1	3
9.	Chilli	5	1	-	2

49. Profile of the tomato growers' in the study areas

Particulars	% farmers responded			
	Cumilla	Dinajpur	Rajshahi	All areas
1. Age				
15-29 years	17	18	27	21
30-44 years	35	45	46	42
45-59 years	39	30	23	31
60-74 years	9	6	5	7
75-89 years	1	1	-	1
2. Literacy status				
Illiterate	9	3	13	8
Can sign	13	11	10	11
Primary (Class I-V)	41	26	18	28
Secondary (Class VI-SSC)	28	41	33	34
Higher secondary (HSC)	5	15	21	14
Degree and above	4	5	4	4
3. Occupation				
Main occupation				
Agriculture	97	99	100	98

Particulars	% farmers responded			
	Cumilla	Dinajpur	Rajshahi	All areas
Business	2	-	-	1
Service	-	-	-	-
Others	1	1		1
Subsidiary occupation				
No Profession	80	73	80	78
Agriculture	3	1	-	1
Business	13	17	10	13
Others	4	9	10	8
4. Experience in farming				
2-15 years	40	54	60	60
16-29 years	29	27	23	23
30-43 years	29	15	16	16
44-57 years	3	3	1	1
5. Farm size (%)				
Marginal (below 0.19 ha)	8	4	5	6
Small (0.19-0.99 ha)	87	59	87	77
Medium (1.00-3.03 ha)	5	33	8	15
Large (above 3.03 ha)	1	5	-	2
6. Number of family member				
2-4	19	41	53	38
5-7	56	51	41	49
8-10	19	6	6	10
11-13	6	1	-	2
7. Family member involved in agriculture				
1	76	56	45	59
2	19	33	45	32
3	3	11	9	7
4	2	1	1	1

50. Distribution of different cropping patterns followed by the farmers in tomato cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Cumilla	Dinajpur	Rajshahi	All areas
1.	Tomato-Fallow-Aman	-	80	23	34
2.	Tomato-Aus-Aman	62	2	-	21
3.	Tomato-Aus-Fallow	28	-	23	17
4.	Tomato-Maize-Aman	-	6	-	2
5.	Tomato-Jute-Aman	-	5	42	16
6.	Tomato-Maize-Fallow	-	4	7	4
7.	Tomato-Bottle gourd-Aman	6	2	5	3
8.	Tomato-Bitter gourd-Aman	2	1	-	1
9.	Tomato-Brinjal-Aman	2	-	-	1
	Total	100	100	100	100

51. Competitive crops of tomato grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Cumilla	Dinajpur	Rajshahi	All areas
1.	Potato	59	76	11	49
2.	Cabbage	54	33	-	29
3.	Brinjal	26	27	-	18
4.	Cauliflower	23	28	-	17
5.	Wheat	29	18	82	43
6.	Radish	29	0	-	10
7.	Bottle gourd	22	3	-	8
8.	Maize	-	-	43	14
9.	Bean	18	3	-	7
10.	Chilli	1	17	-	6
11.	Okra	1	16	-	6
12.	Boro	7	5	-	4
13.	Lentil	-	-	29	10
14.	Mustard	-	-	22	7
15.	Onion	-	-	75	25
16.	Garlic	1	0	29	10

52. Profile of the country bean growers' in the study areas

Particulars	% farmers responded			
	Chattogram	Jashore	Narsingdi	All areas
1. Age				
15-29 years	9	14	11	12
30-44 years	27	30	25	27
45-59 years	45	39	44	43
60-74 years	19	15	19	17
75-90 years	-	2	1	1
2. Literacy status				
Illiterate	6	5	8	7
Can sign	15	20	22	20
Primary (Class I-V)	29	30	26	28
Secondary (Class VI-SSC)	43	31	37	36
Higher secondary (HSC)	3	9	5	6
Degree and above	4	5	2	4
3. Occupation				
Main occupation				
Agriculture	95	99	85	93
Business	1	-	12	4

Particulars	% farmers responded			
	Chattogram	Jashore	Narsingdi	All areas
1. Age				
Others	4	1	3	3
Subsidiary occupation				
No Profession	76	62	68	68
Agriculture	5	1	15	7
Business	10	22	15	16
Others	9	15	2	9
4. Experience in farming				
2-15 years	30	43	32	35
16-29 years	33	21	30	27
30-43 years	34	31	36	34
44-57 years	3	5	3	4
5. Farm size (%)				
Marginal (below 0.19 ha)	16	1	16	10
Small (0.19-0.99 ha)	75	85	77	80
Medium (1.00-3.03 ha)	9	13	7	10
Large (above 3.03 ha)	-	1	-	-
6. Number of family member				
2-4	22	34	26	28
5-7	63	56	59	59
8-10	13	9	13	12
11-13	2	1	2	2
7. Family member involved in agriculture				
1	64	56	71	64
2	31	41	23	32
3	5	1	5	4
4	-	3	1	1

53. Distribution of different cropping patterns followed by the farmers in country bean cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Chattogram	Jashore	Narsingdi	All areas
1.	Country bean-Aus-Aman	15	21	25	20
2.	Country bean- Country bean - Country bean	-	44	-	15
3.	Country bean-Aus-Fallow	25	-	11	12
4.	Country bean-Jute-Country bean	-	22	11	11
5.	Country bean-Cucumber-Fallow	1	-	25	9
6.	Country bean-Okra-Fallow	25	-	-	8
7.	Country bean-Aus-Country bean	9	12	-	7
8.	Country bean-Sweet gourd-Fallow	1	-	15	5
9.	Country bean-Teasel gourd-Fallow	8	-	4	4
10.	Country bean-Bitter gourd-Fallow	5	-	3	3
11.	Country bean-Ridge gourd-Fallow	10	-	-	3
12.	Country bean-Fallow-Country bean	1	1	2	1
13.	Country bean-Jute-Aman	-	-	4	1
	Total	100	100	100	100

54. Competitive crops of country bean grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Chattogram	Jashore	Narsingdi	All areas
1.	Tomato	88	27	41	52
2.	Brinjal	3	63	46	37
3.	Cabbage	8	71	31	37
4.	Cauliflower	4	39	36	26
5.	Bottle gourd	52	5	25	27
6.	Wheat	15	25	22	21
7.	Radish	32	15	16	21
8.	Bean	16	8	9	11
9.	Teasel gourd	2	23	1	9
10.	Potato	-	2	32	11
11.	Chilli	1	1	13	5
12.	Boro	7	7	4	6
13.	Sweet gourd	-	-	6	2
14.	Okra	1	-	1	1

55. Profile of the banana growers' in the study areas

Particulars	% farmers responded			
	Narsingdi	Tangail	Jhenaidah	All areas
1. Age				
15-29 years	16	9	23	16
30-44 years	38	47	33	39
45-59 years	33	31	35	33
60-74 years	12	11	9	10
75-90 years	1	3	-	1
2. Literacy status				
Illiterate	6	13	3	7
Can sign	23	20	21	21
Primary (Class I-V)	22	20	23	22
Secondary (Class VI-SSC)	31	34	41	36
Higher secondary (HSC)	14	9	7	10
Degree and above	4	5	4	4
3. Occupation				
Main occupation				
Agriculture	99	97	97	98
Business	1	2	-	1
Others	-	1	3	1
Subsidiary occupation				
No Profession	88	83	87	86
Agriculture	1	3	3	2
Business	6	13	9	10
Others	5	1	1	2
4. Experience in farming				
2-15 years	40	39	39	39
16-29 years	31	37	39	36
30-43 years	25	22	21	23
44-57 years	5	2	1	2
5. Farm size (%)				
Marginal (below 0.19 ha)	3	-	-	1
Small (0.19-0.99 ha)	84	81	72	79
Medium (1.00-3.03 ha)	12	18	28	19
Large (above 3.03 ha)	1	1	-	1
6. Number of family member				
2-4	41	41	47	43
5-7	51	55	50	52
8-10	5	2	2	3
11-13	3	2	1	2
7. Family member involved in agriculture				
1	57	60	75	64
2	39	37	23	33
3	3	3	2	2
4	1	-	-	1

56. Distribution of different cropping patterns followed by the farmers in banana cultivation

Sl. No.	Cropping pattern	% farms followed			
		Narsingdi	Tangail	Jhenaidah	All areas
1.	Banana-Fallow-Fallow	67	28	16	37
2.	Fallow- Banana-Fallow	5	21	51	26
3.	Fallow-Fallow-Banana	9	15	1	8
4.	Banana-Banana-Banana	13	37	33	28
5.	Banana-Fallow-Banana	4	-	-	1
6.	Banana-Banana-Potato	1	-	-	-
	Total	100	100	100	100

57. Competitive crops of banana grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Narsingdi	Tangail	Jhenaidah	All areas
1.	Guava	54	35	85	58
2.	Papaya	-	85	-	28
3.	Ber	-	34	35	23
4.	Pointed gourd	34	-	-	11
5.	Potato	42	-	16	19
6.	Ridge gourd	15	-	-	5
7.	Brinjal	5	-	32	12

C. BINA Component

1. Profile of the mustard growers' in the study areas

Particulars	% farmers responded			
	Tangail	Sirajganj	Jashore	All areas
1. Age				
15-29 years	10.56	10.00	12.78	11.11
30-44 years	33.89	32.22	33.89	33.33
45-59 years	34.44	33.33	35.00	34.26
60-74 years	15.56	20.56	13.33	16.48
75-89 years	5.56	3.89	5.00	4.81
2. Literacy status				
Illiterate	0.00	2.22	3.33	1.85
Can sign	19.44	21.11	17.22	19.26
Primary (Class I-V)	19.44	21.11	20.56	20.37
Secondary (Class VI-SSC)	38.33	37.78	47.78	41.30
Higher secondary (HSC)	17.22	15.56	9.44	14.07
Degree and above	5.56	4.44	5.00	5.00

Particulars	% farmers responded			
	Tangail	Sirajganj	Jashore	All areas
3. Occupation	0.00	2.22	3.33	1.85
Main occupation				
Agriculture	52.78	52.78	51.67	52.41
Business	0.00	1.11	0.56	0.56
Service	2.22	1.11	2.22	1.85
Others	0.56	0.56	1.11	0.74
Subsidiary occupation	55.56	55.56	55.56	55.56
No Profession	67.22	68.89	70.00	68.70
Agriculture	1.11	4.44	2.22	2.59
Business	31.67	26.67	27.78	28.70
4. Experience in farming				
2-15 years	50.56	45.00	54.44	50.00
16-29 years	21.67	27.78	33.33	27.59
30-43 years	22.78	21.67	7.78	17.41
44-57 years	5.00	5.56	4.44	5.00
5. Farm size (%)				
Marginal (below 0.19 ha)	10.56	11.11	10.00	10.56
Small (0.19-0.99 ha)	66.11	67.78	63.89	65.93
Medium (1.00-3.03 ha)	16.11	16.67	21.11	17.96
Large (above 3.03 ha)	7.22	4.44	5.00	5.56
6. Number of family member				
2-4	27	32	27	29
5-7	64	60	65	63
8-10	9	5	7	7
11-13	0	3	1	1
7. Family member involved in agriculture				
1	61	60	37	52
2	20	25	38	28
3	8	7	13	9
4	11	8	12	10

2. Distribution of different cropping patterns followed by the farmers in mustard cultivation

Sl. No.	Cropping pattern	% farms followed			
		Tangail	Sirajganj	Jashore	All areas
1.	Mustard-Jute-Aman	37	43	23	32
2.	Mustard-Boro-Aman	58	28	29	50
3.	Mustard-Fallow-Aman	5	29	48	18
	Total	100	100	100	100

3. Competitive crops of mustard grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Tangail	Sirajganj	Jashore	All areas
1.	Potato	2	24	44	28
2.	Cabbage	12	21	33	18
3.	Cauliflower	5	12	19	14
4.	Khesari	47	2	5	19
5.	Onion	19	22	18	16
6.	Maskalai	4	10	12	10
7.	Chilli	15	25	61	33
8.	ChickPea	8	12	10	9
9.	Lentil	-	8	28	11

4. Profile of the groundnut growers' in the study areas

Particulars	% farmers responded			
	Panchagor	Faridpur	Noakhali	All areas
1. Age				
15-29 years	28	24	21	24
30-44 years	39	41	34	38
45-59 years	21	24	29	25
60-74 years	10	11	16	12
75-90 years	1	0	0	0
2. Literacy status				
Illiterate	13	15	16	15
Can sign	36	17	21	25
Primary (Class I-V)	21	33	29	28
Secondary (Class VI-SSC)	21	26	25	24
Higher secondary (HSC)	6	7	6	6
Degree and above	1	2	3	2

Particulars	% farmers responded			
	Panchagor	Faridpur	Noakhali	All areas
Main occupation				
Agriculture	94	96	99	99
Business	-	-	-	0.5
Service	-	4	1	0.5
Others	1		-	-
Subsidiary occupation		77		
No Profession	80	11	81	64
Agriculture	1	15	1	2
Business	17	3	26	24
Others	10	32	12	10
4. Experience in farming				
1-15 years	45	29	30	40
16-30 years	50	48	38	39
31-45 years	29	4	25	17
46-60 years	1	3	4	3
5. Farm size (%)		74		
Marginal (below 0.19 ha)	16	12	22	3
Small (0.19-0.99 ha)	65	5	34	71
Medium (1.00-3.03 ha)	55	9	24	45
Large (above 3.03 ha)	1	25	2	2
6. Number of family member		63		
2-4	68	19	49	41
5-7	45	2	48	48
8-10	15	23	19	18
11-13	12	61	3	3
7. Family member involved in agriculture		3		
1	53	42	19	21
2	23	12	9	11
3	12	3	4	4

5. Distribution of different cropping patterns followed by the farmers in groundnut cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Panchagor	Faridpur	Noakhali	All areas
1.	Groundnut-Aus -Fallow	23	12	10	12
2.	Groundnut -Fallow -Aman	34	23	8	31
3.	Groundnut -Jute -Fallow	6	5	12	8

6. Competitive crops of groundnut grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Panchagor	Faridpur	Noakhali	All areas
1.	Mustard	69	68	61	79
2.	Wheat	67	81	7	64
3.	Potato	34	69	2	39
4.	Lentil	57	-	56	19
5.	Garlic	8	38	41	15
6.	Boro	16	6	3	12
7.	Onion	18	12	17	11
8.	Chickpea	16	2	8	9
9.	Brinjal	12	2	2	5

7. Profile of the sesame growers' in the study areas

Particulars	% farmers responded			
	Jashore	Tangail	Barishal	All areas
1. Age				
15-29 years	15	13	15	14
30-44 years	30	27	31	29
45-59 years	36	39	33	36
60-74 years	19	21	21	20
2. Literacy status				
Illiterate	2	0	10	4
Can sign	12	24	28	21
Primary (Class I-V)	36	26	32	31
Secondary (Class VI-SSC)	28	32	26	29
Higher secondary (HSC)	14	11	3	9
Degree and above	8	7	1	5
3. Occupation				
<i>Main occupation</i>				
Agriculture	94	96	98	100
Business	6	3	2	2

Particulars	% farmers responded			
	Jashore	Tangail	Barishal	All areas
Service	-	1	-	-
Others	-	-	-	-
<i>Subsidiary occupation</i>				
No Profession	89	54	57	56
Business	46	24	16	20
Others	5	22	27	24
4. Experience in farming				
2-15 years	14	24	25	28
16-29 years	29	31	33	31
30-43 years	31	36	35	34
44-57 years	4	9	8	7
5. Farm size (%)				
Marginal (below 0.19 ha)	15	25	33	4
Small (0.19-0.99 ha)	72	69	81	78
Medium (1.00-3.03 ha)	25	25	17	23
Large (above 3.03 ha)	3	8	5	6
6. Number of family member				
2-4	64	28	34	38
5-7	89	65	66	68
8-10	9	23	22	15
11-13	5	8	12	5
14-17	4	2	3	6
7. Family member involved in agriculture				
1	68	50	63	56
2	36	37	40	37
3	3	5	9	5
4	5	2	6	2

8. Distribution of different cropping patterns followed by the farmers in sesame cultivation

Sl. No.	Cropping pattern	% farmers followed			
		Jashore	Tangail	Barishal	All areas
1.	Sesame-Jute-Aman	65	23	30	33
2.	Sesame-Fallow-Aman	34	89	4	31
3.	Sesame-Potato-Aman	36	15	15	15
4.	Muskalai-Sesame-Aman	13	-	34	15

9. Competitive crops of sesame grown in the study areas

Sl. No.	Competitive crops	% farmers responded			
		Jashore	Tangail	Barishal	All
1.	Maize	54	15	55	41
2.	Maskalai	45	4	34	35
3.	Moog	19	45	40	34
4.	Wheat	45	2	3	14
5.	Kaun	4	-	51	34
6.	Chilli	5	30	33	24

Pictorial view of the sub-project activities



















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