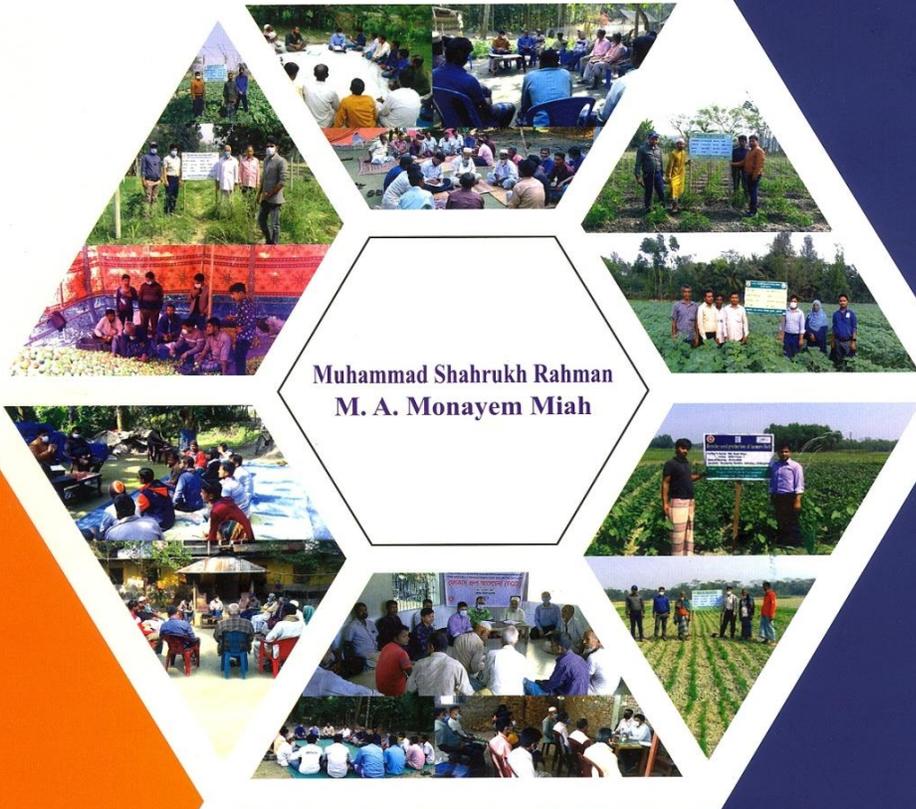




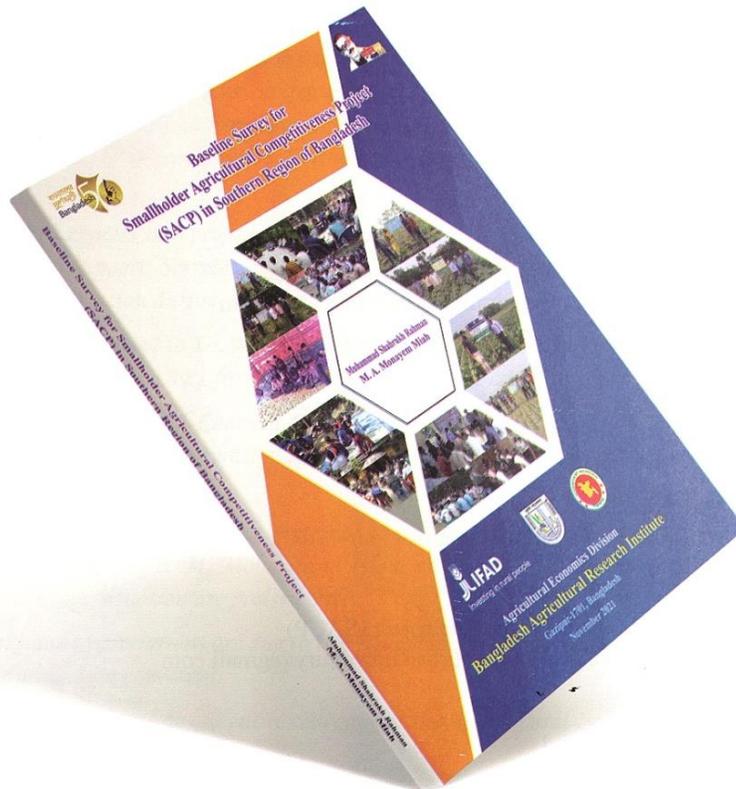
# Baseline Survey for Smallholder Agricultural Competitiveness Project (SACP) in Southern Region of Bangladesh



Agricultural Economics Division  
**Bangladesh Agricultural Research Institute**  
Gazipur-1701, Bangladesh  
November 2021



**Baseline Survey for  
Smallholder Agricultural Competitiveness Project  
(SACP) in Southern Region of Bangladesh**



**Agricultural Economics Division  
Bangladesh Agricultural Research Institute**

Gazipur-1701, Bangladesh

November 2021



## Team Details

### *Research Team*

#### **Muhammad Shahrukh Rahman**

Scientific Officer

Agricultural Economics Division

Bangladesh Agricultural Research Institute, Gazipur-1701

Mobile No.: +8801741486334, Email: msr\_30bau@yahoo.com

#### **Dr. M. A. Monayem Miah**

Principal Scientific Officer

Agricultural Economics Division

Bangladesh Agricultural Research Institute, Gazipur-1701

Mobile No.: +8801757739542, Email: monayem09@yahoo.com

### *In overall cooperation*

#### **Dr. Apurba Kanti Chowdhury**

Director

Horticulture Research Center

Bangladesh Agricultural Research Institute, Gazipur-1701

and

Ex Project Coordinator (BARI Part)

Smallholder Agricultural Competitiveness Project (SACP)

Mobile No.: +8801819128302, Email: apurba.chowdhury@gmail.com

#### **Dr. Md. Abdur Rashid**

Chief Scientific Officer and Head

Agricultural Economics Division,

Bangladesh Agricultural Research Institute, Gazipur-1701

Mobile No.: 01711070110, Email: md.abdurr@yahoo.com

#### **Dr. Parimal Chandra Sarker**

Principal Scientific Officer

Seed Technology Division

Bangladesh Agricultural Research Institute, Gazipur-1701

and

Project Coordinator (BARI Part)

Smallholder Agricultural Competitiveness Project (SACP)

Mobile No.: +8801712102012, Email: sarkerparimalch@yahoo.com

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*The errors remain ours.*

### *The Authors*



## Baseline Survey for Smallholder Agricultural Competitiveness Project (SACP) in Southern Region of Bangladesh



**Data Enumerators**

*Research Team*

**Muhammad Shahrulkh Rahman  
Dr. M. A. Monayem Miah**

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## LIST OF ABBREVIATIONS

ADB	=	Asian Development Bank
AED	=	Agricultural Economics Division
ASA	=	Association for Social Advancement
B. Aman	=	Broadcasted Aman
B. Aus	=	Broadcasted Aus
BADC	=	Bangladesh Agricultural Development Corporation
BARI	=	Bangladesh Agricultural Research Institute
BBS	=	Bangladesh Bureau of Statistics
BCR	=	Benefit Cost Ratio
BDT	=	Bangladeshi Taka
BPRSP	=	Bangladesh Poverty Reduction Strategy Paper
BRAC	=	Bangladesh Rural Advancement Committee
CDI	=	Crop Diversity Index
COVID-19	=	Corona Virus Disease of 2019
DAE	=	Department of Agriculture Extension
DAM	=	Department of Agricultural Marketing
DRC	=	Domestic Resource Cost
FAO	=	Food and Agriculture Organization of the United Nations
FGD	=	Focus Group Discussion
FMPE	=	Farm Machinery and Post-harvest Engineering
FPMU	=	Food Planning and Monitoring Unit
GDP	=	Gross Domestic Product
GoB	=	Government of the People's Republic of Bangladesh
HVC	=	High Value Crops
HYV	=	High Yielding Variety
IFAD	=	International Fund for Agricultural Development
KII	=	Key Informant Interview
MoA	=	Ministry of Agriculture
MoWR	=	Ministry of Water Resources
NCA	=	Net Cropped Area
NGOs	=	Non-Government Organizations
SACP	=	Smallholder Agricultural Competitiveness Project
T. Aman	=	Transplanted Aman
TA	=	Technical Assistance
UK	=	United Kingdom
UN	=	United Nations
UNDP	=	United Nations Development Program

## ACRONYMS

- Arathdar cum Paiker : *Arathdar* is a stockiest or merchant or agent who owns a place or space termed as warehouse, with the aim of providing space to different market functionaries to do their business and demands a specific commission to provide this service. When *Arathdar* act as one of the market functionaries and traded product then it is regarded as *Arathdar cum Paiker*.
- Bepari : *Beparies* are one kind of market functionaries who usually purchase products from *Faria* and supplied it to the central wholesale market located at Upazila area or urban area. Sometimes they also collect products directly from farmers. They supply their products to the *Paiker* or wholesaler.
- Dealer : The government incorporates some persons or institutions in principle through DAE or BADC temporarily into the input distribution system for ensuring uninterrupted supply of the agricultural input during the each of the production season. They are called as Dealer.
- District : Bangladesh is divided into eight major administrative divisions. The divisions are divided into 64 districts. Each district is run by a Deputy Commissioner who appointed by the Government. The capital of a district is called a district seat or Zila Sadar. The districts are further subdivided into 492 sub-districts or Upazilas.
- Faria : Market functionaries who purchase products directly from farmers or producers' premises termed as *Faria*. The volume of products they traded are not large enough. Mostly they are small-scale traders and sell their products to *Beparies* and in the local market.
- Paiker or wholesaler : *Paikers* or wholesalers are located in the central wholesale market. *Beparies* supply their products to the *Paiker* or wholesaler. They also collect their products from producer with maintaining a prior contract.
- Primary market : Primary market is defined as the local market of the farmers, where Farias, producers and few of *Beparies* traded products.
- Secondary market : The market, which is located in Upazila area or urban areas, and composed of *Beparies*, *Paikers*, *Arathdars* and wholesalers, can be termed as secondary market.
- Terminal market : Terminal market is called the final market of a product where large volume of product placed from all over the country. Products again distributed from these places through retailers. It is an organized market in a city into which large quantities of agricultural produces, livestock, etc., are shipped for distribution and sale.
- Upazila : *Upazila* is an administrative region in Bangladesh formerly known as Thana. It functions as the sub-units of districts. Their functionality can be seen to be analogous to that of a country or a borough of Western countries. Rural *Upazilas* are further administratively divided into union councils (Union Parishads).

## ***EXECUTIVE SUMMARY***

Agricultural land in low lying coastal region of Bangladesh are subject to a number of problems such as salinity, stagnation of rain and runoff water, flooding from rivers or periodic storm surges. There may be the chances of physical damage from windstorms or tidal waves. Due to the global climate change this low-lying agricultural lands may also be vulnerable to shoreline retreat and flooding because of coastal erosion and a rise in sea level. Agricultural activities in this region tend to be marginalized. Gradually, it is replacing with non-agricultural activities or by agro-based entrepreneurship, which require higher capital inputs. But this is mostly impossible for the smallholder farmers of the Southern coastal Bangladesh to invest and intensify these non-agricultural activities. But production of the HVC may be a good prospect for the farmer if it is possible to remove the remaining barriers. To enhance the life and livelihood standard of this smallholder farmers, the Government of Bangladesh launched Smallholder Agricultural Competitiveness project with the financial aid of IFAD and technical assistance from FAO. The project goal is to contribute to Bangladesh's agriculture smallholders' responsiveness and competitiveness in the high value crop (HVC) production and marketing of fresh and/or processed products, and market linkages. The project development objective is to increase farmer's income and livelihood through demand-led productivity growth, diversification, and increase market linkages in a changing climatic condition.

Bangladesh Agricultural Research Institute (BARI) is one of the important parts of this project, which involves in enhancing the production of HVC and technology adoption. BARI will also facilitate the processing and marketing of HVCs available in the project catchment areas. BARI is providing different commodity and non-commodity technologies related to HVCs production and marketing, farm machinery and post-harvest processing among the target beneficiaries in the project catchment areas. At the end of this project, BARI will also assess the impact of the adoption of these technologies on farmer's income and livelihoods in the project catchment areas. Therefore, a baseline study should be conducted at the initial stage of the project to get knowledge of the status of the project beneficiaries regarding the use of BARI developed crop production technologies. Without a baseline, it will be difficult to contribute correctly by the BARI in the overall objectives of SACP project. Besides, this baseline study is also necessary to know the impact of adopting BARI developed commodity and non-commodity technologies on livelihood development of southern smallholder farmers. The Agricultural Economics Division of BARI got the responsibility to conduct this baseline study. The specific objectives of the study were: (i) to know the present status of production, processing and marketing of selected HVCs at farm level; (ii) to document some baseline data and information for assessing the impacts of BARI technology adoption on farmers' income and livelihood; and (iii) to explore the constraints and opportunities of producing demand led HVCs production, processing and marketing under changing climate condition.

Both primary and secondary data were used in this study. Primary data were collected through face-to-face interview with a pre-tested structured interview schedule from the project catchment areas. Secondary data were collected from different books, articles, periodicals, seminar papers, etc. to complement the primary data. Some qualitative data were also collected through administering FGDs and KII to ornament the report. A total of 1000 farmers from 20 Upazilas of 11 project districts were interviewed to collect the farm level data. Besides, 12 FGDs were conducted in six districts equally from Khulna, Barisal and Chattogram division where the total number of participants were 120. A multistage stratified random sampling procedure was followed to select the

survey respondents. Researcher along with three data enumerators collected primary data from field level. Descriptive statistics were used to analyze the collected data.

Most of the surveyed farmers (25%) belonged to 36-45 years of age categories followed by 24% in 46-55 years of age, and 23% in 36-35 years of age. The maximum number of ethnic farmers were found from Rakhaine community, which was 2.6% of the total surveyed farmers. Besides, Chakma and Marma farmers were also found and they were 1.4% and 0.8% of the total surveyed farmers respectively. Out of 1000 surveyed farms, 89.3% of them were male and the rest 10.7% of them were female. The 20% of the surveyed farmers were illiterate which means they even can't make their own signature. Besides, the educational attainment of the lion share of the survey respondents (27%) was only class 6 to class 8. Only 5% of them completed honors or degree or equivalent study. Farming was the primary occupation of 90% of the surveyed farmers. Besides, the study also found some farmers from different primary occupation such as small business, labor, service, rickshaw or van puller, carpenter and masson. About 55% of the survey respondents depends on single occupation, which means they had only one occupation. But 23% of the total respondents had small business as secondary occupation. Medium type of family size (5-7 members) were found mostly in the survey areas accounted for 49% of the survey respondents. It was found that the survey respondents were mostly experienced in farming. The majority portion (41%) had up to 15 years of farming experience followed by 36% in 16-30 years of farming experience. The 70% of the total surveyed respondents opined that they got a number of training on farming while the rest 30% asserted that they didn't attend any kind of farming training either from DAE or from BARI. Training were mostly provided from DAE, which was 65% of the total delivered training followed by BARI (32%) and NGOs (2%). Farm size was categorized into three groups- small, medium and large of which 63% of the total surveyed farmers belonged to small groups that means they had farmland of 0.05 - 2.49 acres. Only 5% of them belonged to large farm size groups owning farmland of 7.50 acres and above. Out of total sample respondents 72% had own cultivable land followed by 30% of them engaged in rented in system of cultivation. Besides, 41% of them engaged in leased in and 18% of them engaged in mortgaged in system of cultivation.

A varieties of means of housing were found of which 81% had fully tin with earthen floor type of housing. Only 9% of them had fully brick built type of housing. Different types of livestock were reared by the respondent farmers of which bull, cow, goat, chicken, duck and pigeon were the most noticeable. The study found a number of agricultural tools and machinery owned by the survey farmers. The most popular items are sprayer, LLP and STW owned by 58%, 17% and 15% of the farmers respectively. Out of 1000 farm families 83.3% had electricity facilities and the rest, 16.7% were still had no electricity facilities. Farm families who had no electricity they had to arrange alternate sources of lighting or electric energy. The present study found four alternate options viz. solar home system, kerosene lamp or candle, rechargeable battery, rechargeable light. The study found a number of sources of drinking water in which the lion share of farm families had normal tube well (63.1%) to provide drinking water. Out of 1000 farm families, 18.5% used submerge for collecting drinking water. Out of 1000 surveyed farm families 86% had latrine facilities in their dwelling houses and 14% of them asserted that they did not have latrine facilities in any form in their dwelling houses. It was reported that 68.9% of the farm families consult with the doctor when they become sick and the rest 31.1% were reluctant to consult with the doctor. The main sources of income of the most farmers was rice production (82%) following by vegetables production (75%), pulses crop production (40%) and oilseed production (21%).

Cropping intensity varies among the project catchment areas. Highest cropping intensity was in Feni district (215%) and lowest was in Patuakhali district (142%). Average cropping intensity in all the project area is 175%. Vegetables and cereals were mostly the same in each of the three divisions. Only mungbean was found in Khulna division from the pulses crops while grass pea, felon, mungbean and lentil were available in Barisal division. Grass pea, felon and mungbean were cultivating by the farmers of Chattogram division. Among the oilseed crops mustard was found cultivating in Khulna division while sesame, mustard, ground nut and sunflower were available in the farmers field in Barisal and Chattogram division. A number of spices crop were growing in each of the three division in which onion, coriander leaf, chili and garlic were available in Khulna division while chili, onion and garlic were available in Barisal division. The main sources of information regarding HVCs production was DAE. Besides, farmer also received information from local dealer, other farmers, BARI, BADC, and NGOs. Farmer mostly collect seed from local dealer, which was 36% of the total, surveyed farmers. BADC, other farmers, and DAE also provide a significant portion of the seed demand. A number of BARI varieties were found in the survey areas but these were very few than the varieties developed by BARI. This varieties includes vegetables, cereals, pulse crops, oil seed crops, spices and fruits. Farmer opined that they used BARI developed technologies mainly due to higher yield, higher profit margin and higher market demand. But demonstration of BARI varieties was not satisfactory. The main cause for this according to the surveyed farmers was communication gap between BARI and farmer and unavailability of technology and variety.

Fallow-fallow-rice and vegetables-vegetables-vegetables were the most common pattern followed by most of the farmers of Shaymnagarupazila of Satkhira district accounted for 37% and 37% respectively. But vegetables-fallow-rice were mostly practiced cropping pattern in Kaliganjupazila of Satkhira. Rice-fallow-fallow was the dominant cropping pattern in Fakirhatupazila of Bagerhat district whereas vegetables-vegetables-vegetables was dominant in Kachuaupazila of the same district. Fallow-fallow-rice was most common in Kaokhaliupazila of Pirojpur district practiced by 51% of the survey respondents. Most of the farmers of Kamalnagarupazila of Lakshmipur district (41%) followed soybean-fallow-rice cropping pattern. But vegetables-fallow-rice was practiced mainly (36%) in Chagolnaiyaupazila of Feni district. Pulse-fallow-rice was the main cropping pattern in Nalsityupazila of Jhalokati district, Mirsharai and Boalkhaliupazila of Chattogram district, Charfashion and Lalmohonupazila of Bhola district, Hattiaupazila of Noakhali and Aamtoli and Taltoliupazila of Barguna district followed by 69%, 58%, 31%, 66%, 31%, 29%, 35% and 44% of the survey respondents respectively. But pulses-vegetable-rice was practiced mostly by 55% of the survey farmers of Bamnaupazila of Barguna district. Extent of machinery used in crop production was investigated through this study where tilling of land and threshing of harvested crop was found to be done mostly by machine accounted for 95.4% and 87.4% of the total surveyed farmers respectively. But sowing, harvesting, and drying were mostly done manually.

It was evident from the study that, per hectare production of brinjal, groundnut, cabbage, cauliflower, grasspea, bottle gourd, sweet pumpkin, mustard, sunflower, tomato, potato, felon and mungbean was found 41.8 MT, 3.01 MT, 42.43 MT, 29.98 MT, 1.76 MT, 49.47 MT, 20.78 MT, 2.80 MT, 2.23 MT, 44.65 MT, 27.40 MT, 2.96 MT and 2.92 MT respectively. BCR of brinjal, groundnut, cabbage, cauliflower, grasspea, bottle gourd, sweet pumpkin, mustard, sunflower, tomato, potato, felon and mungbean was 1.49, 1.16, 1.57, 1.46, 1.19, 1.31, 1.40, 1.43, 1.17, 1.64, 1.42, 1.39, and 2.23 respectively. The present study found a number of post-harvest functions such as – harvesting, cleaning, sorting, grading, improve packaging, storing, processing on selected HVCs include vegetables (bottle gourd, Okra, brinjal, cabbage, cauliflower, sweet pumpkin, tomato, cucumber), tuber

crops (potato), oil seed crops (groundnut, mustard, soybean, sunflower), pulse crops (grass pea, felon, mungbean) and fruits (mango, guava, bar, watermelon, muskmelon). Farmer used different media to keep the harvested product either for selling or for storing. It includes open soil, jute mate, plastic triple, bamboo basket, polythene sheet, plastic crate, plastic sack, jute sack, silver bowl and plastic drum.

Three types of market remain active in trading agricultural product, which are primary market, secondary market and terminal market. In the case of trading by farmer of the surveyed southern region of Bangladesh, it was found that farmers product can only reached in primary and secondary market. They didn't want to go to the terminal market due to their weak and/or absence of communication. A number of market functionaries were found in the study that includes *Faria*, *Bepari*, *Arathdar cum Paiker*, *Paiker* and retailer acted as main role in trading of HVCs. Sometimes, farmer sold a few portion of their product directly to the local consumer. Study revealed that most of the time, *Bepari* and *Paiker* received the product from the primary and secondary market while *Faria* received directly from the farmhouse. Vehicle for transporting farm production in the survey areas includes head load, pulling van, electric van, bicycle, auto rickshaw, pick up and truck. The present study showed that farmer did not have the option to use truck for carrying instead they mainly used pulling van, electric van and auto rickshaw. Farmer had to incur significant post-harvest loss. The present study measured post-harvest loss based on full damages and partial damages of HVCs. The highest post-harvest loss was incurred in bottle gourd while lowest post-harvest loss was occurred in mustard.

The baseline study proposed some recommendations based on its findings. The first and foremost comments was to remove communication gap between farm level and BARI. Besides, demonstration of BARI released varieties and technologies should be strengthened, as demand for these was very high among the farmers. Farmers training should provide as it was regarded as very important for demonstrating HVCs. Government should take proper care to deliver seed and fertilizer in time. Regular monitoring of input price and quality control should be ensured.

# CHAPTER 1

## INTRODUCTION

### 1.1 The Context

Bangladesh is a deltaic country with a total area of 148,460 km<sup>2</sup>. The 80% of the country consists of alluvial sediments deposited by the rivers Ganges, Brahmaputra, Tista, Jamuna, Meghna and their tributaries (Haque, 2006). Terraces with an altitude of 20-30m cover about 8% of the country, while hilly areas with an altitude of 10-1000m occur in the southeastern and northeastern part. The coastal area covers an areas of 47,201 km<sup>2</sup>, about 32% of the country and over 30% of the net cultivable area (Ahmed, 2019). The coastal areas extends up to 150 km from the coast. Around 35 million people, representing 29% of the population, live in the coastal zone. This zone is the landmass of 19 districts that are Jessore, Narail, Gopalganj, Shariatpur, Chandpur, Satkhira, Khulna, Bagerhat, Pirozpur, Jhalakati, Barguna, Barisal, Patuakhali, Bhola, Lakshmipur, Noakhali, Feni, Chittagong, and Cox's Bazar (Abu et al. (2003) (Figure 1.1).

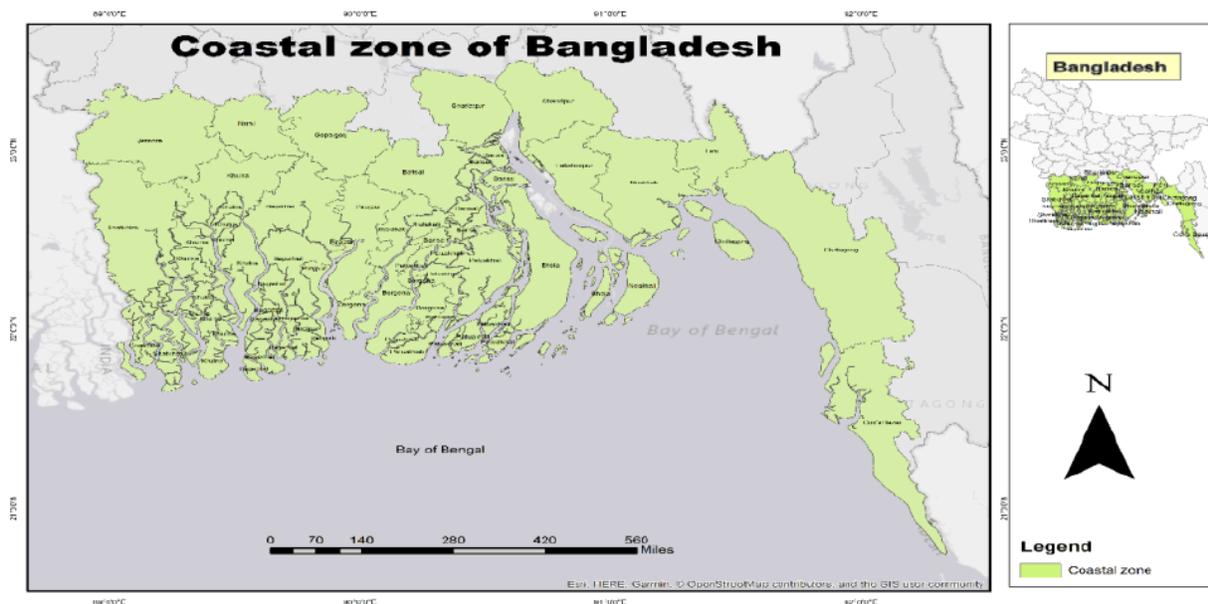


Figure 1.1: Coastal zone of Bangladesh

This coastal zone is divided into three parts, (a) the eastern zone, (b) the central zone and (c) the western zone. The western region known as Ganges tidal plain, comprises the semi-active delta and is crisscrossed by numerous channels and creeks. The central region is the most active and continuous processes of accretion and erosion. Meghna river estuary lies here in this zone. The eastern region is covered by hilly area that is more stable (Ahmed, 2019 and Thomas et al. 1992). A part of coastal area is a reserved natural mangrove forest covering about 6017 km<sup>2</sup>, which is called as The Sundarbans, the world largest mangrove forest. The total volume of coastal and offshore areas is 2.85 million hectares of which 0.83 million hectares are arable lands (Haque, 2006). The 710 km long coastline is composed of the interface of various ecological and economic systems, tidal flat, estuaries, sea grass, islands, accreted land, beaches, a peninsula, rural settlements, urban and industrial areas and ports (Hossain, 2001 and Iftekhar, 2006). A significant part of the coastal area is using in crop production. But crop production in coastal areas are regularly affected by both natural and man-made hazards. Natural disasters includes climate change driven events like sea

level rise, cyclone, storm surge, coastal inundation, salinity intrusion and land erosion (Figure 1.2) (Iftihar, 2006 and MoWR, 1999).



**Figure 1.2: Major coastal hazards in Bangladesh**

Agricultural land use in these areas is very poor, which is roughly 50% of the country’s average (Petersen and Shireen, 2001). Agriculture is the most important livelihood option for the coastal people of Bangladesh in which 40 million people depend on agriculture (GoB and UNDP, 2009; BBS, 2011). It is regarded as the prime important sector for achieving development goals in the coastal areas (BPRSP, 2005). The coastal zone has the potentiality for increasing crop productivity and this will be possible through efficient utilization of available resources. In order to raise farmers’ income and livelihood resilience through HVC production, demand led productivity growth of HVC, diversification and marketing under changing climatic conditions in coastal zone of Bangladesh the Government of Bangladesh has launched a project called Smallholder Agricultural Competitiveness project (SACP). This is an IFAD financing project of total cost US\$ 110.72 million along with co-finance from government of Bangladesh. The functioning of the project begins 01 July 2018 and will continue up to 30 June 2024. The goal of the project is to contribute to Bangladesh’s agriculture smallholders’ responsiveness and competitiveness in high value crop (HVC) production and marketing of fresh and/or processed products, market linkages. The project catchment area includes 30 Upazilas under 11 southern districts of Bangladesh.

Agricultural Economics Division (AED) of Bangladesh agricultural Research Institute (BARI) has been assigned to do the market led research based on component 1 and component 2 of the project. In order to conduct the market led research AED first completed this baseline study to identify the baseline indicators on which the intervention will be done on creation of agricultural market for HVCs and process industries in project catchment areas of SACP.

## **1.2 Background and justification of the baseline study**

Bangladesh is a developing country in South Asia bordered by India and Myanmar. With a population of 163 million, the country had a poverty rate of 20.5% in 2019. Since the inception in 1971, Bangladesh faced a myriad of issues. In 1971, the annual GDP was -14%, the country was plagued by famine and floods and there were high rates of political instability. But due to the active working of the present government in reduction of chronic poverty, Bangladesh achieved a great success. Since 2000, the country has reduced poverty by half. In the last decade and a half, it lifted more than 25 million out of poverty. The rural areas reduced poverty impressively, accounting for 90% of the poverty reduction since 2010 (World Bank, 2019). Bangladesh continuously maintained a robust and resilient economy over the last few years even in the face of many challenges. According to ADB, Bangladesh currently has the fastest growing economy in the region. It demonstrates how growing the economy can help fight poverty. However, there is no room for complacency. The job of ending extreme poverty is not complete. About 1 in 4 Bangladeshi still live in poverty, while almost half of those living in poverty live in extreme poverty and are unable to afford a basic food consumption basket (World Bank, 2019).

Poverty situation in southern region of Bangladesh is not good. About 39.4% of the total poor population are from Barisal division. Besides, the absolute rural poverty in Barisal, Chittagong and Khulna division is 33.7%. Again, this region is prone to different climate change hazards and the intensity of the hazards are much higher compared to other regions of Bangladesh. Despite significant improvements in rural development in many areas, challenges remain to be addressed in the Southern region with increasing population, climate change, salinity intrusion, aging polders, tidal submergence, continued erratic and

unpredictable monsoon and surges and longer draughts. Coastal salinity problems will likely worsen as changing rain patterns reduce the amount of dry season water supply from upstream river source. Salinity causes unfavorable environment and hydrological situation that restrict normal crop production throughout the year. Observations in the recent past indicated that due to increasing degree of salinity of some areas and expansion of salt affected area as a cause of further intrusion of saline water, normal crop production becomes more restricted. In general, soil salinity is believed to be mainly responsible for low land use as well as cropping intensity in the area (Rahman & Ahsan, 2001).

In the saline coastal areas of Bangladesh, rice, sugarcane, jute, pulses, oilseeds, spices, horticultural crops are grown, but their role in cropping intensity vary greatly with regions. Transplanted Aman rice is the dominant crop in the saline highlands of Barisal, Khulna and Patuakhali regions (Kharif 2) while HYV Aman rice is the main crop in the same land type in Chattogram region. Again transplanted Aman rice is also the leading crop for Barisal, Khulna, Noakhali, Patuakhali and Chattogram regions medium highlands. In medium low lands of the former four regions is broadcast Aman rice while broadcast Aus rice is the main crop in medium low lands of Chattogram regions. Therefore, the scenario is not same in all the southern areas of Bangladesh. As a result the agricultural development in this area is constrained by various physical, chemical and social factors. Overall, crop production might be reduced by 30% by the end of the century; rice production could fall by 8%, and wheat production reduced by 32% by 2050 (FPMU 2013). Winter crop production would be seriously hampered due to a warmer and drier environment during non-monsoon seasons, while moisture stress might force farmers to reduce the area under irrigated rice cultivation. Another threats for coastal agriculture is climate change related extreme events like sea level rise. It is expected that sea level rise will inundate 120000 km<sup>2</sup> by 2050 and 14% of the country may become extremely prone to floods by 2030.

But there is significant potential in Southern Bangladesh for increasing sustainability in agricultural production through more efficient utilization of available resources and adoption of BARI developed improved crop production technologies which are specifically adapted to southern agro-ecological zones. The Southern Master Plan of the Ministry of Agriculture's targets the opportunities and challenges for increasing food production in the region and the necessary investments to fulfill the agriculture potential of the area. This Master Plan focused on increasing agricultural productivity and improving water management and rejuvenating productivity of degraded lands (MoA and FAO, 2013). But this will take significant time and resources to re-engineering MoA's service structure in Southern Bangladesh to meet with the challenges in this process of agricultural transformation. So, a supporting project was necessary to speeding up the MoA's institutional re-engineering in the South and this is also necessary to provide operational support to the MoA's Master Plan for the South.

IFAD is an international financial institution and specialized United Nations agency based in Rome, the UN's food and agriculture hub. It has been investing in poor rural women and men in Bangladesh for almost 40 years. It has been collaborating closely with a number of government agencies at all levels and building an effective partnership with the donor community in country since the start of its country programme in Bangladesh. Considering the facts regarding the success of MoA's Master Plan for the south, the Government of Bangladesh along with IFAD's funds and FAO's technical assistance, developed SACP project aiming to significantly increase incomes and food and nutrition security by helping smallholder farmers and make more responsive and competitive in producing diverse, high-value crops and marketing fresh and processed agricultural products. The project will reach 250,000 rural households in southern Bangladesh, where the highest percentage of rural poor reside. Women, youth and disadvantaged households will be specifically targeted. The main thrust is to provide better employment opportunities, product expansion, market viability, and value addition opportunities, quality improvement, improved supply chain management, and input availability for small producers. For this it has some components and objectives to be fulfilled by some lead partner agencies like DAE and BARI.

As one of the components of SACP, BARI will provide different commodity and non-commodity technologies related to fruits, vegetables, pulses, oilseeds, FMPE and postharvest handling among

interested farmers of the region in order to increase crop productivity, farmer's income, and improve their livelihoods. BARI is demonstrating a lot of technologies through a number of its division and outer stations in the South. Another important program of BARI is to conduct market led research aiming at finding out prospects and constraints of spreading BARI developed technologies in the South. It also aims at creation of agricultural market for HVCs in southern areas of Bangladesh. To determine this course of actions that will lead to attainment of the overall objective of the BARI part of SACP, Agricultural Economics Division of BARI is carrying out this baseline survey. A baseline survey is a study that is done at the beginning of a project to get knowledge of the current status of an item of study before a project commences. Without the baseline information, intervention on different aspects of Southern agriculture market through SACP is impossible. At the same time, it's not possible to know the impact of the adoption of those technologies on farmer's income and livelihoods in the study areas. Therefore, this baseline study focused on BARI developed varieties and crop production technologies in SACP project catchment areas.

### **1.3 Project Overview**

The Smallholder Agricultural Competitiveness Project (SACP) is sponsored by the Ministry of Agriculture (MoA), Bangladesh. Four agencies of the Government of Bangladesh are implementing the objectives of the project namely (i) Department of Agriculture Extension (DAE) as lead agency, (ii) Department of Agricultural Marketing (DAM), (iii) Bangladesh Agricultural Development Corporation (BADC) and (iv) Bangladesh Agricultural Research Institute (BARI). The Agriculture, Energy, Water Division Resources division of Planning Commission of Bangladesh is the concerned sector of this project. The total cost of the project is BDT 78033.13 Lac jointly financed by Government of Bangladesh and International Fund for Agricultural Development (IFAD). The project commenced on 1 July 2018 and will be continued up to 30 June 2024.

#### **1.3.1 Objectives of the Project (Component wise)**

The overall objective of the project is to increase farmer incomes and livelihood resilience through demand-led productivity growth, diversification and marketing in a changing climatic condition. The component wise specific objectives of the project are:

##### **Component I: Enhanced production of High Value Crops (HVCs) and technology adoption**

- 1.1: Assessment of HVCs and group mobilization
- 1.2: Demand-driven production and market-led research
- 1.3: institutional support for research and extension

##### **Component II: Processing and marketing of HVC**

- 2.1: Improving market linkage
- 2.2: Increasing Post-harvest and processing investments
- 2.3: Development of food safety and nutrition measures along the value chain

##### **Component III: Climate resilient surface water management**

- 3.1: Sustainable surface water management, drainage, conservation and utilization
- 3.2: Institutional support for capacity building

#### **1.3.2 The Technical Assistance (TA) component**

The objective of TA component is to strengthen the capacity of implementing agencies to successfully implement the SACP project and reach expected SACP results. The TA activities will concentrate on the following:

- Training of trainer's activities and follow-up coaching

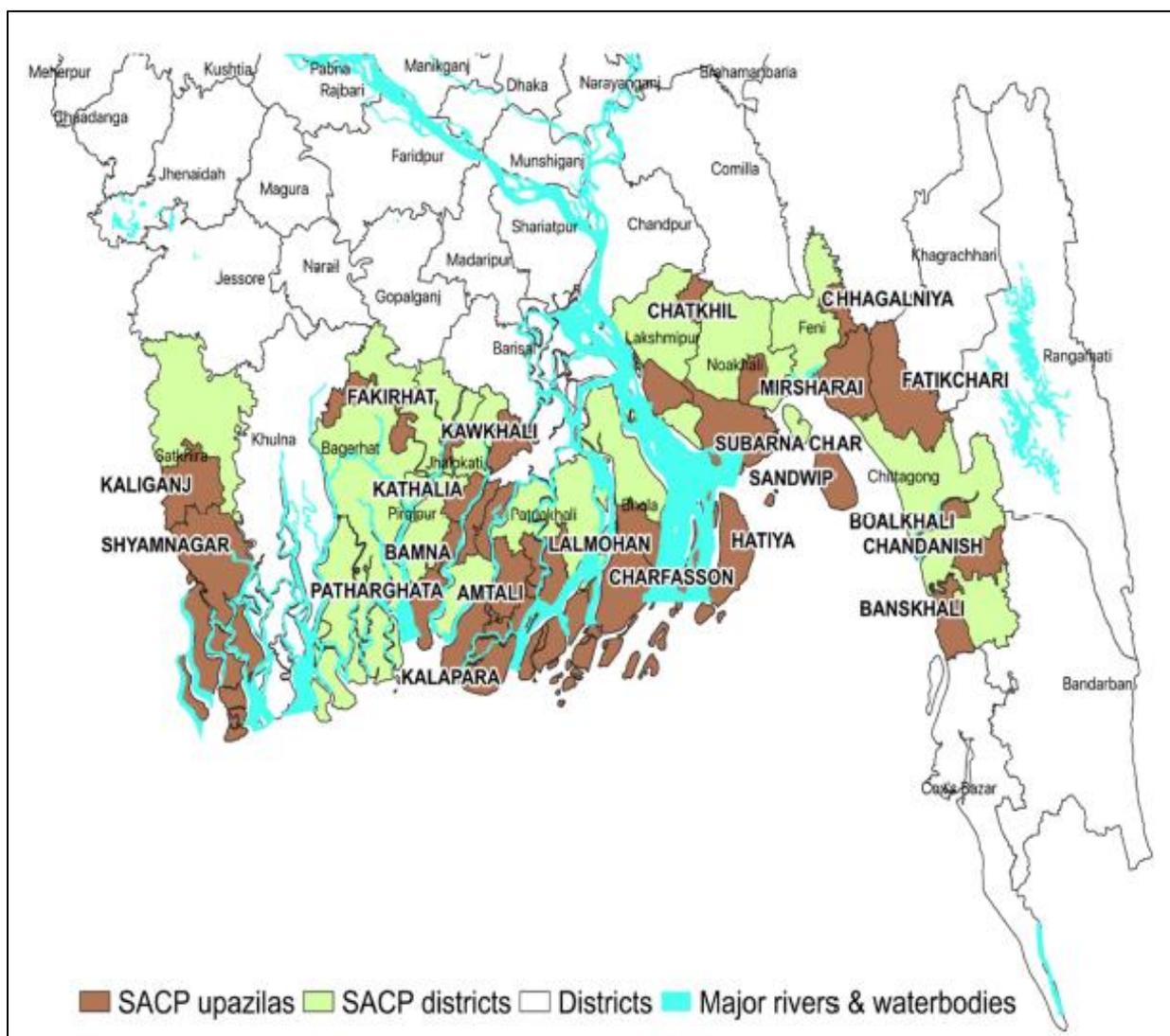
- Assisting the development of a benefit M & E system, and
- Support to value chain and other market-led studies.

#### 1.4 Location of the project

The SACP project includes 30 upazilas of 11 districts in 3 divisions of Bangladesh. Table 1 enumerates this upazilas while Figure 1.3 demonstrates the location in map of southern areas of Bangladesh.

Table 1.1: Location of the SACP project

Division	District	Upazilla
1. Khulna	1. Bagerhat	1. Fakirhat
		2. Kachua
	2. Satkhira	3. Shyamnagar
		4. Kaliganj
2. Barisal	3. Pirojpur	5. Kawkahli
	4. Jhalokati	6. Kathalia
		7. Nalchiti
		8. Amtoli
	5. Barguna	9. Taltoli
		10. Bamna
		11. Betagi
		12. Pathorghata
		13. Mirzagonj
	6. Patuakhali	14. Rangabali
		15. Kalapara
		16. Lalmohon
	7. Bhola	17. Charfasson
		18. Monpura
19. Boalkhali		
3. Chattogram	8. Chattogram	20. Fatkichori
		21. Chandanish
		22. Banskhal
		23. Sandip
		24. Mirsharai
		25. Subornochar
	9. Noakhali	26. Chatkhil
		27. Kabirhat
		28. Hatia
	10. Lakshmipur	29. Kamalnagar
	11. Feni	30. Chagolnaiya



**Figure 1.3: Location of the project**

### 1.5 Outcomes of the project

Outcome I: New and existing technologies researched, developed and adapted to agro-ecological constraints.

Outcome 2: Production decisions respond to market opportunities.

Outcome 3: Improved availability of irrigation water and efficient usage.

### 1.6 High Value Crops (HVCs)

High value crops generally refers to non-staple agricultural crops such as vegetables, fruits, flowers, ornamentals, condiments, spices. In most cases, it includes those crops that have a higher net return per hectare of land than staples, or other widely grown crops. Diversification towards high value crops offers a great scope to improve farmer's income. It is also important for low level of farmer's livelihood improvement and year-to-year fluctuations in crop productivity, which is a major source of agrarian distress. However, smallholders overwhelmingly dominate crop production in Bangladesh and researchers

have long debated about the ability of smallholder dominated subsistence farm economy to diversify into high riskier HVCs production but during the last few years the demand for HVCs has been increasing more quickly than that of staple crops in Bangladesh. Rightly, the SACP project is focusing in HVCs for the southern agriculture for better employment opportunities, product expansion, market viability, and value addition opportunities, quality improvement, improved supply chain management, and input availability for small producers. BARI involves in inventing new technologies and crop varieties for different HVCs. The present study will focus on available HVCs and BARI developed HVCs.

### **1.7 Objectives of the assignment**

The overall aim of this assignment is to conduct a baseline study to develop baseline indicators for facilitating the study to know the impact of adopting BARI developed commodity and non-commodity technologies on livelihood development of smallholder farmers under SACP project in Southern project catchment areas. The specific objectives of the baseline study are as follows:

- i. To know the present status of production, processing and marketing of selected crops at farm level;
- ii. To document some baseline data and information for assessing the impacts of BARI technology adoption on farmers' income and livelihood; and
- iii. To explore the constraints and opportunities of producing demand-led HVCs production, processing, and marketing under changing climate condition.

### **1.8 Limitations of the Study**

The study is based on primary data had to collect from the farmers of project catchment area through face-to-face interview. This needs huge time for assessment. The study also incorporates some other qualitative tools, which was also time consuming. But the present study did not get enough time for the baseline study. Another very important limitation was worldwide COVID-19 pandemic and its outbreak in Bangladesh on 08 March 2020. The Government of Bangladesh was then locked the whole country from March 2020 to July 2020. After 2020 to the end of June 2021 several partial lock down due to COVID-19 pandemic impeded this survey a lot. Collecting data in this situation was a great challenge. The researcher and other scientific staff collected farm-level data with a great risk.

# CHAPTER II

## REVIEW OF LITERATURE

### 2.1 Prelude

The review of related literature in any research is necessary because it provides a scope for reviewing the stock of knowledge, primary concept, and relevant information to the proposed research. These knowledge, concept, and information give a guideline in designing and conducting a research successfully. It is essential for reviewing as it gives proper instruction in designing future research programs and validating the new findings. In the present section, relevant studies about socio-demographic features of coastal farmers, crop production, technology adaption, agronomic practices, profitability analysis, and the post-harvest loss of different crops are given which were conducted in home and abroad in the recent past.

### 2.1 Socio-demographic features of farmers

Uddin and Nasrin (2013) carried out a study on farming practices and livelihood of the coastal people of Bangladesh. They found that the average land holding of small and medium farmers in Bagerhat district was 0.89 and 1.74 ha respectively which was slightly higher than Khulna and Satkhira district. The large category farmers in Khulna had a higher average land holding (3.97 ha) comparative to Satkhira and Bagerhat district. Farmers cultivate both local and HYV Aman rice in *Kharif-II* season and grow vegetables in *Kharif-I* and *Rabi* season. In Khulna, mainly tomato and brinjal are grown in homestead areas, whereas tomato, bean, and pumpkin are grown in Bagerhat district. Brinjal, cabbage, and cucumber represent the main homestead vegetables in Satkhira. On an average, farmers' income of this three districts was increased to some extent that enhanced the overall socioeconomic condition and livelihood status of coastal farmers.

Das et al. (2014) in their study of socio-economic condition of the fish and prawn *Gher* farmers at Dakatia *Beel* in Khulna, Bangladesh found that 21-40 age group made maximum strength and the majority of them were Muslims (58%). They also found that 16% of them could sign and the percentages of school going children were high (86%). The study revealed that 62% of people lived with nuclear families and the highest family size was ranged from 5-7 persons/family. The highest annual household incomes of the people (44%) were Tk.10,000 to Tk.20,000 . About 62% of people lived in *Katcha* house and the construction materials were *Golpata* (leaves of a tree especially grown in the coastal areas) and Mud. About 72% of households used electricity in their houses. More than half of the households (52%) used tube well water for drinking and 56% of them used closed semi-pucca latrines.

A study conducted by Salam and Kamruzzaman (2015) on soybean cultivation in Noakhali and Lakshimpur district of Bangladesh revealed that the average age of the soybean farmers was 47.18 years with minimum and maximum age of 18 years and 80 years respectively. Majority of the soybean farmers had primary and secondary levels of education and few of them were adopted non-institutional education. The length of experience in crop farming is also an important factor that influences farmers' level of adoption for new technologies. The average length of experience of soybean farmers was 5.08 years. On an average, 42.50% of the soybean farmers received training on the improved technique of soybean production from the Department of Agricultural Extension (DAE) and Bangladesh Agricultural Research Institute (BARI). In the study areas, average farm size per household was estimated at 1.30 ha. However, the average yearly household income was Tk. 1,66,679 of which 13.81% (Tk. 23025) received from soybean production in all areas.

Dipu et al. (2017) found in their study on dairy farmers of Chittagong Metro area found that the age group of '35 years or less' has been found dominant in Patiya (53.3%), Raojan (50.0%), and Sitakundu (42.8%) and the age group of '36 to 50 years' has been major in Boalkhali (50%). In Hathazari, 93.4% of farmers were above 36 years of age. In addition, majority of the farmers (62.7%) of the study area have farming

experience of more than 15 years with an exception in Sitakundu and Boalkhali. The study also revealed that majority of the farm families are not dependent on agricultural and or farming income.

Mandal et al. (2015) carried out a study on problem confrontation in sunflower cultivation by the farmers of Nazirpur in Pirojpur district. The study found that majority of the respondent farmers were from a middle-age cluster of people having not more than primary level of education. The younger people tend to be connected with the diversified sources of income beside agriculture. On the contrary, the older people normally do not carry out any significant farming activities. In addition, the higher educated people have less inclination to farming activities. However, the farmers had a high extent of farming experience that is enough to learn farming activities properly. The average of land holdings of the farmers was suitable to continue small- to medium-scale sunflower cultivation. Their household income still seems to be inadequate for their least possible comfortable livelihoods.

A study conducted on farmer communities in Barisal district of Bangladesh revealed that the mean age of the sampled farmers was 48.67 years with a standard deviation of 14.28 and a range of 15 to 71 years. The highest proportion (60.94%) of the respondents was under the age of 40 years. The male participants (92.71%) dominated the sample. Again, the majority of the farmers were predominantly married (74%) and Muslims (80.73%). Education is an influential factor affecting farmers' climate change coping and adaptation strategies. In the sample, approximately half of the farmers have no formal education. Of 384 farmers who participated in the present study, 79.43% have less than 3 acres of land, while 32.03% of them have access to microcredit from two NGOs namely ASA and BRAC. The income distribution of the farmers shows that more than half of the respondents (55.73%) earn more than Tk. 8,000 per month (Huda et al., 2016).

Hasan et al. (2016) discussed in their study on the economic analysis of small-scale dairy buffalo enterprise in Bhola district of Bangladesh that the highest number of farm owner's age was between 30 and 45 years. Again, the age of 42.85% and 37.14% of the respondents was between 30-45 years and 20% respondent's age was below 30 years. Majority of buffalo farm owners reported to be comparatively literate primary to higher secondary level was 11.42%, higher secondary was 42.85%, and graduate and above was 45.71%. Almost 42.85% of the farm owner's yearly average income was above Tk. 10 lakh, 37.14% was in between Tk. 5-10 lakh, and 14.20% was below Tk. 5 lakh.

A case study on better farming practices for resilient livelihoods in saline and flood-prone Bangladesh conducted by Solidarities International asserted that the farmers of Satkhira district generally cultivate Aman rice in *Kharif-2* season and in the rest of the year they either keep their land fallow due to salinity problems or they cultivate fish and/or vegetables. The average land holding of the households ranged from 33 to 50 decimals (less than 0.2 hectares). This is insufficient for many farmers, who lease other lands to extend their cultivation capabilities (Solidarities International, 2017).

Hasan et al. (2019) carried out a study at Tiakhali and Lalua unions under Kalapara Upazila in Patuakhali district of Bangladesh to explore the climate change impacts and its adaptation through agroforestry. They explored that the age of the respondents ranged from 24 to 65 years with an average being 38.94 year. The data further revealed that the highest portions (48%) of the respondents were middle-aged compared to 27% young and 25% old. The highest part (52%) of the respondents possessed medium size family, 27% small, and 21% possessed large family. Maximum farmers (45%) had primary level education and 2% of farmers had secondary level education, and 19% had other levels. In the study area, 38% of the farmers had small farm compared to 27% medium, 20% marginal, 13% had no land, and only 2% had a large farm. More than half (52%) of the farmers had medium sized annual income, while 38% had low to very low income, and 11% had high to very high level of annual income in the study areas.

Mondal et al. (2020) conducted a study on the determinants of farmer's level crop productivity at Dumki Upazila under Patuakhali district. The study revealed that most of the farmers (87.27%) belonged to middle age to old age categories. A high proportion of the farmers (44.55%) had primary level of education. Among the farmers, 65.45% had medium farming experience. The majority of farmers (65.45%) had short training

experience. Among farmers 65.45% had small and 32.73% had medium farm size. Besides, majority of the farmers 56.36% belonged to low credit received.

Azad et al. (2021) analyzed the livelihood status of the people mostly dependent on Sundarbans at Shymnagar Upazila of Satkhira district, Bangladesh. The study revealed that most of the respondents (65%) were middle-aged (30-50 years old), followed by about 25% old-aged (above 50 years), and only 10% (below 30 years) were young. Both male and female respondents used to lead their family and 78% male and 22% female were the earning members of their family. About 50% of respondents were illiterate, where 24% of respondents had primary education and 26% of respondents had secondary education. About 43% of respondents had 4-5 members and 25% of respondents had 5-6 members.

Quddus and Kropp (2020) assessed the constraints to agricultural production and marketing in the lagging regions of Bangladesh. The study revealed that out of the 1257 persons interviewed who were responsible for their household's agricultural decisions, 1203 (96%) were male. Approximately, 24% of the respondents were older than 55 years of age, about 25% of respondents were between 46–55 years of age, 23% were between the ages of 36–45, approximately 20% belonged to 25–35 age group, and only 5% of respondent farmers were younger than 25 years of age. About 56% of sampled farmers had landholdings categorized as small (1–2.49 acres), 21% were categorized as medium (2.5–7.49 acres), 19% as marginal (0.20–0.99 acres), 2% as large (7.5 acres or more), and approximately 2% were landless or tenants (below 0.2 acres). About 45% of landless farmers and 46% of marginal farmers were illiterate, while only 23% and 19% of the medium and large farmers, respectively, were illiterate.

## **2.2 Crop Production and Technology Adaption in Project Catchment Areas**

Mottaleb (2018) conducted a study on the perception and adoption of new agricultural technologies: evidence from a developing country. The researcher discussed in the article that the adoption of new agricultural technologies is always at the center of policy interest in developing countries. In reality, despite the visible benefits of many of the new agricultural technologies, including machinery and management practices, farmers either do not adopt them or it takes a long time to begin the adoption process and scaling up. The present study also demonstrated that the new technology must be modified to adapt to local demand and specifications. Most importantly, the price of the new technology must be competitive with the prices of the existing available substitute technologies to ensure a rapid uptake and scaling up of this new agricultural technology.

Shahidullah et al. (2006) conducted a study in greater Noakhali district to investigate the major cropping patterns during 2000-2001. The study found that the most dominant cropping pattern, single T. Aman alone occupied 35% of land to the net-cropped area. The next three cropping patterns such as Boro–Fallow–T. Aman, Fallow–B. Aus–T. Aman, and single Boro represented 14, 11, and 11%, respectively of the net-cropped area. The lion share of net-cropped area in Feni, Chhagalnaiya, Parshuram, and Raipur is covered by Boro–Fallow–T. Aman pattern. Begumganj and Chatkhil are an exception. More than 80% of the cropped area is in these two Upazilas is characterized by single Boro cropping pattern. The average cropping intensity of the greater Noakhali district is 163%. The highest cropping intensity is 194% in Ramganj and the lowest 115% in Begumganj. The study concluded that the farmers need improved varieties of Aus, T. Aman, and minor Rabi crops.

Islam et al. (2013) analyzed the adoption of BARI mung varieties and its constraints to higher production in southern region of Bangladesh. The study revealed that farmers followed the recommended practices that were very encouraging. All the farmers adopted improved mungben varieties of which 51% farmers adopted BARI Mung-5 variety. The level of adoption of seed rate, use of urea, and MoP was found to be high. The level of adoption of agronomic practices like ploughing, sowing time, weeding, and insecticides use were also found to be high. Respondent farmers were mostly influenced by DAE personnel and neighboring farmers in adopting improved mungbean technology.

Uddin et al. (2018) conducted a study in Chittagong district to find out the adoption status of BARI mango varieties. Results revealed that out of 11 varieties of BARI mango, the highest 77% farmers adopted BARI Aam-3 followed by BARI Aam- 4 (22.1%), and BARI Aam-8 (15.9%). The rate of adoption of individual production technology of BARI mango varieties was found unsatisfactory. Majority of the farmers did not adopt recommended practices as stated by BARI. About 67.7% farmers adopted the improved practice such as breaking inflorescence of mango trees and 65.0% of farmers used mulching. The majority (52%) of farmers did not receive training and practice pruning for mango trees.

A survey-work was implemented over all the Upazilas of Barisal region during 2016 (Ibrahim et al., 2017). A pre-tested semi-structured questionnaire was used as tool to document the existing cropping patterns, cropping intensity, and the crop diversity of the area. In the current investigation, a total of 103 different cropping patterns were identified. The highest number of cropping patterns (40 nos.) was found in Burhanuddin Upazila of Bhola district and the lowest number (08 nos.) was in Betagi and Taltali Upazilas of Barguna district. The most dominant cropping pattern (single T. Aman) occupied 13.40% of net cropped area (NCA) of the region with its distribution over 33 Upazilas out of 42. The second largest area, 10.44% of NCA, was covered by Boro-Fallow-T. Aman pattern, which was spread out over 32 Upazilas. The lowest crop diversity index (CDI) was recorded 0.221 in Agailjhara of Barisal district followed by 0.598 in Bhandaria of Pirojpur. The highest value of CDI was observed 0.972 in Charfasson followed by 0.968 in Tazumuddin of Bhola district.

Shahidullah et al. (2017) assessed the diversity of cropping systems in Chittagong region. The study found that the most dominant cropping pattern (Boro-Fallow-T. Aman) occupied about 23% of net cropped area (NCA) of the region with its distribution over 38 Upazilas out 42. The second largest area, 19% of NCA, was covered by single T. Aman, which was spread out over 32 Upazilas. A total of 93 cropping patterns were identified in the whole region under the present investigation. The highest number of cropping patterns was 28 in Naokhali Sadar and the lowest was four in Begumganj of the same district. The lowest crop diversity index (CDI) was observed 0.135 in Chatkhil followed by 0.269 in Begumganj. The highest value of CDI was observed in Banskhali, Chittagong, and Noakhali Sadar (around 0.95). The values of cropping intensity were ranged from 103 to 283% in the study areas.

Rashid et al. (2017) analyzed cropping systems and their diversity in Khulna region. The study found that Single T. Aman cropping pattern was the most dominant cropping pattern in Khulna region existed in 17 out of 25 Upazilas. Boro-Fallow-T. Aman cropping pattern ranked the second position distributed almost in all Upazilas. Boro-Fish was the third cropping pattern in the region distributed to 17 Upazilas with the major share in Chitalmari, Dumuria, Rupsha, Tala, Kalaroa, Mollahat, Terokhada, Bagerhatsadar, Fakirhat, Rampal, and Phultala Upazilas. Single Boro rice was reported as the fourth cropping pattern covered 18 Upazilas with the higher share in waterlogged area of Dumuria, Mollahat, Tala, Bagerhatsadar, Fakirhat, and Rampal.

Rashid et al. (2019) conducted a study to analyze the adoption of improved production practices in low land rice through community training in south-western Bangladesh. The community training was suited to adopt rice production technologies. The adoption of different rice production technologies was greater by the adopters of Satkhira district compared to Khulna that resulted in significant rice yield difference. The constraints against the adoption of the selected rice production technologies show that a portion of adopters was not convinced to adopt row transplanting, skipped row planting and birds perch for controlling insects, use of appropriate K and S fertilizers due to the requirement of higher labour and fertilizer and the risk of reduction of rice yield.

Farming practices and the livelihood status of non-saline and saline households in southern Bangladesh was assessed in a study conducted by Uddin et al. (2019). The study found that majority of the farmers in non-saline and saline areas followed the cropping pattern of Fallow-Aman rice-Pulses and Fallow-Aman rice – Fallow, respectively. The cropping intensity was higher in non-saline areas (220.0%) compared to saline areas (101.7%). The profitability of major crops was much higher in non-saline areas compared to saline

areas. Based on the poverty indicators, the proportion of deprived households was 41.7 and 56.0% in non-saline and saline areas, respectively.

Saha et al. (2019) conducted a study to find out the factors affecting the adoption of climate-smart agricultural practices by the coastal farmers in Bangladesh. It revealed that farmers mainly performed 15 CSA (Climate Smart Agriculture) practices to cope with the effects of climate change, such as salinity, floods, cyclones, storm surge, and droughts. The practices are saline tolerant varieties, submergence-tolerant varieties, drought resistant varieties, an early variety of rice, Sorjan method, pond side vegetable cultivation, watermelon cultivation, sunflower cultivation, plum cultivation, relay cropping, urea deep placement, organic fertilizer, mulching, rainwater harvesting, and seed storage in plastic bags.

Islam (2012) conducted a study on crop diversification in cyclone Sidr affected southern Bangladesh. The study revealed that the introduction of short-duration improved crop varieties was facilitated due to increase irrigation facilities, introducing mechanization in agriculture, and improving marketing and transportation facilities in the area. The study also revealed that the diffusing rate of high yielding crop varieties is slow due to inappropriate knowledge of the farmers on the entire packages of improved production practices, and unavailability of seeds and seed storage facilities. Credit and marketing facilities are limited to promote high value new crops in the areas. Poor water management system in the polder area is also a serious problem to diffuse high yielding crop varieties.

Mainuddin et al. (2011) investigated the planning and costing of agricultural adaptation to climate change in the salinity-prone cropping system of Bangladesh. The study concluded that various stakeholders in Bangladesh are aware of climate change and its adverse impacts on agricultural production, and are therefore currently trying to embed adaptation into policy and long-term planning documents. The study also indicates that extension workers are active in promoting technological advances for adaptive practices. Research agencies in Bangladesh are also up to date and in the process of developing methods and varieties for climate change adaptation. Many of the existing adaptive varieties and farming techniques were developed by local research agencies.

Happy et al. (2019) assessed the impact of remittance on agricultural technology adoption in Lakshmipur district of Bangladesh. The estimates of the logit model show that the amount of remittance, active males in the household, the level of education of the expatriate, farm size and extension contact have positive impact; and age of the household head and annual household revenue have negative impact on the adoption of agricultural technology.

Islam et al. (2020) assessed the impact of climate change induced disaster on crops and fisheries production at Bhola Sadar and Monpura Upazila of Bhola district. It was evident that T. Aus, T. Aman, Boro, and Mungbean was dominant cropping pattern in Kharif-I, Kharif-II, and Rabi season in Bhola district. Overall, Aus rice production in Kharif-I season increased, but in 2009, 2013 production was decreased because of cyclone Aila (2009) and Cyclone Mahasen (2013). T. Aman production hampered due to Cyclone Sidr (2007) and flood (2014) in Kharif-II season. In Rabi season, Boro rice production lessen because of low rainfall and salinity intrusion. Overall, Mungbean production increase but in 2008 and 2009 production become hampered due to late cultivation because of Cyclone Sidr (2007).

Hasnat et al. (2016) explored the impacts of climate changes on agriculture and changing adaptive strategies in the coastal area of Lakshmipur district in Bangladesh. The results revealed that about 53% of respondents experienced severe intensity of major climate change induced disasters. Furthermore, 9% of respondents experienced little bit severity. Agricultural crops cultivation is changing from previous time due to the climate changing events and decreasing crop production due to their damaging effects. Almost 40% of respondents in the study area were not familiar with coping strategy in response to climate change. They tried to adjust and cope with cultivation of short-duration crops, introducing new variety, and making embankment.

Paul et al. (2016) evaluated the potential for cropping system intensification and diversification with improved varieties and crop management technologies. It may be observed from the results that the productivity of the common cropping pattern (T. Aman-Boro-Fallow) can be increased by 2 to 3 folds through the adoption of high yielding T. Aman rice followed by high yielding non-rice crops such as mustard, potato, wheat, and jute. Based on the benefit cost ratio (BCR), the most profitable cropping pattern is T. Aman-Mustard-Jute, whereas among the four cropping patterns, the highest gross margin (Tk. 87047/ha) was obtained from *T. Aman-Potato-Jute* pattern followed by Tk. 63617/ha from *T. Aman-Mustard-Jute*, Tk. 56142/ha from *T. Aman-wheat-Jute*, and Tk. 38774/ha from *T. Aman-Boro-Fallow* pattern,...

Haque (2006) addressed the salinity problems and crop production in the coastal regions of Bangladesh. The study concluded that the dominant crop grown in the saline areas is local transplanted Aman rice with low yield. The cropping patterns followed in the coastal areas are mainly *Fallow-Fallow-T. Aman* rice. Salinity problem received very little attention in the past. It has become imperative to explore the possibilities of increasing the potential of these (saline) lands for increasing the production of crops.

Mohammad and Malek (2017) conducted a study to demonstrate location specific approach for agricultural technology promotion and adoption in improving the livelihood of the small farmers in the *Haor* basin and the coastal belt of Bangladesh. The study addressed village-level extension farmers, sub-district extension officers, and farmers' cooperative are the unique and central features to the business models and forward linkages. Extension service, power tiller, low-lift pump, sunflower, shallow tube well, quality seed, forward linkage for farmed duck eggs, live ducks, and open catch fish, etc. are the suggested potential technology innovations for the small farmers.

### **2.3 Costs and Returns of Selected HVCs**

Sujan et al. (2017) examined the profitability and resource use efficiency of potato cultivation in Munshigonj district of Bangladesh. The benefit-cost ratio was found to be 1.51 and 1.74 on full cost and variable cost basis, respectively. The key production factors, i.e. human labour, land preparation, seed, fertilizer, insecticides, and irrigations had a significant effect on the gross return of potato. Chowdhury and Chowdhury (2015) concluded in their study that in the context of production and export potato has a great prospect in Bangladesh. It brought out problems faced by the potato farmers viz. the lower price of potato during harvesting period, price fluctuation, shortage of capital, high charge of cold storage, lack of good quality seed, perishability of potato, poor storage facility, higher price of inputs, and lack of marketing facility, etc. Proper steps should be postulated by the Government to puzzle out these problems. Another study conducted by Alamgir et al. (2020) also found potato as one of the major profitable crops in the northeastern part of Bangladesh.

Somajpoti et al. (2016) examined the profitability of cauliflower and cabbage production in selected areas of Sylhet district. The major findings of this study revealed that the productions of the selected homestead vegetables were profitable. The per acre gross cost of production of cauliflower and cabbage were Tk. 93861 and Tk. 92136, respectively, and the corresponding gross returns were Tk. 229407 and Tk. 230800, respectively. The per acre net returns of producing cauliflower and cabbage were Tk. 135547 and Tk. 138664, respectively. The benefit cost ratios of cauliflower and cabbage production per acre were 2.44 and 2.50, respectively. They earned the highest profit from cabbage production. Another study done by Hasan et al. (2003) indicated that cabbage cultivation is more profitable in pre-rabi period and least profitable in the late-rabi period. The BCR was the highest for pre-rabi period in both variable cost and total cost basis. A study on cauliflower cultivation also revealed that the cauliflower cultivation is profitable in Jamalpur district and BCR was found to be 2.44.

Khatun et al. (2017) conducted a study on pumpkin cultivation to find out its' profitability and export potentialities. The study revealed that net returns were positive for pumpkin cultivation. Bangladesh had a comparative advantage for producing pumpkin as the estimate of domestic resource cost (DRC) was less than one.

Ayalew et al. (2018) analyzed the cost and return of soybean production under smallholder farmers in Ethiopia. The results of descriptive analysis indicated that both male and female labor were used in soybean production and the contribution of female farmers was lower than male but more during weeding the crop. The benefit cost ratio of 1.46 indicated that soybean production is a profitable business and it could be enhanced and more attractive through promoting improved technology packages that increase soybean yield and reduce price volatility like market information system and group marketing.

Sarkar et al. (2020) made an economic study of the mustard variety Binasarisha-4 production in some selected areas of Bangladesh. The study found that Binasarisha-4 production is profitable. The average net return per hectare was Tk. 29113. The net return was highest in Magura (Tk. 33060/ha) followed by Kushtia (Tk. 32195/ha), Jashore (Tk. 28227/ha), and Faridpur (Tk. 22971/ha) respectively. The benefit-cost ratio was 1.71 and 2.65 on full cost and cash cost basis, respectively. The major constraints of mustard cultivation were inadequate supply of quality seeds, higher price of fertilizers & insecticides, lack of training, lack of technical know-how, natural calamities, higher charge of irrigation, and infestation of insects.

Islam et al. (2011) conducted economic analysis in two coastal mungbean growing districts Noakhali and Patuakhali. The study revealed that mungbean production was profitable at the farm-level. The benefit cost ratio (BCR) was 2.22 on full cost basis. Besides, farmers in the study areas mentioned higher prices of fertilizers & insecticides, and severe attack of insects as the problems of mungbean production at the farm level. Islam et al. (2008) estimated the profitability and resource use efficiency of mungbean cultivation in Barisal and Jhalokati districts. It revealed that mungbean production is profitable to the farmers. The productivity of mungbean at the farm level was 928 kg/ha, which was higher than the national average of 680 kg/ha. Mungbean farmers received Tk. 24236 as gross margin per hectare. The net benefit received per kilogram of mungbean was Tk. 26.45. The benefit-cost ratios were estimated at 2.53 and 3.56 on variable and cash cost basis, respectively.

Karim et al. (2009) investigated the profitability of summer BARI hybrid tomato cultivation in Jessore district of Bangladesh. The study revealed that 42% and 21% of total variable cost was incurred for tunnel preparation and using human labour, respectively. The average yield of BARI hybrid tomato was found to be 32.78 t/ha. The average return per hectare over variable cost was Tk. 11,44,387 on full cost basis and Tk. 12,07,481 on cash cost basis. On an average, the benefit-cost ratio was found to be 4.19 on full cost basis and 5.09 on cash cost basis. The cost and return per kilogram of hybrid tomato cultivation was Tk 10.94 and Tk. 45.83 respectively. Another study conducted by Rahman and Al Zabir (2018) on the economics of tomato production in Moulvibazar district of Bangladesh. The study found that tomato cultivation was a profitable business in the study area. The per hectare production was 42.68 ton. The average gross cost for tomato production was Tk. 2,80,004/ha. The per hectare gross return of small, medium, and large farm was Tk. 5,62,172/ha, Tk. 5,57,908/ha, and Tk. 5,44,674/ha, respectively. The overall benefit-cost ratio (undiscounted) was 1.98. The benefit-cost ratio of the small, medium, and large farm were 2.09, 1.99, and 1.87, respectively, which indicates that tomato production by small farm was more profitable than the other categories of farmers.

#### **2.4 Post-harvest Processing and Farm Level Marketing of Selected HVCs**

Hossain and Miah (2011) assessed the post-harvest losses of potato in six major potato growing districts of Bangladesh. It was evident from the study that the average harvesting loss was found to be 5.65%. Home storage loss for three months storage period was 7.35%. Average loss in cold storage during nine months storage period was 3.82%. The study also revealed that the average losses at the trader's level for home and cold stored potatoes were 11.95% and 9.61% respectively.

Khatun and Rahman (2018) quantified the post-harvest losses of tomato in some selected areas of Bangladesh. They measured both the quantitative and qualitative postharvest losses of tomato. The farm level postharvest loss of tomato was 12.5% of which 8.9% was due to full damage and the rest 3.6% was due to the partial damage of tomato. Rotten due to physical damage and disease followed by insect

infestation were the major causes of postharvest loss in the survey areas. Due to postharvest losses, farmers have to incur the financial loss of Tk. 152.5 per decimal of tomato cultivation.

Talukder et al. (2003) in their study on the prepackaging, storage losses, and physiological changes of fresh cauliflower as influenced by post-harvest treatments found that storage in perforated polythene bag prolonged the shelf life and helped maintaining the highest physical appearance, acceptability, and economic return of cauliflower. Considering the weight loss and economic return, the wet gunny bag treatment was also found to be acceptable.

Amin et al. (2020) conducted a baseline survey on postharvest handling of selected vegetables at different locations of Bangladesh. The study revealed that vegetable washing is generally practiced by farmers and *Paikers*, and it varied from location to location. The sorting and grading of vegetables were done by either farmers or *Beparis/Paikers*. In all locations, red amaranth and root crops (carrot and radish) were washed by farmers to get a better price. Both farmers and traders used bamboo basket, plastic crate, plastic bag, and jute sack for packaging of selected vegetables. The washing and grading of vegetables was a profitable practice for the farmers.

Hasan et al. (2010) conducted an extensive survey to collect information on the existing pre- and post-harvest practices for the selected fruits and vegetables, assess post-harvest losses (quantitative and nutritional) at the different stages of supply chain. Results revealed that post-harvest operations like sorting, grading, and packaging were hardly used to ensure product quality. Only for some high-value crops like mango and tomato, plastic crates were introduced for long distance transport. Age-old traditional transportation systems like open truck was found to be the principal means for long-distance transportation. The most striking finding was that the post-harvest loss of fruits and vegetables ranged from 23.6 to 43.5%. The total loss was highest in jackfruit followed by pineapple (43.0%), papaya (39.9%), and cauliflower (27.1%). The monetary loss as calculated from the post-harvest quantitative loss of selected fruits and vegetables was enormous. The total annual monetary loss of the selected fruits and vegetables was estimated at Tk.3442 crore based on retail price.

Khatoon et al. (2015) explored post-harvest perishable vegetables loss in Bangladesh. The study concluded that the perishable vegetable loss occurred due to diverse but interlinked reasons that included different stakeholders and varied based on geographical locations. Even though vegetables loss at every point of the supply chain, the perceived value of cold storage solution was conversely found to be low. The stakeholder relationships were found to be a factor that requires due consideration prior to any sort of intervention and farmers were identified as a particularly disadvantaged and vulnerable stakeholder group. In this situation, the potential of utilizing cold storage facilities at the farmer or at the *Arathdar* level was nonetheless found to be a viable solution.

Khatun and Rahman (2019) quantified the post-harvest loss of brinjal in Jamalpur and Rangpur district of Bangladesh. Total post-harvest loss was quantified by evaluating the quantitative and qualitative losses of brinjal. Farmers were found well acquainted with a range of post-harvest practices such as the definite point and stage of brinjal harvesting, sorting, grading, and packaging. Morning was the most preferred time for harvesting and selling of brinjal in the survey areas. Distance selling and motor driving van for local selling were used by 25% and 23% of the respondents. Physical damage and physical appearance were the two basic criteria for grading of brinjal at the farm level. Among the problems, the absence of storage and lower prices of brinjal scored the highest PFI 208 and 181, respectively from the possible range of 0 to 216. The farm level post-harvest loss of brinjal was estimated at 13.90% of total production, where full damages accounts for 9.16% alone.

Hoq et al. (2012) conducted a study on value addition in vegetables production, processing, and export from Bangladesh. The study revealed that the average estimated marketing costs incurred by suppliers were Tk.2906 per ton. The value addition by suppliers was Tk.3094 per ton. The average estimated marketing cost incurred by different exporters for UK, Saudi Arabia, Kuwait, and Qatar were Tk.1,69,442, Tk.98,429, Tk.1,03,499, and Tk.85,324 per ton, respectively. The value addition by different exporters for UK, Saudi

Arabia, Kuwait, and Qatar were Tk.55,778, Tk.16,661, Tk.16,902, and Tk. 23,754 per ton respectively. Among all the cost items, airfreight charge was the highest.

Talukder and Amin (2011) identified problems relating to trade, marketing margins, and the maintenance of quality and safety standards in fresh agriculture produce in urban wholesale markets. The study confirms that the supply of produce from the northwest Bangladesh to Dhaka usually involves middlemen between producers and final consumers, and entails three successive stages of delivery from farm to local primary market, from primary market to urban whole sale market, and from wholesale market to the retail market. Alongside, an emerging retailing sector (supermarkets) is gaining popularity among the rich and upper-middle income consumers in big cities. Inadequacies in handling, transportation, and storage facilities for fresh produce are noted to be the prime cause of quantity loss and degradation of quality resulting in poor shelf life. Significant informal transactions influence the prices across the market chain.

Sabur et al. (2006) estimated the costs and margins and seasonal price variation of onion. The study revealed that the higher marketing cost was incurred by *Beparis* and the lowest by *Arathdars*. On the other hand, retailers earned the highest net marketing margins. Farmer's net share of onion in lean period was higher than that in peak period. The seasonal price variation of onion was the highest in Rajshahi and the lowest in Dhaka market. Price was the lowest in March-April and the highest in November. Rahman and Neena (2018) conducted a study on the marketing system of agricultural products in Bangladesh. It was found that the net marketing margin was the highest in the case of the retailer and the lowest in the case of *Arathdar*. But, return on operating capital was the highest for the *Arathdar* because they did not need to purchase the product they handle. The farmers identified the high price of seed as the topmost constraint in production and marketing systems. The re-structuring of Market Management System and updating regulatory and institutional set up were the recommendations of this study for proper functioning of the market system.

# CHAPTER III

## METHODOLOGY

### 3.1 Prelude

Methodology is a crucial part of any research. The appropriate methodology is prerequisite for conducting a proper scientific research. The researcher gave a careful consideration to design a scientific and logical methodology of the research. Proper methodology is determined by the nature, aims, and objectives of the study. It also depends on the availability of necessary funds, materials, and time. There are various methods for collecting data for research study. The selection of a particular method depends on much consideration such as, nature and scope of the study, availability of funds and times, availability of literature and primary information, etc. The methodology of the present baseline study is mainly based on the following tools.

- a) Face to face interview with a structured questionnaire
- b) Focus Group Discussion (FGD)
- c) Key Informant Interview (KII)
- d) Advance farmers interview with open and close ended questions
- e) Informal discussion with project implementation members such as coordinator of BARI part, officials from SACP project, FAO, DAE, DAM and BADC.
- f) Frequent field visits, and
- g) Review of literature

### 3.2 Baseline Indicators of the Baseline Survey

Basically, a baseline survey conducts right before a project kicks off, and it helps the researcher to gather information about the state of different variables in the systematic investigation. In order to understand the status quo and identify the priority areas of research, the present study made a list of baseline indicators on which the further data collection based on. The study tools used to collect information were finalized based on these baseline indicators. The following Table 3.1 shows the listed baseline indicators for the study.

Table 3.1: Baseline indicators of the baseline study of SACP project (BARI part)

Specific objectives	Indicative items	Indicators
<p>(i) To know the present status of production, processing, and marketing of selected crops at the farm level.</p> <p>(ii) To document some baseline data and information for assessing the impacts of BARI technology adoption on farmers' income and livelihood.</p> <p>(iii) To explore the constraints and opportunities of producing demand-led HVCs production, processing, and marketing under changing climate condition.</p>	Socioeconomic features	<ul style="list-style-type: none"> <li>• Identification of the respondents e.g. name, group name, village, union, upazila, district, division, etc.</li> <li>• Age, ethnicity, gender, educational attainment, occupational status, family size, means of housing, status of kitchen and kitchen fuel, modern amenities, electricity facilities</li> <li>• Farming experience, agricultural training received, farm size, land ownership pattern, livestock owned, status of tools and machinery, saleable commercial trees</li> <li>• Sources of drinking water, sanitation facilities, health status</li> <li>• Income and sources of income</li> </ul>
	Status of HVCs production and technology adoption	<ul style="list-style-type: none"> <li>• Intensity of cropping</li> <li>• Available HVCs</li> <li>• HVCs production technologies</li> <li>• Sources of HVC seed</li> <li>• Available BARI varieties and crop production technologies</li> <li>• Influencing factor of using BARI released crop production technologies</li> <li>• Cropping pattern</li> <li>• Tilling, sowing, harvesting, threshing and drying system of HVC</li> </ul>
	Cost and return of selected HVCs	<ul style="list-style-type: none"> <li>• Variable cost items of HVCs</li> <li>• Fixed cost items of HVCs</li> <li>• Productivity of HVCs</li> <li>• Gross return, gross margin, net return of HVCs</li> <li>• BCR of HVCs</li> <li>• Cost of production (Tk./Kg) of HVCs</li> <li>• Problems of HVCs cultivation</li> </ul>
	Post-harvest processing and farm-level marketing of selected HVCs	<ul style="list-style-type: none"> <li>• Post-harvest functions of HVCs farmers</li> <li>• Farm level keeping system of HVCs</li> <li>• Selling places of HVCs by the farmers</li> <li>• Types of market functionaries</li> <li>• Types of vehicle used to transport HVCs</li> <li>• Post-harvest loss of selected HVCs</li> <li>• Causes of post-harvest loss</li> <li>• Sources of market related information</li> </ul>

### 3.3 Design of the Baseline Survey

#### 3.3.1 Quantitative analysis

Two types of analysis – (i) quantitative and (ii) qualitative were taken under consideration in fulfilling the objectives of the baseline study. Quantitative analysis is based on data collected from a random sampling. The present study designed such as random sampling where a representativeness of different beneficiary groups of SACP project catchment area was ensured. Sample includes male and female farmers, entrepreneurs at different level. The population from where sampling done was from 20 Upazilas of 11 districts of SACP project areas. Appropriate statistical formula was used to determine a representative sampling unit. Both primary and secondary sources of information were used to collect the required information. Figure 3.1 shows the steps used to formulate the survey design of the baseline study.

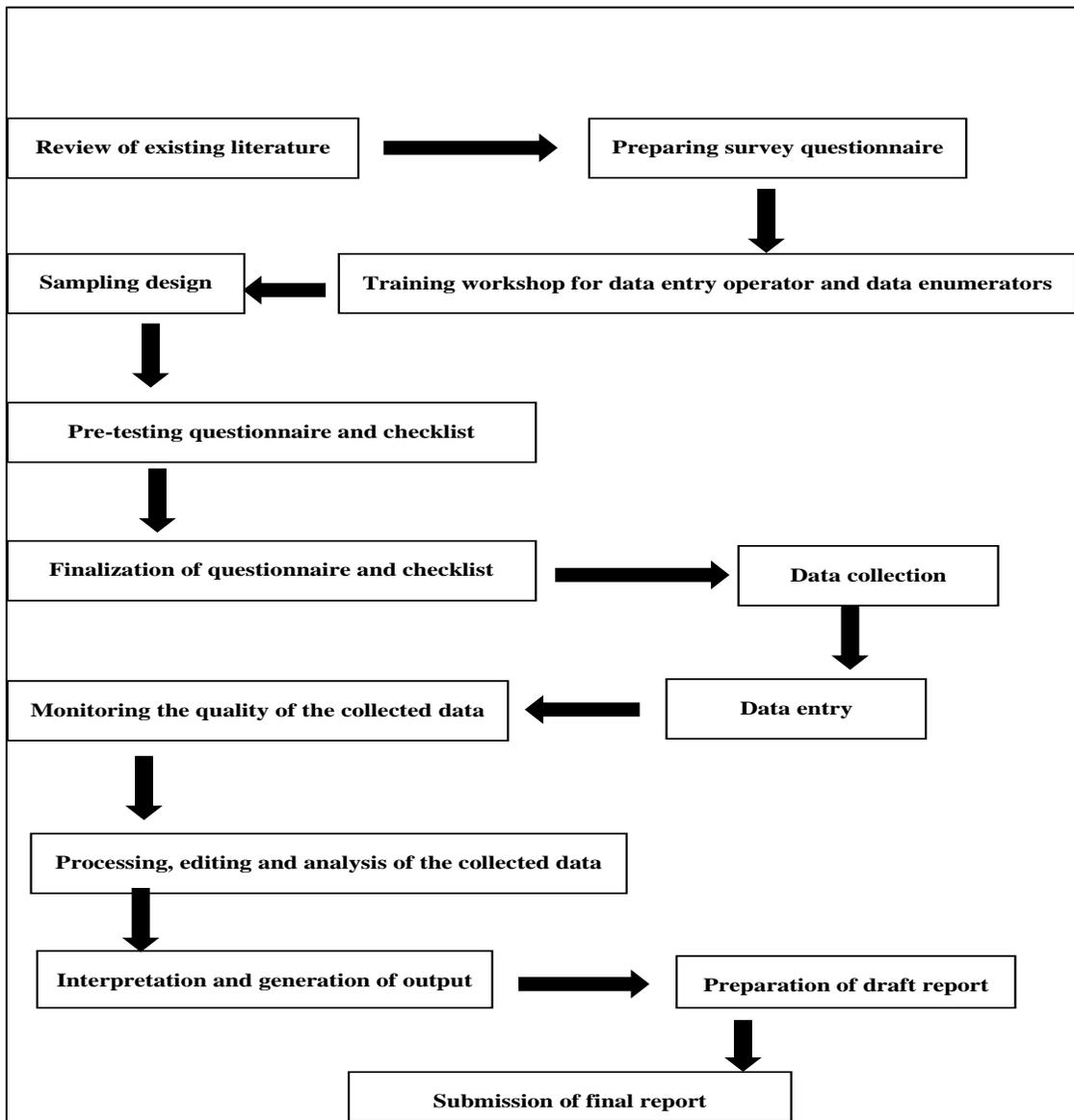


Figure 3.1: Survey design for the baseline study

### 3.3.2 Selection of study area

Selection of the study areas is an important step in conducting any research. According to Yang (1962) “The area in which a business survey is to be carried out depends on the particular purpose of the survey and the possible cooperation from the farmers”. The SACP project includes 30 Upazilas of 11 districts in three divisions of Bangladesh (Table 1). In order to conduct the present baseline survey of BARI part it was not possible for us to take each of the Upazila under consideration. Therefore, the following issues were taken into consideration for selecting the locations.

- (i) budget and time constraints;
- (ii) the existence of BARI developed technologies and varieties;
- (iii) different agricultural ecosystem;
- (iv) accessibility and good transportation system, and
- (v) the high expected co-operation from the respondents

Finally, the survey was conducted in 20 Upazilas of 11 districts in three divisions of Bangladesh. Table 2 enumerates the selected survey Upazilas of the present baseline survey.

Table 3.2: Locations of the baseline survey

Division	District	Upazilla
1. Khulna	1. Bagerhat	1. Fakirhat
		2. Kachua
	2. Satkhira	3. Shyamnagar
		4. Kaliganj
2. Barisal	3. Pirojpur	5. Kawkahlia
	4. Jhalokati	6. Nalchiti
	5. Barguna	7. Amtoli
		8. Taltoli
		9. Bamna
	6. Patuakhali	10. Mirzagonj
		11. Kalapara
	7. Bhola	12. Lalmohon
		13. Charfasson
	3. Chattogram	8. Chattogram
15. Chandanish		
16. Mirsharai		
9. Noakhali		17. Subornochar
		18. Hatia
10. Lakshmipur		19. Kamalnagar
11. Feni		20. Chagolnainya

### 3.3.3 Selection of sample

At the end of the six years of SACP project interventions, a study on the impact of adopting BARI mandated crop production technology on smallholder farmer’s income and livelihoods under this project will be conducted. Before that, a mid-line survey will be conducted aiming to measure the probable changes due to the project’s intervention. Therefore, the beneficiaries of SACP project

were the main respondent farmers of this baseline survey as the impact study will be done on them. At the same time, the existence of BARI developed varieties and crop production technologies were one of the important criteria for finalizing the survey farmers from the selected locations. Besides, a group of control farmers were surveyed and they were more or less similar socio-economic backgrounds and same locations. A multistage stratified random sampling method was followed to select the survey farmers from divisions, districts, Upazillas, unions, villages, DAE demonstration blocks, and the farmers' group of SACP target beneficiaries. Finally, the respondent farmers were selected randomly from the beneficiary group of SACP from the demonstration block of each of the selected Upazillas. For this, firstly each of the 11 project districts was targeted from three administrative divisions. Secondly, the survey was targeted 20 Upazilas out of 30 Upazilas of the whole project. Thirdly, 20 demonstration blocks of the DAE for SACP was identified from the 20 selected Upazilas. Fourthly, 60 beneficiary groups of farmers taking three groups from each of the demonstration blocks were selected from where the final survey farmers were finalized. A list of beneficiaries was prepared with the help of SAAO of each of the selected demonstration block. The final allotted survey farmers were chosen from the given lists using simple random sampling procedure. The farmers of control group were selected purposively from each of the areas of beneficiary group.

### 3.3.4 Sample size determination

In order to calculate the sample size, the present study followed Daniel (1999) statistical formula as follows (equation 1):

$$n = \frac{NPQZ^2}{(N-1)e^2 + Z^2PQ} \times DE \text{ ----- (1)}$$

Where,

n = Sample size

P = Probability of any dichotomous event in the survey area. As there is no information regarding the indicators of SACP project area so the present study used country level poverty data which was 20.5%. However, due to COVID-19 pandemic, the country's poverty rose to 29.5% as of June 2020, which was 20.5% in the last fiscal year.

Q = 1-P = 1-0.205 = 0.795

Z = Standardized normal variate = 1.96 (5% level of significance with 95% confidence interval)

N = Total beneficiary of the SACP project = 250000

e = Marginal error = 0.04 (assumed 4% of this survey)

DE = Design effect = 2.75 (due to five level of strata viz. district, Upazilla, village, demonstration block, and beneficiary group)

Finally, we get the sample size as follows

$$n = 1073.41$$

It was decided to take the round figure of sample size as 1100 from beneficiary farmer. Finally, due to the COVID-19 pandemic situation, the study was able to collect data from 1000 beneficiary farmers.

### 3.3.5 Distribution of farmers

The sample farmers were collected from the villages of SACP project catchment areas. So, after calculating the actual sample size, farmers were identified through five strata viz. district wise selection, Upazila wise

selection, union wise selection, village wise selection, and SACP group wise selection. This distribution of sample farmers has been shown in the following Table.

Table 3.3: Distribution of farmers for the baseline study

Division	District	Upazilla	Union/Village	Sample farmers
Khulna	Bagerhat	Fakirhat	Pilganj, Betaga	34
		Kachua	Khalishkhali, Char Kathalia, ChotoBoga	35
	Satkhira	Shyamnagar	Shankarkathi	35
		Kaliganj	Krishnanagar, Maksudpur, Hogla	35
Barisal	Pirojpur	Kawkahli	PurboAmrajari, Dasher hat, West Magura	52
	Jhalokati	Nalchiti	Dapdapia	52
	Barguna	Amtoli	Gazipur, Ghatakhali	52
		Taltoli	Sodagorpara, Thakurpara, Bati para, Chotobogi	52
		Bamna	Bhai jora, Daotola, Safipur, Uttar Aamtoli	55
	Patuakhali	Mirzagonj	South GhatakerAndua	52
		Kalapara	Maijdanga, Tulatuli, Azimpur, Noyapara,	52
	Bhola	Lalmohon	Dhaoligornagar	52
		Charfasson	Uttar Madraz	52
	Chattogram	Chattogram	Boalkhali	East amuchia, Kanongopara, Dhorla, Karaldanga
Chandanish			Keranirhat	55
Mirsharai			Tinghoriatola, Mehidinagar, Magadhira, Hinguli, Mayani	55
Noakhali		Subornochar	South char klark, Char Majid, Khaserhat	55
		Hatia	Charking, Gamchakhali, Farazipur, East Lakhidia	55
Lakshmipur		Kamalnagar	Char Lawrence, Char Falkan	55
Feni		Chagolnaiya	Kaira, Mondira, Radhanagar, Uttar Satar, Jaichadpur	60
3 divisions	11 districts	20 Upazilas		1000 samples

### **3.3.6 Preparation of survey schedule**

Keeping in view the objectives of the study, a survey schedule was prepared to collect the desired data and information from the respondents. The interview schedule was prepared based on the list of some indicators along with their measurements. Before finalization of the schedule, pre-test was done with some respondents in the three different locations of three divisional project catchment areas. Based on the pre-test made and experience gathered, necessary modification and rearrangements of the questions were made and survey schedule was finally prepared in sample and sequential manner so as to generate desired as well as the accurate information.

### **3.3.7 Period of the study**

The study followed a list of study tools to conduct the study of which face-to-face interview took a lot of time. Beside this, due to COVID 19 pandemic, the survey could not be completed in time. For the present study, data were collected by the researcher himself along with three Scientific Assistants from BARI and one Sub Assistant Agriculture Officer (SAAO) from the respective Upazila agriculture extension office. Data collection started from May, 2020 and it was completed December 2020. Repeated visits and communications were made for collecting necessary data and information. Primary data was supplemented by the secondary data gathered from different publications of BBS, DAE, BADC, BARI, and daily newspapers.

### **3.3.8 Collection of data**

Field-level primary data were collected from the selected respondents through direct interview by the researcher himself. The respondents were interviewed separately. Before starting the interview, each respondent was given a brief introduction about the nature and purpose of the study. The interview was done after taking their consent to give information. Then the questions were asked in a simple manner. The responses were recorded directly on the interview schedule. Usually the respondents do not keep written records of their different activities, so the researcher had to depend on the memory of the respondents. During interview, the researcher asked questions systematically and explained whenever necessary. After the completion of each interview, the interview schedule was re-checked and verified to be sure that answers had been properly recorded. If any information appeared was found to be inconsistent, the respondents were again approached and asked for providing right answer.

## **3.4 Qualitative Analysis**

Two methods of qualitative analysis were applied to gather required information for the present baseline study. The approach of these two methods were described as follows.

### **3.4.1 Focus Group Discussion (FGD)**

A focus group discussion involves gathering people from similar backgrounds or experiences together to discuss a specific topic of interest. It includes questions regarding perceptions, attitudes, beliefs, opinion or ideas. The present study conducted 12 FGDs in three divisional area of SACP project. Each of the FGD comprised of 10 participants. Thus, the total number of respondents of FGDs was 120 participants. These FGDs were conducted to validate the information gathered in the face-to-face interview and add some new information if missed in the face-to-face interview. The participants included in the FGDs were HVC farmers, market functionaries, available processor, service providers, local dealers, agriculture machinery owners, and local entrepreneurs. Male, female, and youth comprised each of the FGDs. Researcher himself led the FGDs and two scientific assistants facilitated the group discussion. A Bangla version structured checklist was used in conducting FGDs. All the FGDs were recorded after taking the permission of group discussants.

### **3.4.2 Key Informant Interview (KII)**

KII is a strong method of analysis, which is qualitative in-depth interviews with people who know what is going on in the community or the objectives of the any research. KII was used in the present baseline study with an aim of collecting information from a wide range of people including community leaders, professionals, residents of the SACP project catchment areas who have first-hand knowledge about the project and the community.

The present study conducted 12 KIIs in 12 Upazilas of SACP project area where the following two common techniques of KII was applied to collect necessary information.

- (i) Telephonic interviews
- (ii) Face-to-face interviews

The following steps were followed to conduct the KIIs

- Gather and review existing data
- Determine what information is needed
- Determine target population and brainstorm about possible key informants
- Choose key informants
- Choose the type of interview
- Develop an interview tool
- Determine documentation method
- Select designated interviewers
- Conduct key informant interviews
- Compile and organize key informant interview data

Each of the KII targeted the following eight groups of respondents

- (i) Farmers
- (ii) Market functionaries
- (iii) Available agro-processors
- (iv) Representative from local government
- (v) NGO personnel from the respective project area
- (vi) Representative from local financial institution
- (vii) Local transportation personnel
- (viii) Entrepreneurs

# CHAPTER IV

## SOCIOECONOMIC FEATURES OF THE SURVEY RESPONDENTS

### 4.1 Prelude

This section used frequencies and percentages to discuss the socioeconomic characteristics of the farmers in project catchment areas. This will enable to know different factors influencing the adoption of different technologies. Besides, the future intervention of the project will be done based on the socioeconomic indicators of the farmers.

### 4.2 Age of the Farmers

Table 4.1 presents the age distribution of the farmers surveyed in the project areas in five different age categories viz. 15-25 years, 26-35 years, 36-45 years, 46-55 years, and above 55 years. The maximum respondents of Khulna (28%) and Chattogram division (25%) were in between 36-45 years age, whereas it was above 55 years of age in Barisal division (26%). A significant portion of the farmers were relatively young (26-35 years) in both the three divisions which were accounted for 26%, 22%, and 23% in Khulna, Barisal, and Chattogram division respectively. Farmers belonged to 15-25 years were less compared to other categories in all the three divisions and these were only 5%, 8%, and 6% in Khulna, Barisal, and Chattogram division respectively. The average picture was different within the districts. For example, the lion share of farmers (31%) in Khulna division were in 26-35 years, while it was 28% in 46-55 years in Satkhira district. At the same time, the age of most farmers of Jhalokati, Patuakhali, and Bhola district under Barisal division was in above 55 years. This picture was similar in the case of Feni of Chattogram division. Besides, the highest proportion of farmers of Lakshmipur, Noakhali, and Chattogram district belonged to the age group of 26-35 years, 36-45 years, and 46-55 years respectively (Table 4.1).

Table 4.1: Age distribution of the respondent farmers in the study areas<sup>1</sup>

Age categories (years)	Percentages of farmer responses (n=1000)														
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram division (n=390)					All Ar
	Sat	Bag	Av	Piroj	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Fen	Cht	Av	
15-25	3	7	5	3	9	6	7	14	8	7	10	4	5	7	6
26-35	31	20	26	37	13	20	21	18	22	26	25	13	18	21	23
36-45	29	26	28	23	19	33	27	12	23	23	31	20	20	24	25
46-55	26	28	27	26	21	24	19	18	22	19	19	25	33	24	24
Above 55	11	19	15	11	38	17	27	38	26	25	15	38	24	26	22

Source: Field survey, 2020

### 4.3 Ethnicity of the Farmers

Ethnicity of the surveyed farmers was identified in the following Table 4.2 where the maximum number of ethnic farmers were found from the Rakhaine community which was 2.6% of the total surveyed farmers. Besides, Chakma and Marma farmers were also found in the Rakhaine community and they were 1.4% and 0.8% of the total surveyed farmers. About 1.1% of the survey farmers belonged to different small ethnic communities in the study areas.

<sup>1</sup>Sat= Satkhira, Bag= Bagerhat, Piroj= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Bho= Bhola, Lak= Lakshmipur, Noa= Noakhali, Cht= Chattogram, Av= Average, and Ar= Area.

Table 4.2: Ethnicity of the surveyed farmers

Types of ethnicity	No. of farmer	% of total surveyed farmers
Rakhaine	26	2.6
Chakma	14	1.4
Marma	8	0.8
Others	11	1.1

#### 4.4 Gender of the Household Head

Table 4.3 shows distribution of surveyed farm families based on their gender. It was evident that out of 1000 farm families 89.3% of them was male headed and the rest 10.7% of them reported that their families were female headed.

Table 4.3: Gender of the household head in the study areas

Gender of the family head	No. of farmer	Percentages of total surveyed farmers
Male	893	89.3
Female	107	10.7
Total	1000	100

#### 4.5 Educational Attainment of the Farmers

The education qualification of the respondent farmers was presented in Table 4.4. To bring the real picture of the educational attainment of the surveyed farmers, it was categorized into seven different ways based on the educational system of Bangladesh. Illiterate persons refer those farmers who are unable to read and write and even cannot give their signature. A significant proportion of farmers were illiterate in the three divisions and this was accounted for 20% of the total farmers. On the other hand, a very small proportion of the surveyed farmers (5%) completed honours or degree or equivalent degree in each of the three divisions. Again, the highest 27% of farmers completed class 6 to class 8 level of education. The educational qualification of the second highest proportion of farmers (24%) was completed the primary level of education (class 1 to 5) in Bangladesh. Farmers completed the secondary (SSC) and higher secondary (HSC) level of educations were 13% and 6% respectively. Within the divisions, the highest proportion of farmers completed class 6 to 8 level of education, which was accounted for 30%, 29%, and 27% of the total farmers in Khulna, Barisal, and Chattogram division respectively. At the same time, the least proportion of farmers (7%, 5%, and 3% respectively) in each of the divisions completed the highest level of education. Among the divisions, a significant proportion of farmers were illiterate and these were 14%, 19%, and 26% in Khulna, Barisal, and Chattogram division respectively.

Table 4.4: Educational qualification of the respondent farmers in the study areas<sup>1</sup>

Educational Qualification	% of farmers' responses (n=1000)														
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram Division (n=390)					All Av
	Sat	Bag	Av	Piroj	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Fen	Cht	Av	
Illiterate	10	17	14	23	24	16	16	16	19	36	39	14	16	26	20
Can sign only	6	3	5	3	12	6	1	10	6	13	7	8	9	9	7
Class 1 to 5	19	20	20	17	10	26	40	30	25	33	31	18	24	27	24
Class 6 to 8	33	26	30	34	28	31	28	26	29	8	17	31	27	21	27
Secondary	19	17	18	14	13	8	9	6	10	8	4	15	12	10	13
Higher secondary	7	10	9	6	5	3	4	8	5	0	1	10	8	5	6
Honors/Degree /Equivalent	7	6	7	3	8	8	2	4	5	3	1	4	4	3	5

<sup>1</sup>Sat= Satkhira, Bag= Bagerhat, Piroj= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Bho= Bhola, Lak= Lakshmipur, Noa= Noakhali, Cht= Chattogram, and Av= Average

Source: Field survey, 2020

#### 4.6 Primary Occupational Status of the Farmers

Table 4.5 presents the primary occupational status of sampled farmers. Besides farming, the present survey found a number of occupations in the survey areas such as small business, labour, Government or private job, rickshaw or van pulling, carpenter, and masson. As the study was on the farmers so most of the farmers' (90%) primary occupation was farming and the rest 10% farmer's primary occupation was small business (5%), Govt. or private job (3%), labour (1%), and rickshaw or van pulling (1%). It is evident from Table 4.5 that small business and Govt. or private job were the common primary occupation in all the divisions.

Table 4.5: Primary occupational status of the respondent farmers in the study areas

Occupational status	% of farmers' responses (n=1000)														
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram Division (n=390)					All Av
	Sat	Bag	Av	Piroj	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Fen	Cht	Av	
Farming	90	91	91	94	90	96	97	80	91	92	97	81	87	89	90
Small business	7	5	6	6	3	3	1	6	4	5	0	13	6	6	5
Labour	0	0	0	0	1	1	1	2	1	0	0	1	1	1	1
Service	3	4	4	0	3	2	0	8	3	3	3	3	3	3	3
Rickshaw/ Van pulling	0	0	0	0	3	0	0	2	1	0	0	3	1	1	1
Others	0	0	0	0	0	0	1	2	0	0	0	0	1	0	0

Note: Sat= Satkhira, Bag= Bagerhat, Piroj= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Bho= Bhola, Lak= Lakshmipur, Noa= Noakhali, Cht= Chattogram, and Av= Average. Others=Carpenter & Masson

Source: Field survey, 2020

#### 4.7 Secondary Occupational Status of the Farmers

In addition to primary occupation, some farmers were involved in some other occupations as secondary job. The study found farming, small business, labour, Govt. or private job, rickshaw or van pulling, carpenter, mason, and fishermen as the secondary sources of occupation. However, the maximum proportion of farmers had no secondary occupation (55%) means that they depend only on their primary source of occupation. Besides primary occupation, 23% of the farmers involved in small business, 9% in farming, and 5% in selling wage labour. Only 2% of the farmers had Govt. or private job (service) besides their primary occupation. This picture was mostly same in each of the three divisions (Table 4.6).

Table 4.6: Secondary occupational status of the respondent farmers

Occupational status	% of farmers' responses (n=1000)														
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram Division (n=390)					All Av
	Sat	Bag	Av	Piroj	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Fen	Cht	Av	
Farming	9	7	8	6	9	4	5	20	9	5	3	16	15	10	9
Small Business	39	19	29	34	16	27	30	6	23	13	21	24	16	19	23
Labour	3	6	5	6	3	3	3	6	4	18	3	5	2	7	5
Service	1	1	1	3	6	1	3	0	3	3	1	3	2	2	2
Rickshaw/ Van pulling	3	7	5	0	0	2	3	0	1	0	0	3	1	1	2
Fisherman	0	1	1	0	3	0	0	0	1	0	2	0	0	1	1
Others	0	2	2	0	4	0	3	10	4	0	1	4	4	2	2
No Occupation	46	55	51	51	59	63	53	58	57	61	69	45	60	59	55

Note: Sat= Satkhira, Bag= Bagerhat, Piroj= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Bho= Bhola, Lak= Lakshmipur, Noa= Noakhali, Cht= Chattogram, and Av= Average. Others=Carpenter & Masson

Source: Field survey, 2020

#### 4.8 Family size of the farmers

Family size of the farmers was grouped into three different categories viz. small family whose family members were less than or equal to four, medium family if number of members were in between 5-7 and larger than medium size was considered as large type of family (Table 4.7). Overall, 49% of the farmers belonged to medium sized family following by 37% small and 14% large. The most common type of family in Barisal and Chattogram division was medium type accounted for 53% and 55% respectively. But in Khulna division most common was small type of family (51%). Among the districts the large type of family was most common in Lakshmipur and Bhola district (24%) whereas in medium type family was mostly found in Jhalokathi and Noakhali district (59%). The 55% of the farmers belonged to small family type of households in Bagerhat district and this is highest among the other districts in case of small family type.

Table 4.7: Family size of the respondent farmers

Family type	% of farmers' responses (n=1000)														
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram Division (n=390)					All Av
	Sat	Bag	Av	Piro	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Feni	Cht	Av	
Small ( $\leq 4$ )	46	55	51	49	32	41	33	22	35	26	17	25	35	26	37
Medium (5 - 7)	40	41	41	43	59	53	54	54	53	49	59	61	50	55	49
Large ( $\geq 8$ )	14	4	9	8	9	6	13	24	12	25	24	14	15	20	14

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Bho= Bhola, Lak= Lakshmipur, Noa= Noakhali, Cht= Chattogram, and Av= Average.

Source: Field survey, 2020

#### 4.9 Farming Experience of the Farmers

The farming experience of the surveyed farmers is presented in Table 4.8. Farming experience was divided into four different durations viz. up to 15 years, 16-30 years, 31-45 years, and above 45 years. It is evident from the Table 4.8 that the surveyed farmers were mostly experienced. The lion share (41%) of them falls under first category, which is up to 15 years followed by 36% in 16-30 years and 16% in 31-45 years. The farmers' experience of 6% of farmers was above 45 years.

Table 4.8: Farming experience of the respondent farmers

Duration (year)	% of farmers' responses (n=1000)														
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram Division (n=390)					All Av
	Sat	Bag	Av	Pir o	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Fen i	Cht	Av	
Up to 15	44	43	44	34	35	49	33	38	38	46	47	38	40	43	41
16-30	43	39	41	49	29	32	43	26	36	26	35	35	34	33	36
31-45	10	16	13	11	26	12	17	18	17	21	15	21	21	20	16
Above 45	3	2	3	6	10	7	7	18	10	7	3	6	5	5	6

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Bho= Bhola, Lak= Lakshmipur, Noa= Noakhali, Cht= Chattogram, and Av= Average.

Source: Field survey, 2020

#### 4.10 Training Received by the Farmers

Table 4.9 presents the proportion of farmers who received training related to farming in their lifetime. The 70% of the farmers received training on farming whereas 30% of them still did not get any kind of training. The highest proportion of farmers got farming training was in Barisal division (82%) and the lowest was in Chattogram division (54%). More than 50% of the farmers of Lakshmipur and Chattogram districts did not get training on their farming activities. On the other hand, more than 80% of farmers in Pirojpur, Jhalokati, Barguna, and Patuakhali districts got different kinds of training related to crop farming.

Table 4.9: Farming training received by the respondent farmers

Training received	% of farmer's responses (n=1000)														
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram Division (n=390)					All Av
	Sat	Bag	Av	Piro	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Fen	Cht	Av	
Yes	80	70	75	86	83	81	82	76	82	49	55	65	48	54	70
No	20	30	25	14	17	19	18	24	18	51	45	35	52	46	30

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Bho= Bhola, Lak= Lakshimpur, Noa= Noakhali, Cht= Chattogram, and Av= Average.

Source: Field survey, 2020

#### 4.11 Sources of Training

Crop farming training in the survey areas was provided by a number of institutes of which DAE, BARI, BADC, different NGOs, and other research institutes are noticeable. Table 4.10 shows the percent of farmers received training from each of these institutes. Respondent farmers mostly got crop farming training from DAE (65%) followed by BARI (32%), BADC (1%), other research institutes (1%), and different NGOs (2%). A good proportion of farmers of three divisions received training from BARI that is accounted for 22%, 37%, and 38% in Khulna, Barisal, and Chattogram divisions respectively. Only 1% of the farmers received training on farming activities from BADC and other research institutes, while NGOs provided training to 2% of the total surveyed farmers.

Table 4.10: Sources of training for the respondent farmers

Sources of Training	% of farmer's responses (n=1000)														
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram Division (n=390)					All Av
	Sat	Bag	Av	Piro	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Fen	Cht	Av	
DAE	73	73	73	73	94	55	36	55	63	63	98	37	35	58	65
BARI	20	24	22	27	6	45	60	45	37	37	2	57	57	38	32
BADC	0	0	0	0	0	0	3	0	1	0	0	0	4	1	1
Other Res institutes	0	1	1	0	0	0	0	0	0	0	0	2	2	1	1
NGOs	7	2	5	0	0	0	1	0	0	0	0	4	2	2	2

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Bho= Bhola, Lak= Lakshimpur, Noa= Noakhali, Cht= Chattogram, and Av= Average.

Source: Field survey, 2020

#### 4.12 Farm size of the farmers

The farm size of the surveyed farmers is shown in Table 4.11. The surveyed farmers comprised of three categories such as small, medium, and large farm. The highest proportion of farmers belonged to the small farm category (63%) followed by medium (32%), and large (5%) category. Among the districts, the highest proportion of small farm category that accounted for 95% of the total surveyed farmer in Lakshimpur district. Farmers belonged to the highest number of medium farm category was in Jhalokati district (51%), whereas the highest number of large farm category was in Pirojpur district (11%).

Table 4.11: Farm size of the respondent farmers in the study areas

Category	% of farmer's responses (n=1000)														
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram Division (n=390)					All Av
	Sat	Bag	Av	Piro	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Feni	Cht	Av	
Small	69	61	65	52	46	43	53	72	53	95	51	74	68	72	63
Medium	30	32	31	37	51	49	41	24	40	0	44	26	27	24	32
Large	1	7	4	11	3	8	6	4	6	5	5	0	5	4	5

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Bho= Bhola, Lak= Lakshmipur, Noa= Noakhali, Cht= Chattogram, and Av= Average.

Source: Field survey, 2020

#### 4.13 Land ownership pattern of farmers

Ownership pattern of land has enumerated in Table 4.12. A number of patterns were found in the survey areas such as own cultivable land, rented in, mortgaged in and leased in. The land ownership pattern of the farmers of Satkhira and Bagerhat districts was mostly own cultivable land (87% and 80%). Only 4% and 6% of the farmers of this two districts used mortgaged land for crop production. The highest 87% of the farmers of Jhalokati, Barguna, Patuakhali districts used their own land for crop production. But 80% of the farmers of Pirojpur district were leased farmers whereas it was 54% in Bhola district. Farmers of Feni district used mostly their own land for farming while 67% farmers of Lakshmipur district leased additional land for farming.

Table 4.12: Ownership pattern of land by the respondent farmers

Ownership pattern	Percentages of farmer responses (n=1000)*												
	Khulna Division (n=139)		Barisal Division (n=471)						Chattogram Division (n=390)				All av
	Sat	Bag	Piro	Jhal	Bar	Patu	Bho	Lak	Noa	Feni	Cht		
Own land	87	80	40	87	87	87	62	51	72	79	60	72	
Rented in	29	14	11	53	18	18	10	21	47	45	61	30	
Mortgaged in	4	6	0	29	40	29	12	15	11	28	24	18	
Leased in	44	57	80	22	25	17	54	67	37	21	30	41	

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Bho= Bhola, Lak= Lakshmipur, Noa= Noakhali, Cht= Chattogram, and Av= Average. \*Multiple responses

Source: Field survey, 2020

#### 4.14 Housing Status of the Farmers

Four different types of houses were found in the study areas. These houses were fully brick built, brick wall and corrugated tin shed, corrugated tin shed with earthen floor, and corrugated tin shed with bamboo fence and earthen floor (Table 4.13). The houses of the farmers of Satkhira district were mostly (49%) corrugated tin shed with bamboo fence and earthen floor and only 27% of the houses were fully brick built. Corrugated tin along with earthen floor was the most common housing type (75%) among the farmers of Bagerhat district followed by 52% corrugated tin shed with bamboo fence and earthen floor, 23% brick and corrugated tin houses, and the 13% had fully brick built houses. Most of the farmers of Pirojpur, Patuakhali, and Bhola districts had fully corrugated tin with earthen floor houses accounted for 97%, 93%, and 92% respectively. Only 2% of the farmers of Barguna, Patuakhali, and Bhola district owned fully brick built houses. The farmers of Lakshmipur, Noakhali, Feni, and Chattogram district mostly owned fully corrugated

tin shed with earthen floor houses, while the farmers of Noakhali district had no fully brick built houses at all (Table 4.13).

Table 4.13: Housing status of the respondent farmers

Housing Type	% of farmer's responses (n=1000) *											
	Khulna Division (n=139)		Barisal Division (n=471)					Chattogram Division (n=390)				All Av
	Sat	Bag	Piro	Jhal	Bar	Patu	Bho	Lak	Noa	Feni	Cht	
Fully brick built	27	13	9	15	2	2	2	3	0	16	6	9
Brick wall & corrugated tin roof	47	23	2	27	13	9	22	23	16	34	18	21
Corrugated tin roof & earthen floor	39	75	97	82	88	93	92	90	92	74	71	81
Corrugated tin roof, bamboo fence & earthen floor	49	52	34	17	49	13	22	44	33	31	38	35

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Bho= Bhola, Lak= Lakshimpur, Noa= Noakhali, Cht= Chattogram, and Av= Average. \*Multiple responses

Source: Field survey, 2020

#### 4.15 Status of Kitchen and Fuel for Cooking of the Farm Families

Table 4.14 contains the status of kitchen and cooking fuel of the sample farmers. Out of 1000 surveyed farm families, 91.1% of them opined that they had separate room or house used for kitchen purposes and the rest 8.9% had no formal kitchen in their household. It was evident that sample farmers used various cooking materials in their kitchen. The lion share of respondent farm families (69.7%) used firewood as fuel followed by cowdung cake (9.4%), cylinder gas (8.2%), straw or other crop residues (5.1%), charcoal (3.9%), different electric equipment (2.4%), and biogas (1.3%).

Table 4.14: Status of kitchen and cooking fuel of the respondent farm families

Sl. No.	Issues	No. of farm families	% of total surveyed farm families
1.	Presence of separate room/house as kitchen		
	Yes	911	91.1
	No	89	8.9
2.	Types of fuel used for cooking purposes		
	Firewood	697	69.7
	Cowdung cake	94	9.4
	Cylinder gas	82	8.2
	Straw or other crop residues	51	5.1
	Charcoal	39	3.9
	Different electric equipment	24	2.4
Biogas	13	1.3	

#### 4.16 Livestock Owned by the Farmers

Farmers of the present study owned different types of livestock. Bull/oxen, cow, calf/heifer, goat/sheep, chicken, duck, and pigeon were the most common livestock in each of the three divisions (Table 4.15). About 81% of the farmer of Satkhira district had chicken/duck while it was 87% in Bagerhat district. Besides, 63% of the farmers of Satkhira district reared cow while it was 74% in Bagerhat district. Chicken/duck reared by 86%, 85%, 91%, 74%, and 90% of the farmers of Pirojpur, Jhalokati, Barguna, Patuakhali, and Bhola district respectively. On the other hand, the proportion of farmers of these districts

owned cow by 54%, 50%, 69%, 73%, and 68% respectively. A good number of farmers in Lakshmipur, Noakhali, Feni, and Chattogram district reared cow by 51%, 84%, 51%, and 59% respectively. Most of these farmers owned chicken or duck that accounted for 82%, 93%, 60%, and 62% respectively.

Table 4.15: Different types of livestock owned by the respondent farmers

Types of livestock	% of farmer's responses (n=1000) *										
	Khulna Division (n=139)		Barisal Division (n=471)					Chattogram Division (n=390)			
	Sat	Bag	Piro	Jhal	Bar	Patu	Bhola	Lak	Noa	Feni	Cht
Bull/oxen	24	23	26	13	24	16	20	10	21	16	20
Cow	63	74	54	50	69	73	68	51	84	51	59
Calf/heifer	33	38	29	36	40	58	34	28	48	35	27
Goat/sheep	59	20	46	10	38	37	40	15	39	8	7
Chicken/duck	81	87	86	85	91	74	90	82	93	60	62
Pigeon	16	17	26	19	31	19	14	41	25	24	17

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Lak= Lakshmipur, Noa= Noakhali, Cht= Chattogram, and Av= Average. \*Multiple responses

Source: Field survey, 2020

#### 4.17 Status of Agricultural Tools and Machinery Used by the Farmers

Sprayer, low lift pump (LLP), shallow tube well (STW), power tiller, tractor, thresher, and weed picker were some of the popular agricultural tools and machinery used by the respondent farmers in each of the three divisions (Table 4.16). Most common items were sprayer, LLP, and STW. The presence of power tiller, tractor, thresher, and weed picker were very low in all the districts.

Table 4.16: Agricultural tools and machinery used by the respondent farmers

Types of tools and machinery	% of farmer's responses (n=1000)*											
	Khulna Division (n=139)		Barisal Division (n=471)					Chattogram division (n=390)				All av
	Sat	Bag	Piro	Jhal	Bar	Patu	Bhola	Lak	Noa	Feni	Cht	
Sprayer	93	80	57	14	77	72	60	36	59	43	48	58
LLP	47	35	11	6	19	6	8	18	15	18	6	17
STW	53	46	14	6	8	7	0	3	4	13	13	15
Power tiller	3	3	11	12	26	19	4	0	0	8	5	8
Tractor	1	0	3	0	1	2	0	0	4	6	3	2
Thresher	4	1	6	3	4	1	8	0	1	13	9	5
Weed picker	0	3	0	0	0	0	0	3	0	0	0	1

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Lak= Lakshmipur, Noa= Noakhali, Cht= Chattogram, and Av= Average. \*Multiple responses

Source: Field survey, 2020

#### 4.18 Saleable Wood Trees Owned by the Farmers

Table 4.17 presents different types of saleable wood trees owned by the surveyed farmers. Teak, Mahogany, Karoy, Sirish, Rain tree, and Akashi were some of the wood trees found in the surveyed areas. It was opined that Mahogany and Rain tree were available in all the districts of three divisions, while Teak was found in Feni and Chattogram district. Sirish tree was found in the three districts namely Barguna, Patuakhali, and Chattogram district and Akashi was found only in Lakshmipur and Noakhali district. A good number of farmers had Karoy tree in Jhalokati, Barguna, Patuakhali, Bhola, Lakshmipur, Noakhali, Feni, and

Chattogram districts. Moreover, the proportion of saleable wood trees owners in all the districts were less than 50%.

Table 4.17: Different types of saleable wood trees owned by the respondent farmers

Types of saleable wood trees	% of farmer's responses (n=1000)*										
	Khulna Division (n=139)		Barisal Division (n=471)					Chattogram Division (n=390)			
	Sat	Bag	Piro	Jhal	Bar	Patu	Bhola	Lak	Noa	Feni	Cht
Teak	0	0	0	0	0	0	0	0	0	5	5
Mahogany	6	26	29	26	18	11	2	5	4	28	8
Karoy	0	0	0	13	3	2	2	3	33	24	17
Sirish	0	0	0	0	25	22	0	0	0	0	1
Rain tree	3	13	29	38	35	43	10	8	3	10	23
Akashi	0	0	0	0	0	0	0	3	4	0	0

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Lak= Lakshmipur, Noa= Noakhali, Cht= Chattogram. \*Multiple responses

Source: Field survey, 2020

#### 4.19 Saleable Commercial Fruit Trees Owned by the Farmers

The surveyed farmers in the study areas owned different types of fruit trees such as mango, jackfruit, litchi, plum, and olive fruit trees (Table 4.18). Mango trees were the most common in all the districts except Lakshmipur and Noakhali districts. In fact, the study did not found any saleable commercial fruit trees among the farmers of these two districts. Plum trees were available in Patuakhali and Bhola district that accounted for 39% and 10% of the total surveyed farmers respectively. Commercial litchi trees were also available in these two districts.

Table 4.18: Saleable commercial fruit trees owned by the respondent farmers

Types of fruit trees	% of farmer's responses (n=1000)*										
	Khulna Division (n=139)		Barisal Division (n=471)					Chattogram Division (n=390)			
	Sat	Bag	Piro	Jhal	Bar	Patu	Bhola	Lak	Noa	Feni	Cht
Mango	14	4	3	1	1	11	20	0	0	10	6
Jackfruit	3	1	0	3	1	6	6	0	0	3	3
Litchi	0	0	0	0	0	3	10	0	0	0	0
Plum	0	0	0	0	0	39	10	0	0	0	0
Olive	0	0	0	0	1	5	8	0	0	0	0

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Lak= Lakshmipur, Noa= Noakhali, and Cht= Chattogram. \*Multiple responses

Source: Field survey, 2020

#### 4.20 Modern Amenities Used by the Farm Families

A number of modern amenities were used by the surveyed farmers that included mobile phone, television, refrigerator, bicycle, motorcycle, charger light, rice cooker, pressure cooker, and electric fan (Table 4.19). Almost all the farm families (99%) had mobile phone for communication. Electric fan was another most common necessary thing for 86% of the farm families in the survey areas. Charger light owned by 65% of the farm families while 46% had bicycle. Farm families had television and refrigerator by 34% and 27% of the farmers respectively. Only 10% of the families had motor cycle and pressure cooker and 12% had rice cooker.

Table 4.19: Modern amenities used by the respondent farm families

Types of modern amenities	% of farmer's responses (n=1000)*														All Av
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram Division (n=390)					
	Sat	Bag	Av	Piro	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Feni	Cht	Av	
Mobile phone	99	100	100	100	100	99	100	100	100	100	99	98	99	99	99
Television	36	32	34	54	41	31	23	12	32	28	3	54	58	36	34
Refrigerator	17	41	29	26	41	18	19	26	26	10	0	61	36	27	27
Bicycle	81	58	70	31	23	8	12	38	22	23	64	48	49	46	46
Motorcycle	24	10	17	3	9	7	6	6	6	8	7	10	6	8	10
Charger light	64	55	60	77	49	70	63	70	66	79	71	60	72	71	65
Rice cooker	17	39	28	3	14	11	2	4	7	0	0	3	3	2	12
Pressure cooker	16	25	21	3	14	9	2	4	6	5	0	3	4	3	10
Electric fan	94	100	97	100	91	90	81	92	91	77	68	38	96	70	86

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Lak= Lakshmipur, Noa= Noakhali, and Cht= Chattogram, Av= Average. \*Multiple responses

Source: Field survey, 2020

#### 4.21 Electricity Facilities and Alternate Sources of Lighting or Electric Energy

Out of 1000 farm families, 83.3% had electricity facilities and the rest 16.7% of families were still had no electricity facilities (Table 4.20). The farm families who had no electricity had to arrange alternate sources of lighting or electric energy. The present study found four alternate options viz. solar home system, kerosene lamp or candle, rechargeable battery, and rechargeable light. Among them, 36.5% arranged solar home system in their dwelling houses, 35.3% arranged kerosene lamp or candle, 23.9% arranged rechargeable battery, and 4.3% arranged rechargeable light.

Table 4.20: Electricity facilities and alternate sources of lighting in the surveyed farm families

Sl. No.	Issues	No. of farm families	% of total surveyed farm families
1.	Presence of electricity facilities		
	Yes	833	83.3
	No	167	16.7
2.	Alternate sources of lighting/electric energy		
	Solar home system	61	36.5
	Kerosene lamp or candle	59	35.3
	Rechargeable battery	40	23.9
	Rechargeable light	7	4.3

#### 4.22 Sources of Drinking Water

Table 4.21 shows a number of sources of drinking water in which the lion share of farm families had normal tube well (63.1%) to provide drinking water. Out of 1000 farm families, 18.5% used submerge for collecting drinking water. Besides, pond/river/ditch water, well, municipal supplied water, and rainwater were used as drinking water accounted for 9%, 3.7%, 3.4%, and 2.3% respectively.

**Table 4.21: Distribution of farm families based on sources of drinking water**

Sources	No. of farm families	% of surveyed farm families
Normal tube well	631	63.1
Submerge	185	18.5
Pond or river or ditch water	90	9.0
Well	37	3.7
Municipal supplied water	34	3.4
Rainwater	23	2.3
Total	1000	100

**4.23 Sanitation Facilities of the Farm Families**

The sanitation facilities of surveyed farm families are shown in Table 4.22. Out of 1000 surveyed farm families, 86% had latrine facilities in their dwelling houses and the rest 14% of them did not have latrine facilities in any form in their dwelling house. On the other hand, out of 860 farm families with latrine facilities 61.9% had hand-washing system in the latrine or beside the latrine and 38.1% farm families had no hand-washing system in their latrine or beside the latrine. It is also evident from the Table that 52.3% of the farm families had bathing places in their dwelling houses whereas 47.7% of them did not had such type of facilities. Different types of latrine were found in the survey areas. It was evident that permanent *Kacha*, temporary *Kacha*, and brick built or sanitary latrine were the three types of latrine found in 52.3%, 27.9%, and 19.8% of the total farm families who had latrine in their dwelling houses respectively.

Table 4.22: Distribution of farm families based on sanitation facilities

Sl. No.	Issues	No. of farm families	Percentages of total surveyed farm families
1.	Presence of latrine in the dwelling house		
	Yes	860	86.0
	No	140	14.0
	Total	1000	100
2.	Presence of hand washing system in the latrine or beside the latrine		
	Yes	532	61.9
	No	328	38.1
	total	860	100
3.	Presence of bathing places in the dwelling house		
	Yes	523	52.3
	No	477	47.7
	Total	1000	100
4.	Forms of latrine in the dwelling house		
	Permanent <i>Kacha</i>	450	52.3
	Temporary <i>Kacha</i>	240	27.9
	Brick built or sanitary latrine	170	19.8
	Total	860	100

**4.24 Status of Health Related Issues of the Farm Families**

Table 4.23 shows the distribution of farm families based on some health related issues. It was found that 68.9% of the farm families consulted with the doctor when they become sick and the rest 31.1% were

reluctant to consult with the doctor. The causes of reluctance included alternate sources of getting treatment such as local medicine seller, village doctor, *Kabiraj*, homeopath doctor, and medicinal plant. Out of 311 farm families, 35.7% got treatment from local medicine seller followed by 30.5% from village doctor and 18% from *Kabiraj*. Besides, they also took treatment from homeopath doctor (14.8%). Only 1% of them depends on medicinal plant for getting treatment. Out of 1000 farm families, 72.1% had the ability to manage the treatment expenses and the rest 27.9% opined that they can't manage the treatment expenses due to their poverty.

Table 4.23: Distribution of farm families based on health related issues

Sl. No.	Issues	No. of farm families	% of total surveyed farm families
1.	Consult with the doctor?		
	Yes	689	68.9
	No	311	31.1
	Total	1000	100
2.	Alternate sources of getting treatment		
	Local medicine seller	111	35.7
	Village doctor	95	30.5
	<i>Kabiraj</i>	56	18.0
	Homeopath doctor	46	14.8
	Medicinal plant	3	1.0
	Total	311	100
3.	Ability to manage the treatment expenses		
	Yes	721	72.1
	No	279	27.9
	Total	1000	100

#### 4.25 Per Family Average Net Worth

Table 4.24 presents the average net worth of the surveyed farmers. The average net worth was Tk. 5.96 lakh in all the districts following by Tk. 6.07 lakh in Khulna division, Tk. 6.34 lakh in Barisal division, and Tk. 5.47 lakh in Chattogram division. The highest net worth was found to be Tk. 8.5 lakh in Pirojpur district, while the lowest was found to be Tk. 4.17 lakh in Lakshmipur district.

Table 4.24: Average net worth of the farm families (BDT)

Net worth	Average in Lakh Taka(N=1000)														All Av.
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram Division (n=390)					
	Sat	Bag	Av	Piro	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Feni	Cht	Av	
Net worth	4.64	7.5	6.07	8.5	7.13	6.25	5.38	4.46	6.34	4.17	4.63	7.74	5.32	5.47	5.96

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Lak= Lakshmipur, Noa= Noakhali, and Cht= Chattogram, Av= Average. \*Multiple responses

Source: Field survey, 2020

#### 4.26 Sources of Income of the Farmers

The sources of income of the surveyed farmers are presented in Table 4.25. The main source of income of the most farmers was rice production (82%) followed by vegetables production (75%), pulses crop

production (40%), and oilseed production (21%). Besides, livestock rearing was also an important source of income for a good percent (28%) of respondent farmers. Foreign remittances and home remittances regarded as a good source of income for about 20% and 9% of the farmers in the study areas. About 16% of farmers opined that a significant proportion of their income also came from fisheries sector (Table 4.25). The 80% of the income of the farmers of Khulna division came from rice and vegetables production. The second and third largest sources of income were foreign remittances (31%) and livestock rearing (28%) respectively. The lion share of the income of the farmers of Barisal division came from rice production (82%) followed by pulses crop (68%) and vegetables (66%) production. Among the non-crop income sources, livestock and petty business were the principal sources of income account for 32% and 30% of the total farmers respectively. Rice again the principal source of income for the farmers of Chattogram division (84%) followed by vegetables (78%) and pulses crop (49%) production. Livestock rearing and petty business were found to be an important source of income for the farmers of this division (Table 4.25).

Table 4.25: Sources of income of the respondent farmers

Sources of income	Percentages of farmer's responses (N=1000)*														All Av
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram Division (n=390)					
	Sat	Bag	Av	Piro	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Feni	Cht	Av	
<b>Crop production</b>															
Rice	87	72	80	71	87	91	96	66	82	77	75	93	89	84	82
Pulses crops	6	0	3	26	86	76	70	80	68	41	52	45	57	49	40
Oilseed crops	6	6	6	11	14	39	32	76	34	21	39	24	8	23	21
Vegetables	63	97	80	100	64	60	54	50	66	82	97	70	63	78	75
<b>Other sources</b>															
Day labour	9	12	11	0	6	8	9	8	6	5	15	5	13	10	9
Rent of machineries	0	6	3	11	4	8	1	6	6	3	3	5	3	4	4
Petty business	9	17	13	46	22	34	23	24	30	26	27	29	17	25	23
Livestock	17	39	28	69	26	17	32	18	32	18	37	19	25	25	28
Fishery	20	20	20	40	10	20	10	10	18	8	25	6	6	11	16
Foreign Remittance	3	58	31	9	14	14	9	16	12	36	9	11	9	16	20
Home remittances	6	9	8	3	13	4	1	6	5	10	4	21	20	14	9

\* Multiple responses

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Lak= Lakshimpur, Noa= Noakhali, and Cht= Chattogram, Av= Average. \*Multiple responses

Source: Field survey, 2020

#### 4.27 Status of Yearly Income of the Farmers

Table 4.26 presents distribution of farmers based on yearly income. Overall, 29% of the farmer's yearly income was above Tk. 300000 whereas it was 26% in Khulna division, 30% in Barisal division and 32% in Chattogram division. Only 3% of the total surveyed farmers income was less than or equal to Tk. 20000 while it was 3%, 2% and 3% of the farmers of Khulna division, Barisal division and Chattogram division respectively.

Table 4.26: Distribution of farmers based on their yearly income

Yearly income (Tk)	Percentages of farmer's responses (N=1000)*														
	Khulna Division (n=139)			Barisal Division (n=471)						Chattogram Division (n=390)					All Av
	Sat	Bag	Av	Piro	Jhal	Bar	Patu	Bho	Av	Lak	Noa	Feni	Cht	Av	
≤20000	5	1	3	0	1	2	2	6	2	3	0	5	4	3	3
20,001 - 40,000	11	1	6	0	3	4	4	8	4	0	5	11	11	7	6
40,001 - 60,000	6	2	4	3	4	3	2	2	3	2	1	3	7	3	3
60,001 - 80,000	5	6	6	6	8	7	4	4	6	5	3	4	5	4	5
80,001 - 100000	6	4	5	9	8	5	7	4	7	5	3	10	6	6	6
100001-150000	14	17	16	20	18	19	9	20	17	21	15	14	14	16	16
150001-200000	10	19	15	4	14	14	21	10	13	5	12	20	10	12	13
200001-300000	17	25	21	20	15	18	22	18	19	18	24	9	17	17	19
Above 300000	26	25	26	38	29	28	29	28	30	41	37	24	26	32	29

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Lak= Lakshmipur, Noa= Noakhali, and Cht= Chattogram, Av= Average. \*Multiple responses

Source: Field survey, 2020

## CHAPTER V

### STATUS OF HIGH VALUE CROPS PRODUCTION AND TECHNOLOGY ADOPTION

#### 5.1 Prelude

Component 1 of SACP project is enhanced production of HVC and technology adoption of which one output is supporting organizational development of farmer groups in HVC technology requirements and another output is adaptive trials of new or existing technologies. DAE is involved fully in developing farmer's groups regarding HVC production and demonstration of related technologies. BARI is inventing different crop production technologies regularly. BARI demonstrates these technologies through DAE and it's on farm research divisions. BARI, DAE and BADC conduct adaptive trials of BARI released new crop production technologies and existing technologies. Therefore, data were collected from SACP farmer's groups to know the status of HVCs production and technology adoption. Further, some qualitative data were collected from officials of DAE, BARI, and BADC.

#### 5.2 Intensity of cropping

Distribution of cropped area and intensity of cropping has been shown in the following Table 5.1. Average cropping intensity in Chattogram divisional project area is 207% in which highest cropping intensity (215%) is in Feni district and lowest in Chattogram district. The average cropping intensity in Barisal divisional project area is 169% of which highest cropping intensity was in Bhola district and lowest is in Patuakhali district accounted for 213% and 142% respectively. Cropping intensity is 149% in Khulna divisional project area where the highest intensity is found in Bagerhat district (153%) and lowest intensity is found in Satkhira district (146%). Overall, the average cropping intensity in the project areas is 175%, which is far below than the national average cropping intensity of Bangladesh (195%).

Table 5.1: Distribution of cropped area and intensity of cropping in the project area

Project area	Cropped area (acres)						Cropping intensity
	Single cropped	Double cropped	Triple cropped	Quadruple cropped	Net cropped	Gross cropped	
Chattogram	102000	223000	78000	0	403000	782000	194
Noakhali	54000	197000	75000	0	326000	673000	206
Lakshmipur	19000	153000	44000	0	216000	457000	212
Feni	12000	87000	32000	0	131000	282000	215
<b>Chattogram division</b>	<b>46750</b>	<b>165000</b>	<b>57250</b>	<b>0</b>	<b>269000</b>	<b>548500</b>	<b>207</b>
Jhalokathi	36000	55000	19000	0	110000	203000	185
Pirojpur	111000	55000	23000	0	189000	290000	153
Bhola	105000	184000	157000	2000	446000	952000	213
Patuakhali	298000	136000	30000	0	464000	660000	142
Barguna	209000	87000	46000	1000	342000	525000	153
<b>Barisal division</b>	<b>151800</b>	<b>103400</b>	<b>55000</b>	<b>600</b>	<b>310200</b>	<b>526000</b>	<b>169</b>
Satkhira	235000	109000	31000	1000	375000	550000	146
Bagerhat	180000	77000	38000	1000	295000	452000	153
<b>Khulna division</b>	<b>207500</b>	<b>93000</b>	<b>34500</b>	<b>1000</b>	<b>335000</b>	<b>501000</b>	<b>149</b>
<b>Total</b>	<b>135350</b>	<b>120467</b>	<b>48917</b>	<b>533</b>	<b>304733</b>	<b>525167</b>	<b>175</b>

Source: BBS 2017

### 5.3 Crops Grown in the Survey Areas

The present study classified different crops grown in the survey areas into several groups' viz. vegetables, cereals, pulses, oilseeds, spices, fruits, and others (Table 5.2). Vegetables and cereals were mostly the same in each of the three divisions. Only mungbean was found in Khulna division from the pulses crops, while grass pea, felon, mungbean, and lentils were available in Barisal division. Grass pea, felon, and mungbean were cultivating by the farmers of Chattogram division. Among the oilseed crops, mustard was found cultivating in Khulna division while sesame, mustard, groundnut, and sunflower were available in the farmers field in Barisal and Chattogram division. A number of spices crop were grown in each of the three division in which onion, coriander leaf, chili, and garlic were available in Khulna division while chili, onion and garlic were available in Barisal division. Beside this, coriander leaf, chili, garlic and zinger were cultivating by the farmers of Chattogram division. Number of fruit trees was very limited in in each of the three divisions. The present study found only banana as cultivating commercially by the farmers of Khulna division while the farmers of Barisal division were cultivating watermelon, banana, malta, musk melon, and dragon fruits. Malta, wood apple, banana, and coconut were found in Chattogram division. Other crops included sugarcane, battle leaf, battle nut, jute, and lemon.

Table 5.2: List of crops grown by the surveyed farmers

	<b>Vegetables</b>	<b>Cereals</b>	<b>Pulses</b>	<b>Oilseeds</b>	<b>Spices</b>	<b>Fruits</b>	<b>Others</b>
<b>Khulna division</b>	Okra, potato, papaya, eggplant, pointed gourd, cauliflower, asparagus bean, cabbage, bottle gourd, red spinach, bitter gourd, arum, spinach, country bean, sweet pumpkin, cucumber, tomato, ridge gourd, reddish, turnip, broccoli	Rice, maize, wheat	Mungbean	Mustard	Onion, coriander leaf, chili, garlic	Banana	Sugarcane, battle leaf, jute
<b>Barisal division</b>	Snake gourd, Okra, potato, papaya, eggplant, pointed gourd, cauliflower, cabbage, bottle gourd, red spinach, bitter gourd, arum, spinach, country bean, sweet pumpkin, cucumber, tomato, ridge gourd, reddish, turnip	Wheat, rice, maize	Grass pea, felon, mungbean, lentil	Sesame, Mustard, Ground nut, sunflower	Chili, onion, garlic	Watermelon, banana, Malta, musk melon, dragon fruit	Battle leaf, battle nut, sugarcane
<b>Chattogram division</b>	Snake gourd, Okra, potato, papaya, eggplant, pointed gourd, cauliflower, cabbage, bottle gourd, red spinach, bitter gourd, arum, spinach, country bean, sweet pumpkin, cucumber, tomato, ridge gourd, reddish, turnip	Rice, maize, wheat	Grass pea, felon, mungbean	Sesame, mustard, sunflower ground nut	Coriander leaf, chili, garlic, Zinger	Malta, wood apple, banana, coconut	Sugarcane, lemon, jute

Source: Field survey, 2020

#### 5.4 Sources of Information Regarding HVCs and New Crop Production Technologies

Farmers need various information regarding the cultivation of HVCs and new crop production technologies. For this, they seek information from different sources, which are easy to go. It was evident from Table 5.3 that out of 1000 surveyed farmers in the three divisional project areas, the maximum information came from DAE as opined by 33% of the sample farmers. Local dealer was another important source for information regarding HVCs and new crop production technologies accounted for 23% of the sample farmers. About 13% of the farmers asserted that they depend on their neighboring progressive farmers for information. BARI also provides information as opined by 12% of the sample farmers. Besides, BADC, NGOs, and relatives or family member were also some other sources of information as listed by 11%, 5% and 2% of the sample farmers respectively.

Table 5.3: Sources of information regarding HVCs and new crop production technologies

Information sources	No. of farmers	% of total surveyed farmers
DAE	333	33
Local dealer	232	23
Progressive farmers	133	13
BARI	124	12
BADC	110	11
NGOs	45	5
Relatives or family member	23	2
Total	1000	100

#### 5.5 Sources of HVCs Seed

Table 5.4 represents the sources of HVCs seed. A number of sources were found through the present study. Local dealer was the main source of HVCs seed from which 36% of the total surveyed HVCs farmer collect seed. Besides, BADC was found to be the second major source of seed and 23% of the farmers collected their required seed from BADC. Neighboring progressive farmers contributed a large portion of the seed to the total requirement, where 17% of the surveyed farmers collected seed from them. The 10% of the farmer's seed requirement was fulfilled by the DAE and BARI that contributed 9% of the farmer's seed requirement.

Table 5.4: Sources of HVCs seed in the study areas

Sources of HYV seed	No. of farmers	% of total surveyed farmers
Local dealer	362	36
BADC	231	23
Progressive farmers	168	17
DAE	101	10
BARI	94	9
NGOs	25	3
Relatives	19	2
Total	1000	100

#### 5.6 BARI Released Crop Varieties Available in the Survey Areas

Since inception, BARI has been successfully contributing agricultural production by evolving improved technologies that are suitable for the country's climate and appropriate for the farmer's condition. BARI

has so far developed a total of 1050 technologies of which 545 are improved crop varieties (commodity). However, the present study found a few of them in the surveyed areas (Table 5.5). Among different vegetables, BARI released varieties were found in bottle gourd, country bean, eggplant, and tomato. Two wheat varieties were cultivated by the respondent farmers in the study areas. Among the pulse varieties, BARI released felon and mungbean varieties were available. Oilseed crops included groundnut, grass pea, mustard, and sesame. Spices included three onion varieties while fruits included one dragon fruit variety, one malta variety, and two mango varieties.

Table 5.5: List of available BARI crop varieties grown in the survey area

Vegetables	Cereals	Pulses	Oilseeds	Spices	Fruits
BARI Lau-4	BARI Gom-25	BARI Felon-4	BARI Chinabadam-6	BARI Piaj-1	BARI dragon-1
BARI Sheem-1	BARI Gom-26	BARI Mung-4	BARI Chinabadam-4	BARI Piaj-4	BARI Malta-1
BARI Sheen-2		BARI Mung-6	BARI Chinabadam-9	BARI Piaj-5	BARI Aam-3
BARI Begun-6		BARI Mung-8	BARI Kheshari-3		BARI Aam-4
BARI Begun-2			BARI Sarisha-14		
BARI B <sub>t</sub> Begun-4			BARI Sarisha-15		
BARI B <sub>t</sub> Begun-2			BARI Sesame- 3		
BARI Tomato-4			BARI Sesame-4		
BARI Tomato-8					

Source: Field survey, 2020

### 5.7 Causes of Using BARI Developed Crop Production Technologies

Table 5.6 represents the causes of using different crop production technologies released by BARI. The study found a number of causes of which 37% of the sample farmers of Khulna division opined that they used BARI developed crop production technologies due to their higher yields. Besides, 33% of the farmers of this division asserted that BARI production technologies provide higher profit margin. At the same time, 11% of them told that BARI released varieties are less susceptible to insects and pests infestation. On the other hand, 27% of the surveyed farmers of Barisal division used BARI varieties and crop production technologies due to higher yield. The second important reason was higher profit margin, which was opined by 21% of the sample farmers. Besides, 11% of them asserted that BARI developed crop varieties have good market demand. In Chattogram division, the highest percentages of farmers used BARI released crop varieties and technologies due to the similar causes stated by the farmers of the two divisions which were higher yield (23%), higher profit margin (18%), and higher market demand (13%).

### 5.8 Causes of Not Using BARI Developed Crop Production Technologies

Still a substantial number of surveyed farmers didn't use BARI developed crop production technologies. The present study identified the inherent causes of it (Table 5.7). The highest percentages of farmers (59%) asserted that the main reason was the communication gap between BARI and farmer. The second important reason was the unavailability of technology and variety accounted for 20% of the respondents. The lack of knowledge for cultivating BARI variety was another reason for not using BARI technologies opined by 12% of the respondents. Besides, the higher price of seed/saplings, less demand, lower yield, higher cost of production, less profitable, and higher infestation of pest and insects were some other important reasons for not cultivating BARI varieties and using different crop production technologies.

Table 5.6: Causes of using BARI developed crop production technologies

Causes	Farmer's responses (%)														All Av
	Khulna division			Barisal division						Chattogram division					
	Sat	Bag	Av	Piro	Jha	Bar	Patu	Bho	Av	Lax	Noa	Feni	Cht	Av	
1. Higher yield	42	32	37	30	16	32	23	34	27	21	17	26	28	23	29
2. Higher profit	38	28	33	20	16	22	23	23	21	18	17	13	24	18	24
3. Higher demand	3	5	4	14	23	5	8	5	11	22	1	10	13	12	9
4. Less infestation of insect & pest	6	16	11	6	6	9	8	15	9	10	5	12	15	11	10
5. Testy	4	4	4	9	4	5	8	0	5	5	9	8	4	7	5
6. Technology and saplings are available	0	4	2	3	17	4	8	4	7	3	0	3	1	2	4
7. Delay harvest provide good price	0	0	0	0	2	0	4	4	2	0	1	3	0	1	1
8. High shelf life	4	3	4	6	3	8	5	8	6	3	32	9	5	12	7
9. Less labour required to cultivate	0	3	2	3	3	4	3	3	3	8	1	9	3	5	3
10. Less time required to cultivate	3	4	4	9	7	5	7	4	6	10	9	4	5	7	6
11. Less price of saplings/seed	0	1	0.5	0	3	6	3	0	2	0	8	3	2	3	2

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Lak= Lakshmipur, Noa= Noakhali, and Cht= Chattogram, Av= Average. \*Multiple responses

Source: Field survey, 2020

Table 5.7: Causes of using BARI developed crop production technologies

Causes	Farmer responded (%)														All Av.
	Khulna division			Barisal division						Chattogram division					
	Sat	Bag	Av	Pir	Jha	Bar	Patu	Bho	Av	Lax	Noa	Fen	Cht	Av	
1. Communication gap between BARI and farmer	80	57	69	56	51	61	58	44	54	64	62	58	36	55	59
2. Unavailability of tech & variety	3	19	11	33	29	21	12	48	29	17	37	17	13	21	20
3. Lack of knowledge	17	9	13	0	20	15	23	8	13	19	0	13	12	11	12
4. High price of seed/saplings	0	9	4.5	0	0	2	0	0	0	0	0	2	13	4	3
5. Less demand	0	6	3	0	0	1	0	0	0	0	0	3	11	4	2
6. Lower yield	0	0	0	0	0	0	3	0	1	0	0	5	1	2	1
7. Higher cost of production	0	0	0	0	0	0	0	0	0	0	0	1	9	3	1
8. Less profitable	0	0	0	0	0	0	0	0	0	0	0	1	5	2	1
9. Higher infestation of insect and paste	0	0	0	0	0	0	4	0	3	0	1	0	0	0	1

Note: Sat= Satkhira, Bag= Bagerhat, Piro= Pirojpur, Jhal= Jhalokati, Bar= Barguna, Patu= Patuakhali, Lak= Lakshmipur, Noa= Noakhali, and Cht= Chattogram, Av= Average. \*Multiple responses

Source: Field survey, 2020

## 5.9 Influencing Factor for Using BARI Developed Technologies

Table 5.8 enumerates the influencing factors of surveyed farmers for using BARI developed technologies where the lion share of farmers (33%) stated that they came to know about BARI due to the activities of SAAO of DAE or SA of BARI. Nearby farmers who used BARI developed technologies were another factor to influence using BARI developed technologies accounted for 29% of the respondents. About 17% of the respondent farmers opined that their family member influenced us to use the BARI varieties and different crop production technologies. Besides, SACP group contributes largely to influence farmers in this case which was accounted for 13% of the farmers using BARI developed technologies in different stages of their crop production (Table 5.8).

Table 5.8: Factors influencing the use of BARI developed technologies at farm level

Influencing factor	Farmer responded (%)			All area average
	Khulna division	Barisal division	Chattogram division	
1. Family member	10	13	27	17
2. Researcher	4	2	3	3
3. Other farmer	32	28	26	29
4. SAAO/SA	31	38	29	33
5. IPM club	7	5	3	5
6. SACP group	16	14	10	13
7. NGO	0	0	2	1

Source: Field survey 2020

## 5.10 Cropping Patterns in the Project Areas

### 5.10.1 Cropping pattern of Satkhira and Bagerhat project area

Table 5.9 contains the cropping patterns usually practiced in Satkhira and Bagerhat project areas in three different cropping seasons of Bangladesh namely *Rabi*, *Kharif-1*, and *Kharif-2*. It was evident that *vegetables-vegetables-vegetables* and *fallow-fallow-rice* were the two most practiced cropping patterns in Shyamnagar upazila of Satkhira district which is accounted for 37% and 37% of the total surveyed farmers. On the other hand, *vegetables-fallow-rice* was found to be a highly practiced cropping pattern (38%) in Kaliganj upazila of Satkhira district. The second highest practiced cropping pattern was *vegetables-vegetables-fallow*, which was practiced by 8% of the total surveyed farmer of Kaliganj. *Rice-fallow-fallow* was the most common cropping pattern in Fakirhat Upazila, where 28% of farmers followed this practice. But *vegetables-vegetables-vegetables* cropping pattern was found to be the most practiced cropping pattern in Kachua upazila accounted for 22% of the total surveyed farmers.

Table 5.9: Cropping patterns of Satkhira and Bagerhat project areas

Area	Rabi (16 <sup>th</sup> October to 15 <sup>th</sup> March)	Kharif-1 (16 <sup>th</sup> March to 15 <sup>th</sup> July)	Kharif-2 (16 <sup>th</sup> July to 15 <sup>th</sup> October)	% of farmer responded
<b>Satkhira district</b>				
Shaymnaagar	Fallow	Fallow	Rice	37
	Vegetables	Vegetables	Vegetables	37
	Vegetables	Vegetables	Fallow	16
	Rice	Rice	Rice	11
Kaliganj	Vegetables	Fallow	Rice	38
	Vegetables	Vegetables	Fallow	8
	Vegetables	Sugarcane	Fallow	6
	Vegetables	Fallow	Fallow	6
	Fallow	Fallow	Rice	6
	Rice	Rice	Rice	6
	Vegetables	Fallow	Vegetables	6
	Rice	Fallow	Rice	4
	Vegetables	Vegetables	Arum	4
	Vegetables	Vegetables	Vegetables	4
	Vegetables	Vegetables	Rice	4
	Wheat	Fallow	Rice	2
	Mustard	Fallow	Rice	2
	Vegetables	Rice	Rice	2
<b>Bagerhat district</b>				
Fakirhat	Rice	Fallow	Fallow	28
	Vegetables	Vegetables	Rice	13
	Brinjal	Fallow	Rice	12
	Fallow	Rice	Fallow	11
	Vegetables	Vegetables	Fallow	6
	Onion	Leafy vegetables	Brinjal	6
	Onion/pointed gourd	Pointed gourd	Fallow	6
	Potato	Brinjal	Brinjal	6
	Leafy vegetables	Brinjal	Fallow	6
	Vegetables	Fallow	Banana	6
Kachua	Vegetables	Vegetables	Vegetables	22
	Rice	Fallow	Fallow	18
	Fallow	Vegetables	Vegetables	14
	Vegetables	Vegetables	Fallow	14
	Rice	Fallow	Rice	9
	Vegetables	Fallow	Vegetables	8
	Vegetables	Fallow	Pulses	4
	Vegetables	Rice	Vegetables	4
	Onion	Vegetables	Fallow	2
	Maize	Fallow	Rice	2
	Mustard	Vegetables	Leafy Vegetables	2
	Rice	Rice	Rice	2

### 5.10.2 Cropping pattern of Pirojpur, Lakshmipur, and Feni project areas

The cropping patterns of Pirojpur, Lakshmipur, and Feni project areas are presented in Table 5.10. More than half of the surveyed farmers (51%) of Kaokhali upazila of Pirojpur district were practicing *fallow-fallow-rice* cropping pattern. The farmers of Kamalnagar upazila of Lakshmipur district mostly practiced *soybean-fallow-rice* following by *soybean-rice-rice* cropping pattern accounted for 41% and 33% of the farmers respectively. The mostly practiced cropping pattern in Chagolnaiya upazila of Feni district was *vegetable-fallow-rice*, which was found in 36% of the total surveyed farmers of this upazila. Beside this, *mustard-fallow-rice* and *pulses-fallow-rice* were practiced by 15% and 15% of the farmers respectively.

Table 5.10: Cropping patterns of Pirojpur, Lakshmipur, and Feni project areas

Area	Rabi (16 <sup>th</sup> October to 15 <sup>th</sup> March)	Kharif-1 (16 <sup>th</sup> March to 15 <sup>th</sup> July)	Kharif-2 (16 <sup>th</sup> July to 15 <sup>th</sup> October)	% of farmer responded
<b>Pirojpur district</b>				
Kaokhali	Fallow	Fallow	Rice	51
	Vegetables	Fallow	Rice	11
	Vegetables	Vegetables	Vegetables	6
	Pulses	Fallow	Rice	6
	Maize	Fallow	Rice	6
	Wheat	Rice	Rice	3
	Rice	Fallow	Rice	3
	Banana	Banana	Banana	3
	Fallow	Rice	Rice	3
	Mung	Rice	Rice	3
	Spinach	Vegetables	Arum	3
	Watermelon	Rice	Rice	3
<b>Lakshmipur district</b>				
Kamalnagar	Soybean	Fallow	Rice	41
	Soybean	Rice	Rice	33
	Vegetables	Vegetables	Vegetables	5
	Fallow	Fallow	Rice	5
	Pulses	Rice	Rice	5
	Chili	Fallow	Rice	3
	Fallow	Rice	Rice	3
	Vegetables	Fallow	Vegetables	3
	Vegetables	Vegetables	Fallow	3
	<b>Feni district</b>			
Chagolnaiya	Vegetables	Fallow	Rice	36
	Mustard	Fallow	Rice	15
	Pulses	Fallow	Rice	15
	Rice	Fallow	Rice	10
	Vegetables	Fallow	Vegetables	5
	Vegetables	Vegetables	Rice	4
	Vegetables	Rice	Rice	3
	Rice	Vegetables	Rice	3
	Vegetables	Vegetables	Fallow	1
	Vegetables	Vegetables	Vegetables	1
	Wheat	Fallow	Rice	1
	Maize	Fallow	Rice	1
	Pulses	Vegetables	Vegetables	1
	Pulses	Fallow	Vegetables	1
	Rice	Sunflower	Maize	1
	Rice	Rice	Sunflower	1

### 5.10.3 Cropping pattern of Jhalokati and Chattogram project areas

Table 5.11 shows the cropping patterns found in the project areas of Jhalokati and Chattogram districts. The lion shares of farmers of Nalsiti upazila of Jhalokati district were practicing *pulses-fallow-rice* pattern accounted for 69% of the farmers. The second highest practiced cropping pattern (13%) was *fallow-fallow-rice*. The farmers of Mirsharai upazila of Chattogram district mostly practiced *pulses-fallow-rice* pattern following by *vegetables-fallow-rice* pattern, which were accounted for 58% and 17% of the surveyed farmers of this Upazila respectively. On the other hand, *pulses-fallow-rice*, *rice-fallow-rice* and *vegetable-fallow-rice* were the three most practiced cropping patterns in Boalkhali upazila of Chattogram district which were accounted for 31%, 28%, and 24% of the surveyed farmers respectively (Table 5.11).

Table 5.11: Cropping patterns of Jhalokati and Chattogram project areas

Area	Rabi (16 <sup>th</sup> October to 15 <sup>th</sup> March)	Kharif-1 (16 <sup>th</sup> March to 15 <sup>th</sup> July)	Kharif-2 (16 <sup>th</sup> July to 15 <sup>th</sup> October)	% of farmer responded
<b>Jhalokati district</b>				
Nalsiti	Pulses	Fallow	Rice	69
	Fallow	Fallow	Rice	13
	Pulses	Rice	Rice	5
	Rice	Fallow	Rice	3
	Pulses	Vegetable	Rice	3
	Groundnut	Fallow	Rice	3
	Bottle gourd	Fallow	Rice	1
	Mustard	Fallow	Rice	1
	Sesame	Fallow	Rice	1
	Maize	Rice	Rice	1
<b>Chattogram district</b>				
Mirsharai	Pulses	Fallow	Rice	58
	Vegetables	Fallow	Rice	17
	Vegetables	Rice	Rice	7
	Vegetables	Vegetables	Fallow	4
	Vegetables	Fallow	Vegetables	4
	Rice	Fallow	Rice	2
	Vegetables	Vegetables	Vegetable	2
	Vegetables	Vegetables	Rice	2
	Vegetables	Fallow	Fallow	1
	Vegetables	Rice	Fallow	1
	Rice	Fallow	Fallow	1
Boalkhali	Pulses	Fallow	Rice	31
	Rice	Fallow	Rice	28
	Vegetable	Fallow	Rice	24
	Green chili	Fallow	Rice	6
	Cucumber	Fallow	Rice	2
	Fallow	Fallow	Rice	2
	Green chili	Fallow	Vegetable	2
	Pulses	Fallow	Vegetable	2
	Potato	Fallow	Rice	2
	Green chili	Vegetable	Rice	1

#### 5.10.4 Cropping patterns of Bhola and Noakhali project areas

The cropping patterns of Bhola and Noakhali project areas are shown in the Table 5.12. Among the surveyed farmers of Charfashion Upazila, 66% of them were practicing *pulses-fallow-rice* pattern whereas *groundnut-fallow-rice* pattern was followed by 22% of the respondents. *Pulses-fallow-rice* and *groundnut-fallow-rice* were the two dominant patterns in Lalmohan upazila that followed by 31% and 25% of the respondents respectively. But, *rice-fallow-rice* was the main cropping pattern in Subornachar upazila of Noakhali district which was accounted for 40% of the survey farmers followed by *fallow-fallow-rice* (10%), *vegetable-fallow-rice* (10%), and *pulses-fallow-rice* (10%). Accordingly, *pulses-fallow-rice* and *groundnut-rice-rice* were the two most practiced cropping patterns found by the present survey in Hatia upazila of Noakhali district that accounted for 29% and 26% of the farmers respectively (Table 5.12).

Table 5.12: Cropping patterns of Bhola and Noakhali districts

Area	Rabi (16 <sup>th</sup> October to 15 <sup>th</sup> March)	Kharif-1 (16 <sup>th</sup> March to 15 <sup>th</sup> July)	Kharif-2 (16 <sup>th</sup> July to 15 <sup>th</sup> October)	% of farmer responded	
<b>Bhola district</b>					
Charfashion	Pulses	Fallow	Rice	66	
	Groundnut	Fallow	Rice	22	
	Bottle gourd	Bottle gourd	Bottle gourd	4	
	Green chili	Fallow	Rice	4	
	Vegetable	Vegetable	Fallow	4	
Lalmohan	Pulses	Fallow	Rice	31	
	Groundnut	Fallow	Rice	25	
	Chili	Fallow	Rice	8	
	Mustard	Fallow	Rice	8	
	Potato	Fallow	Rice	8	
	Potato	Sweet pumpkin	Rice	4	
	Rice	Fallow	Vegetables	4	
	Soybean	Fallow	Rice	4	
	Potato	Fallow	Tomato	4	
	Pulses	Fallow	Vegetables	4	
<b>Noakhali district</b>					
Subornachar	Rice	Fallow	Rice	40	
	Fallow	Fallow	Rice	10	
	Vegetable	Fallow	Rice	10	
	Pulses	Fallow	Rice	10	
	Vegetable	Vegetable	Vegetable	8	
	Rice	Rice	Rice	5	
	Vegetable	Vegetable	Rice	5	
	Vegetable	Fallow	Vegetable	3	
	Pulses	Fallow	Fallow	3	
	Rice	Fallow	Fallow	3	
	Soyabean	Fallow	Rice	3	
	Vegetable	Fallow	Fallow	3	
	Hatia	Pulses	Fallow	Rice	29
		Groundnut	Rice	Rice	26
Vegetable		Rice	Rice	17	
Vegetable		Vegetable	Rice	6	
Pulses		Rice	Rice	6	
Fallow		Fallow	Rice	6	
Vegetable		Fallow	Vegetable	3	
Pulses		Vegetable	Rice	3	
Rice		Fallow	Rice	3	
Vegetable	Vegetable	Vegetable	3		

### 5.10.5 Cropping patterns of Barguna district project areas

Table 5.13 represents the cropping patterns of Barguna district project areas. It was found that *pulses-fallow-rice*, *watermelon-rice-rice*, and *pulses-rice-rice* were the dominant cropping patterns found in Aamtoli upazila which were practiced by 35%, 24%, and 19% of the survey farmers respectively. On the other hand, *pulses-fallow-rice* and *vegetables-vegetables-vegetables* were practiced by the majority of the survey farmers in Taltoli upazila that accounted for 44% and 35% of the respondents respectively. But, *pulses-vegetable-rice* and *pulses-rice-rice* were the main patterns in Bamna upazila of Barguna district practiced by 55% and 19% of the survey farmers respectively.

Table 5.13: Cropping patterns of Barguna district project areas

Area	Rabi (16 <sup>th</sup> October to 15 <sup>th</sup> March)	Kharif-1 (16 <sup>th</sup> March to 15 <sup>th</sup> July)	Kharif-2 (16 <sup>th</sup> July to 15 <sup>th</sup> October)	% of farmer responded
<b>Barguna district</b>				
Aamtoli	Pulses	Fallow	Rice	35
	Watermelon	Rice	Rice	24
	Pulses	Rice	Rice	19
	Groundnut	Rice	Rice	8
	Watermelon	Fallow	Rice	3
	Green chili	Vegetable	Vegetable	3
	Rice	Rice	Rice	3
	Rice	Fallow	Rice	3
	Sunflower	Rice	Rice	3
Taltoli	Pulses	Fallow	Rice	44
	Vegetable	Vegetable	Vegetable	35
	Sunflower	Rice	Fallow	12
	Rice	Fallow	Rice	9
Bamna	Pulses	vegetable	Rice	55
	Pulses	Rice	Rice	19
	Sunflower	Rice	Fallow	14
	Vegetable	Vegetable	Vegetable	12

### 5.11 Pre- and Post-harvest Operations of HVCs

Table 5.14 shows the different pre- and post-harvest operations of HVCs in the SACP project catchment areas. The present status of agricultural mechanization in the southern areas of Bangladesh was assessed through this investigation. It was evident that 95.4% of the total surveyed farmers performed tillage operations through different tilling machines available in the area. Only 4.6% of the farmers still tilled their crop-lands manually. But, the sowing system of seed or seedlings was mostly done manually. It was found that 97.2% of the farmers sown seed or seedlings through manually. Only 2.8% of them got the chance of sowing through machine. It was opined that this was mainly possible due to the supply of machine by BARI and DAE. The harvesting system was still mostly manual where 94.3% of the surveyed farmers harvested their crops through manual system. The rest 5.7% of farmers had mechanical harvesting system through the cooperation of BARI, DAE, and NGOs. The scenario was changed in the case of threshing system of harvested crops. The harvesting of crops was mostly done through machine, which was accounted for 87.4% of the surveyed farmers. Among the surveyed farmers in the project area, 12.6% of them still threshed their crops manually. It was also evident that all the survey respondents (100%) dried their crops manually. No mechanical dryer was found among the survey respondents in project area (Table 5.14)

Table 5.14: Tilling, sowing, harvesting, threshing, and drying system of HVCs

Sl. No.	Issues	No. of farmers	% of total surveyed farmers
1.	Tilling system of land		
	Manually	46	4.6
	Through tilling machine	954	95.4
2.	Sowing system of seed/seedlings		
	Manually	972	97.2
	Through sowing machine	28	2.8
3.	Harvesting system of crops		
	Manually	943	94.3
	Through harvester	57	5.7
4.	Threshing system of harvested crops		
	Manually	126	12.6
	Through threshing machine	874	87.4
5.	Drying of harvested crops		
	Manually	1000	100
	Through drying machine	0	0

# CHAPTER VI

## COST AND RETURN OF SELECTED HIGH VALUE CROPS

### 6.1 Prelude

At the end of every farming season, all farmer become aware of the productivity and profitability of his crop production. Productivity and profitable farming is very important for many reasons; from providing more food, better competitiveness on the agricultural market to personal benefits of the farmers such as income, health, and wellbeing, as well as being able to increase the outputs of his labour. Besides, the profitability analysis of selected HVCs will supply farmers with knowledge that will inform their decisions in resource allocation and target return on investment. It will provide them with information, which can facilitate them to make decisions based on sound economic analysis. The findings of the profitability analysis will further provide valuable knowledge on the economic analysis of different crops to researchers and enable them to develop suitable techniques to make these crops economically more viable to the beneficiaries.

### 6.2 Profitability of Brinjal Cultivation

#### 6.2.1 Total cost of brinjal cultivation

Variable cost includes the cost of land preparation, hired labor, seed/seedlings, manure, fertilizers, irrigation, interest on operating capital, and pesticides. Again, fixed cost includes family labour and land use cost. It is evident from the Table 6.1 that the per hectare average total variable cost of brinjal cultivation was Tk. 4,05,296 which is accounted for 66.80% of the total cost of production. The highest cost incurred for pesticides (8.98%) followed by the cost of hired labor (6.12%). On the other hand, the per hectare average total fixed cost of brinjal cultivation was Tk. 2,01,433 and this was 33.20% of the total cost of brinjal cultivation.

#### 6.2.2 Financial profitability of brinjal cultivation

It is evident from Table 6.2 that the per hectare average yield of brinjal was 41.8 MT, while it was the highest in Satkhira district (48.8 MT) and the lowest was in 34.8 MT. The average selling price of farmer was Tk. 20.9 per kg of brinjal. Among the three districts, the farmers of Bagerhat got the highest price (Tk. 25.1 per kg) while the farmers of Noakhali district got the lowest average price of brinjal (Tk. 34.8 per kg). The average gross return and gross margin was Tk. 8,68,998 and Tk. 4,63,702 respectively for one hectare of brinjal cultivation. Besides, per hectare average net return was Tk. 2,62,269 which was found to be highest in Bagerhat district (Tk. 5,45,262) followed by Satkhira district (Tk. 2,18,260) and Noakhali district (Tk. 23,283). Average Benefit Cost Ratio (BCR) on total cost basis was 1.49. The lowest BCR was found in Noakhali (1.03), while the highest BCR was 2.09 in Bagerhat (Table). The average cost of one kg of brinjal cultivation was Tk. 12.0.

Table 6.1: Per hectare cost (Tk.) of brinjal cultivation

Particulars	Districts			All	% of total cost
	Satkhira	Bagerhat	Noakhali		
Variable cost					
Land preparation	11913	10917	11759	11530	1.90
Hired labour	37114	29680	44580	37125	6.12
Seedlings/seed	5094	17352	8870	10439	1.72
Cow dung	10197	3621	1489	5102	0.84
Compost	2144	4722	0	2289	0.38
Urea	10836	5317	15620	10591	1.75
TSP	18047	10473	30509	19676	3.24
DAP	11349	3939	6894	7394	1.22
MoP	5968	3096	3176	4080	0.67
Gypsum	2910	3205	2685	2933	0.48
Boron	7274	2797	1241	3771	0.62
Zinc sulphate	2334	1113	556	1334	0.22
Magnesium	141	459	185	262	0.04
Zinc	314	707	833	618	0.10
Irrigation	19623	4812	18426	14287	2.35
Pesticides/Insecticides	64801	31617	67037	54485	8.98
Sub-total	210060	133826	213861	185916	30.64
Interest on operating capital	37811	24089	38495	33465	5.52
Total variable cost	457930	291741	466217	405296	66.80
Fixed cost					
Family labor	147507	180545	186126	171392	28.25
Land use cost	44455	29121	16547	30041	4.95
Total fixed cost	191962	209666	202672	201433	33.20
Total cost	649892	501408	668889	606729	100.00

Table 6.2: Per hectare returns (Tk.) from Brinjal cultivation

Particulars	Districts			
	Satkhira	Bagerhat	Noakhali	All area
Yield (MT/ha)	48.8	41.7	34.8	41.8
Price (Tk./kg)	17.79	25.1	19.89	20.9
Gross return (GR)	868152	1046670	692172	868998
Total variable cost (TVC)	457930	291741	466217	405296
Total fixed cost (TFC)	191962	209666	202672	201433
Total cost (TC)	649892	501408	668889	606729
Gross margin (GR-TVC)	410222	754929	225955	463702
Net return (GR-TC)	218260	545262	23283	262269
BCR over total cost	1.34	2.09	1.03	1.49
Cost of production (Tk./kg)	11.8	12.3	11.81	12.0

Source: Author's own calculations from field survey data, 2020

### 6.2.3 Problems faced by the farmers in brinjal cultivation

The respondent farmers in the study areas faced a number of problems during brinjal cultivation. These problems were divided into some specific areas viz. problems on seed or saplings, fertilizer, disease, insect and pest, labor, storing, processing, and marketing. In the case of seed related problems, all the farmers opined that three problems were obvious viz. poor germination, adulterated seed, and higher prices of seed. Besides, 33% of the farmers opined that saplings were died after a certain period of germination while 52% told that sometimes saplings were rotten (Table 6.3). Brinjal farmers faced some problems in the case of fertilizer use in their plot. The 100% of farmers told that the price of fertilizer was high. They also blamed that the dealers provide adulterated fertilizers.

A number of diseases were reported in brinjal cultivation. All the respondent brinjal farmers told that they had to face with leaf curl disease and scorched leaves. Besides, 86% of the farmers told that their brinjal fields were damaged due to viral mosaic disease, while yellowing and/or dying of leaves was found by 62% of the farmers of Satkhira, Bagerhat, and Noakhali district. On the other hand, a number of pests such as insects, birds, and rats attacked brinjal fields. Table 6.3 further shows that 100% of the farmer told that their brinjal was damaged by different birds. Brinjal was also damaged largely by rat (88%), fruit borer (93%), Mazra (83%), aphid (95%), and white flies (80%).

The lack of labour during land preparation and harvesting was very common which was opined by 100% of the farmers of Satkhira, Bagerhat, and Noakhali districts. Besides, higher labor wages was also a great problem for brinjal farmers. No storing system was found for brinjal in these districts. So, farmers had no option to store. If they forced to store for 2 to 3 days then brinjal was rotten which was opined by 83% of the brinjal farmers. All the surveyed farmers told that they didn't know about the processing system of brinjal. The present study found a number of market related problems for brinjal production. Lower prices, higher transportation cost, poor demand in the peak season, lack of good communication system, traders syndicate, has to give extra 2 kg in each of 40 kg during selling, and lack of enough market functionaries in the peak season were some of the crucial problems opined by 91%, 93%, 92%, 78%, 95%, 100%, and 87% farmers in the three growing districts respectively (Table 6.3).

Table 6.3: Problems faced by the farmers in brinjal cultivation

Particulars	Farmer responded (%)*			All
	Satkhira	Bagerhat	Noakhali	
<b>Seed/Saplings related</b>				
Poor germination	100	100	100	100
Die of saplings	35	30	33	33
Adulterated seed	100	100	100	100
Rotten	60	45	50	52
Higher prices	100	100	100	100
Unavailability of saplings/seed in time	25	25	30	27
<b>Fertilizer related</b>				
Higher prices	100	100	100	100
Adulterated fertilizer	100	100	100	100
Lower quality	15	10	13	13
Sometimes hard to find in time	25	40	30	32
Traders syndicate	20	10	20	17
<b>Disease related</b>				
Leaf rotten	75	72	72	73

Change of leaf or plant colour which turn to death of the plant	55	63	60	59
Leaf curl	100	100	100	100
Viral mosaic disease	80	92	85	86
Dumping off/peeling disease	25	30	27	27
Less number of fruit	10	14	10	11
Fruit & Stem Rot	40	35	20	32
Scorched leaves	100	100	100	100
Root rot	40	55	35	43
Yellowing and drying leaves	56	70	60	62
Blight or alternaria blight	25	10	15	17
<b>Insect/rat/bird related</b>				
Bird	100	100	100	100
Rat	80	95	90	88
Fruit borer	95	88	95	93
Leda	100	100	100	100
Mazra	85	90	75	83
Aphid	100	85	100	95
White flies	75	85	80	80
Tiny red spider	25	10	10	15
Brown plant hopper	35	20	40	32
Shoot borer	15	35	30	27
<b>Labor related</b>				
Higher wages	80	80	80	80
Lack of enough labor	100	100	100	100
<b>Store related</b>				
Rotten	85	80	85	83
Absence of storing system	100	100	100	100
<b>Processing related</b>				
Lack of knowledge on processing	100	100	100	100
<b>Marketing related</b>				
Lower prices	88	95	90	91
Higher transport cost	90	100	89	93
Poor demand in the peak season	90	90	95	92
Lack of good communication system	80	75	80	78
Traders syndicate	96	95	95	95
Take extra two kg in each of 40 kg	100	100	100	100
Lack of enough market functionaries in the peak season	85	85	90	87

\* indicates multiple responses

## 6.3 Profitability of Groundnut Cultivation

### 6.3.1 Total cost of groundnut cultivation

Groundnut was cultivated mostly in Barguna, Bhola, and Noakhali district in the southern region of Bangladesh. The total cost of groundnut cultivation includes variable cost and fixed cost. Variable cost includes the cost of land preparation, hired labor, seed/seedlings, manure, fertilizers, irrigation, interest on operating capital, and pesticides, while fixed cost includes family labor and land use cost. It is evident from the Table 6.4 that the per hectare average total variable cost of groundnut cultivation was Tk. 1,33,946,

which is accounted for 73.02% of the total cost of groundnut cultivation. The highest (16.77%) cost incurred for hired labor and the lowest was for Zinc application. On the other hand, the per hectare average total fixed cost of groundnut cultivation was Tk. 49,485 that accounted for 26.98% of the total cost.

Table 6.4: Per hectare cost (Tk.) of groundnut cultivation

Particulars	Districts			All	% of total cost
	Barguna	Bhola	Noakhali		
<b>Variable Cost</b>					
Land preparation	10012	8263	8343	8873	4.84
Hired labor	37204	30206	24871	30760	16.77
Seedlings	7603	11747	14456	11269	6.14
Cow dung	63	366	118	183	0.10
Urea	951	732	1083	922	0.50
TSP	3757	3550	3788	3699	2.02
DAP	107	820	592	506	0.28
MoP	271	1113	716	700	0.38
Gypsum	2096	287	340	908	0.49
Boron	144	0	178	107	0.06
Zinc	0	243	41	95	0.05
Irrigation	790	0	0	263	0.14
Pesticides	2789	5080	1583	3150	1.72
<b>Sub-total</b>	<b>65814</b>	<b>62407</b>	<b>56109</b>	<b>61443</b>	<b>33.50</b>
Interest on operating capital	11847	11233	10100	11060	6.03
<b>Total variable cost</b>	<b>143474</b>	<b>136047</b>	<b>122317</b>	<b>133946</b>	<b>73.02</b>
<b>Fixed cost</b>					
Family labor	49286	37880	24871	37346	20.36
Land use cost	7939	8904	19575	12140	6.62
<b>Total fixed cost</b>	<b>57225</b>	<b>46785</b>	<b>44446</b>	<b>49485</b>	<b>26.98</b>
<b>Total cost</b>	<b>200699</b>	<b>182832</b>	<b>166763</b>	<b>183431</b>	<b>100.00</b>

### 6.3.2 Financial profitability of groundnut cultivation

The per hectare average yield of groundnut (Table 6.5) was 2.99 MT, while it was highest in Barguna (3.43 MT) and lowest was in Bhola (2.6 MT). The average farm gate selling price of groundnut was Tk. 70.28 per kg. Among the three districts, the farmers of Noakhali got the highest price (Tk. 79.19 per kg) while the farmer of Barguna got the lowest average price of groundnut (Tk. 60.5 per kg). The average gross return and gross margin was Tk. 2,09,770 and Tk. 75,823 respectively for one hectare of groundnut cultivation. Besides, per hectare average net return was Tk. 26,338 which was found to be highest in Noakhali (Tk. 70,015) followed by Barguna (Tk. 6,816) and Bhola district (Tk. 2,184). The average Benefit Cost Ratio (BCR) on total cost basis was 1.16. The lowest BCR was found in Bhola (1.03) while the highest BCR was 1.42 in Noakhali district (Table 6.5). The average cost of one kg of groundnut cultivation was Tk. 33.56.

Table 6.5: Per hectare returns (Tk.) from groundnut cultivation

Particulars	Districts			
	Barguna	Bhola	Noakhali	All area
Yield (MT/ha)	3.43	2.6	2.99	3.01
Price (Tk./kg)	60.5	71.16	79.19	70.28
Gross return (GR)	207515	185016	236778.1	209770
Total variable cost (TVC)	143474	136047	122317	133946
Total fixed cost (TFC)	57225	46785	44446	49485
Total cost (TC)	200699	182832	166763	183431
Gross margin (GR-TVC)	64041	48969	114461	75823
Net return (GR-TC)	6816	2184	70015	26338
BCR over total cost (GR/TC)	1.03	1.01	1.42	1.16
Cost of production (Tk./kg)	40.81	30.93	28.95	33.56

### 6.3.3 Problems faced by the farmers in groundnut cultivation

Respondent groundnut farmers faced a number of problems during their cultivation. These problems were divided into some specific areas viz. problems on seed, fertilizer, disease, insects and pests, labor, storage, processing, and marketing (Table 6.6). Seed-related problems included the lack of quality seed, higher prices of seed, adulterated seed, lower germination, rotten after sowing and not availability in harvesting time, which were opined by 68%, 65%, 92%, 77%, 48%, and 33% of the groundnut farmers in Barguna, Bhola, and Noakhali district. Groundnut farmers faced some problems in the case of fertilizer application. The higher price of fertilizer was a very common problem mentioned by 82% of the farmers. Farmers also told that local dealer didn't sell the fertilizer at a price fixed by the Government of Bangladesh. Dealer also formed syndicate by which they sometimes made the artificial crisis of fertilizer. Farmers also opined that they very often got adulterated and wet fertilizer. Leaves turn to yellow and aftermath drying of leaves.

Groundnut field was infested by a number of diseases of which very common disease was *Tikka* opined by 81% of the farmers. At the same time, 78% of the farmers told about viral mosaic disease and scorched leaf and stem. The other diseases were yellow color leaves, plants turned to red color and drying, rust, root rot, stem rot, etc. The 76% of the farmers opined that fruit rot recently turned dangerous for groundnut cultivation. Besides, stem rot, dumping off, and small and curl leaf were also found in groundnut cultivation (Table 6.6).

On the other hand, the groundnut field was attacked by a number of pests such as insect, bird, and rat. It is evident that 100% of the farmer told that their groundnut was damaged by wasp, aphid, white spider, leaf piercing, and caterpillar. More than 90% of the farmer opined that they have to fight with fruit piercer, bird, leaf tunneling insects and white flies in order to safe groundnut in the field. Grasshopper, rat, and majra also caused a significant damage of groundnut in Barguna, Bhola, and Noakhali district. Farmers also told about red pumpkin beetle, stink bug, and scorpion insect. Higher wages during land preparation and harvesting time was very common, which was opined by 100% of the groundnut farmers.

The farmers of groundnut had to face some difficulties during the storage of groundnut. It reveals that insect infestation, lack of improved technologies, lack of cold storage and fungal infection were opined by 100% of the groundnut farmers. Almost all farmers stated that they did not know the processing system of groundnut. At the same time, the unavailability of oil extracting machine and the low price of oil were also bared themselves to involve in processing. The present study also found a number of market related problems during groundnut marketing. Lower prices in harvesting season and the lack of market information, most traders received 42 to 44 kg equivalent to 40 kg of groundnut, traders syndicate, lack of enough market functionaries, transport problem, higher transportation cost, etc. were some of the common groundnut marketing problems in Barguna, Bhola, and Noakhali districts (Table 6.6).

Table 6.6: Problems faced by the farmers in groundnut cultivation

Particulars	Farmer responded (%)			All area
	Barguna	Bhola	Noakhali	
<b>Seed related</b>				
Lack of quality seed	70	65	70	68
Higher prices of seed	55	70	70	65
Adulterated seed	90	90	95	92
Lower germination	75	85	70	77
Rotten after sowing	50	50	45	48
Not available in time	30	40	30	33
<b>Fertilizer related</b>				
Higher price	80	85	80	82
Syndicate	60	45	50	52
Adulterated fertilizer	70	72	67	70
Crisis of fertilizer	65	60	60	62
Not available in time	55	59	57	57
Wet fertilizer	45	40	44	43
Dealer sold at higher price than the Govt. fixed price	75	70	72	72
<b>Disease related</b>				
Tikka	85	78	80	81
Viral mosaic	70	85	80	78
Scorched leaf and stem	76	82	75	78
Yellow color and drying leaves	75	76	77	76
Fruit rot	75	77	75	76
Red color and drying Plants	66	72	70	69
Rust	69	62	65	65
Sudden die	50	55	56	54
Root rot	80	70	74	75
Stem rot	60	65	62	62
Dumping off	45	55	48	49
Small and curl leaves	35	35	40	37
<b>Insect/rat/bird related</b>				
Wasp insects	100	100	100	100
Aphid	100	100	100	100
White spider	100	100	100	100
Leaf piercing	100	100	100	100
Cater pillar	100	100	100	100
Fruits piercer	95	100	95	97
Bird	95	98	92	95
Leaf tunneling insect	90	85	99	91
White flies	95	88	90	91
Grasshoppers	85	88	90	88
Rat	88	85	90	88
Majra insect	90	88	90	89
Red pumpkin beetle	85	76	77	79
Stink bug	75	80	77	77
Carrie insect	55	65	59	60
Scorpion insect	65	55	60	60

<b>Labor related</b>				
Higher wages	100	100	100	100
Lack of workers	80	80	80	80
Not available in time	75	80	80	78
<b>Storage related</b>				
Insects infestation when stored	100	100	100	100
Lack of improve techniques for storing	100	100	100	100
Lack of cold storage	100	100	100	100
Fungal infection	100	100	100	100
Powdering	70	70	70	70
Changes of color	70	60	60	63
<b>Processing related</b>				
Processing method unknown	100	100	100	100
Low price of oil	100	100	100	100
Absence of oil extracting machine	100	100	100	100
<b>Marketing related</b>				
Lower prices in harvesting season	100	100	100	100
Lack of market information	100	100	100	100
Traders received 42-44 kg equal to 40 kg	100	100	100	100
Traders syndicates	90	90	90	90
Lack of enough market functionaries	75	66	70	70
Transport problem	80	35	30	48
Very poor local demand	33	40	35	36
Fluctuation of prices	40	35	35	37
Higher transport cost	40	20	25	28

## 6.4 Financial Profitability of Cabbage

### 6.4.1 Total cost of cabbage cultivation

The total cost of cabbage cultivation in Satkhira, Bagerhat, and Noakhali districts has shown in Table 6.7. It includes variable cost and fixed cost. Variable cost includes the cost of land preparation, hired labor, seed/seedlings, manure, fertilizers, irrigation, pesticides, and interest on operating capital, while fixed cost includes family labor and land use cost. Table 6.7 shows that the per hectare average total variable cost of cabbage cultivation was Tk. 2,63,572 which is accounted for 68.36% of the total cost. The highest (8.05%) cost incurred for hired labor and the lowest cost was for the application of magnesium (0.10%). On the other hand, the per hectare average total fixed cost of cabbage cultivation was Tk. 1,21,977 that accounted for 31.64% of the total cost.

Table 6.7: Per hectare cost (Tk.) of cabbage cultivation

Particulars	Districts			All	% of total cost
	Satkhira	Bagherhat	Noakhali		
<b>Variable cost</b>					
Land preparation	7872	9544	8500	8639	2.24
Hired labor	37901	34951	20313	31055	8.05
Seedlings/seed	17124	15467	19363	17318	4.49
Cow dung	4115	1110	760	1995	0.52
Compost	4882	7556	0	4146	1.08
Urea	8385	9554	3750	7230	1.88
TSP	6675	9939	8520	8378	2.17
DAP	5808	1533	1450	2930	0.76
MoP	3489	1759	798	2015	0.52
Gypsum	3838	5762	500	3367	0.87
Boron	9179	944	140	3421	0.89
Zinc sulphate	1359	1506	0	955	0.25
Magnesium	400	750	0	383	0.10
Zinc	1150	1474	125	916	0.24
Irrigation	3222	9744	8750	7239	1.88
Pesticides	37059	13944	11750	20918	5.43
Sub-total	152457	125539	84718	120905	31.36
Interest on operating capital	27442	22597	15249	21763	5.64
<b>Total variable cost</b>	<b>332356</b>	<b>273675</b>	<b>184684</b>	<b>263572</b>	<b>68.36</b>
<b>Fixed cost</b>					
Family labor	70188	107472	108766	95475	24.76
Land use cost	42521	21516	15469	26502	6.87
<b>Total fixed cost</b>	<b>112709</b>	<b>128989</b>	<b>124234</b>	<b>121977</b>	<b>31.64</b>
<b>Total cost</b>	<b>445065</b>	<b>402664</b>	<b>308918</b>	<b>385549</b>	<b>100.00</b>

#### 6.4.2 Financial profitability of cabbage cultivation

Table 6.8 provides the per hectare returns of cabbage cultivation in Satkhira, Bagerhat, and Noakhali district. It is evident that the per hectare average yield of cabbage was 42.43 MT, while it was highest in Satkhira (59.92 MT) and lowest was in Noakhali (29.31 MT). The average farm gate selling price of cabbage was Tk. 14.62 per kg. Among the three districts, the farmer of Noakhali got the highest price (Tk. 18.6 per kg) while the farmer of Bagerhat got the lowest average price of cabbage (Tk. 11.11 per kg). The average gross return and gross margin was Tk. 5,45,166 and Tk. 341,485 respectively for one hectare of cabbage cultivation. Besides, the per hectare average net return from cabbage production was Tk. 2,19,508 which was found to be the highest in Satkhira (Tk.4,02,204) followed by Noakhali (Tk.2,36,248), and Bagerhat (Tk. 20,071). The average Benefit Cost Ratio (BCR) on total cost basis was 1.57 of which the lowest BCR was found in Bagerhat (1.05), while the highest BCR was 1.90 found in Bagerhat (Table 6.8). The average cost of one kg of cabbage cultivation was Tk. 4.61.

Table 6.8: Per hectare returns (Tk.) from cabbage cultivation

Particulars	Districts			
	Satkhira	Bagerhat	Noakhali	All
Yield (MT/ha)	59.92	38.05	29.31	42.43
Price (Tk./kg)	14.14	11.11	18.6	14.62
Gross return (GM)	847269	422736	545166	605057
Total variable cost (TVC)	332356	273675	184684	263572
Total fixed cost (TFC)	112709	128989	124234	121977
Total cost (TC)	445065	402664	308918	385549
Gross margin (GM-TVC)	514913	149060	360482	341485
Net return (GM-TC)	402204	20071	236248	219508
BCR over total cost (GR/TC)	1.90	1.05	1.76	1.57
Cost of production (Tk./kg)	4.57	5.39	3.87	4.61

### 6.4.3 Problems faced by the farmers in cabbage cultivation

Table 6.9 provides a variety of problems faced by the cabbage farmers in Satkhira, Bagerhat, and Noakhali districts of Bangladesh. All the farmers opined that adulterated seed and poor germination were the main problems in the case of seed related problems. Traders syndicate and adulterated fertilizer were the main problems regarding fertilizer use in cabbage cultivation, which was opined by all the cabbage farmers. In the case of disease related problems, respondent farmers identified a number of diseases of which scorched leafs, red, and drying of cabbage leafs, leaf rot, spot on the leaf and viral mosaic disease were the main problems opined by 100% of the surveyed cabbage farmers. Leaf piercing, rat, and cater pillar were the main problems in the case of insect or rat or bird related problems of cabbage cultivation.

All the cabbage farmers told that they are in great difficulties in getting labor in cabbage production. Besides, higher wages in during land preparation and harvesting time were also very common in each year opined by the 100% of surveyed cabbage farmers. On the other hand, all the farmers opined that if they wanted to make delayed selling of the matured cabbage for getting better price, then they have to be hopeless due to frequent fluctuation of prices. Besides, rotten and absence of cold storage were also bared to store the cabbage for future selling. Cabbage farmers not only had to face production related problems but also they had to face various marketing related problems viz. lower prices in peak season, traders syndicate, climatic problem etc. which were opined by all the surveyed cabbage farmers of Satkhira, Bagerhat and Noakhali district of Bangladesh (Table 6.9).

Table 6.9: Problems faced by the farmers in cabbage cultivation

Particulars	Farmer responded (%)			
	Satkhira	Bagerhat	Noakhali	All
<b>Seed/Saplings related</b>				
Adulterated seed	100	100	100	100
Poor germination	100	100	100	100
Higher prices of seed	80	80	80	80
Rotten after sowing	90	55	75	73
Lack of quality seed	70	60	60	63
Not available in time	55	40	40	45
<b>Fertilizer related</b>				
Traders syndicate	100	100	100	100
Adulterated fertilizer	100	100	100	100
Crisis of fertilizer	95	70	88	84
Not available in time	90	85	77	84
Higher price fertilizer	80	80	80	80
Wet Fertilizer	55	55	70	60
<b>Disease related</b>				
Scorched leafs	100	100	100	100
Red and drying leafs	100	100	100	100
Leaf rots	100	100	100	100
Spot on the leaf	100	100	100	100
Viral mosaic disease	100	100	100	100
Yellow and drying leaves	95	90	95	93
Plants rot	75	77	75	76
Stem rot	80	75	85	80
Spoiled cabbage	95	100	100	98
Rust rot	65	77	80	74
Rotting roots	90	85	85	87
<b>Insect/rat/bird related</b>				
Leaf piercing	100	100	100	100
Rat	100	100	100	100
Cater pillar	100	100	100	100
White flies	100	95	100	98
Aphid	85	88	83	85
Leaf tunneling insects	75	77	55	69
Fruits piercer	45	50	44	46
Mazra insects	40	33	35	36
Bird	52	55	51	53
Nematode	10	5	5	7
<b>Labor related</b>				
Higher wages	100	100	100	100
Lack of workers	100	100	100	100
<b>Store related</b>				
Lower prices for late selling	100	100	100	100
Rotten	100	100	100	100
Absence of cold storage	100	100	100	100
<b>Marketing related</b>				

Lower prices in peak season	100	100	100	100
Traders syndicates	100	100	100	100
Climatic problem (rain/very cold)	100	100	100	100
Absence of market functionaries	70	65	55	63
Lower demand in peak season	55	55	60	57
Lower demand in local market	45	40	40	42
No local customer	43	47	33	41
Unavailability of transport in peak season	40	30	30	33
Higher cost of transport	40	30	30	33

## 6.5 Financial Profitability of Cauliflower Cultivation

### 6.5.1 Total cost of cauliflower cultivation

The total cost of cauliflower cultivation in Satkhira, Bagerhat, and Noakhali districts has enumerated in Table 6.10. It includes variable cost and fixed cost. Variable cost includes the cost of land preparation, hired labor, seed/seedlings, manure, fertilizers, irrigation, pesticides, and interest on operating capital, while fixed cost includes family labor and land use cost. It is evident from the Table 6.10 that the per hectare average total variable cost of cauliflower cultivation was Tk. 3,21,484, which is accounted for 72.83% of total cost. The highest cost incurred for hired labor (7.81%) and the lowest was for the cost of magnesium (0.06%) application. On the other hand, the per hectare average total fixed cost of cauliflower cultivation was Tk. 1,19,944 accounted for 27.17% of the total cost.

Table 6.10: Per hectare cost (Tk.) of cauliflower cultivation

Particulars	Districts			All	% of total cost
	Satkhira	Bagherhat	Noakhali		
<b>Variable cost</b>					
Cost of land preparation	5718	6449	11667	7944	1.80
Hired labor	45614	25935	31818	34455	7.81
Seedlings	18258	10907	24061	17742	4.02
Cow dung	2990	1899	2618	2502	0.57
Composite	8809	5514	0	4774	1.08
Urea	6582	6276	7939	6932	1.57
TSP	4932	8650	29508	14363	3.25
DAP	5851	1467	5394	4238	0.96
MoP	3383	1427	2742	2518	0.57
Gypsum	3783	2227	4182	3397	0.77
Boron	8084	210	1242	3179	0.72
Zinc sulphate	1339	822	1091	1084	0.25
Magnesium	309	421	0	243	0.06
Zinc	1314	1081	379	925	0.21
Irrigation	6329	3477	31364	13723	3.11
Pesticides	47000	11047	30303	29450	6.67
Sub-total	170294	87807	184308	147470	33.41
Interest on operating capital	30653	15805	33175	26545	6.01
<b>Total variable cost</b>	<b>371241</b>	<b>191419</b>	<b>401791</b>	<b>321484</b>	<b>72.83</b>

<b>Fixed cost</b>					
Family labor	64977	101472	108977	91809	20.80
Land use cost	47998	22684	13722	28135	6.37
Total fixed cost	112975	124156	122699	119944	27.17
<b>Total cost</b>	<b>484216</b>	<b>315575</b>	<b>524490</b>	<b>441427</b>	<b>100.00</b>

### 6.5.2 Financial profitability of cauliflower cultivation

Table 6.11 provides the per hectare returns of cauliflower cultivation in Satkhira, Bagerhat, and Noakhali districts. The per hectare average yield of cauliflower was 29.98 MT, while it was highest in Bagerhat (34.63 MT) and lowest was in Satkhira (29.31 MT). The average selling price of cauliflower was Tk. 21.23 per kg. Among the three districts, the farmers of Satkhira got the highest price (Tk. 25 per kg) while the farmers of Bagerhat got the lowest average price of cauliflower (Tk.15.85 per kg). The average gross return and gross margin was Tk. 6,23,846 and Tk. 3,02,362 respectively for one hectare of cauliflower cultivation. Besides, the per hectare average net return from cauliflower was Tk. 1,82,419 which was found to be the highest in Bagerhat (Tk. 2,33,310) followed by Satkhira (Tk. 2,03,534) and Noakhali (Tk. 1,10,412). The average Benefit Cost Ratio (BCR) on total cost basis was 1.46 of which the lowest BCR was found in Noakhali (1.21) while the highest BCR was 1.74 in Bagerhat (Table 6.11). The average cost of one kg of cauliflower cultivation was Tk. 5.02.

Table 6.11: Per hectare returns (Tk.) from cauliflower cultivation

Particulars	Districts			
	Satkhira	Bagerhat	Noakhali	All
Yield (MT/ha)	27.51	34.63	27.81	29.98
Price (Tk./kg)	25.00	15.85	22.83	21.23
Gross return (GR)	687750	5488856	634902	623846
Total variable cost (TVC)	371241	191419	401791	321484
Total fixed cost (TFC)	112975	124156	122699	119944
Total cost (TC)	484216	315575	524490	441427
Gross margin (GR-TVC)	316509	357466	233112	302362
Net return (GR-TC)	203534	233310	110412	182419
BCR over total cost (GR/TC)	1.42	1.74	1.21	1.46
Cost of production (Tk./kg)	4.97	4.43	5.66	5.02

### 6.5.3 Problems faced by the farmers in cauliflower cultivation

A number of problems regarding cauliflower cultivation in the study areas were presented in Table 6.12. Adulterated seed, poor germination, and the lack of quality seed were the major seed related problems opined by 100%, 100%, and 88% of the surveyed cauliflower farmers. Respondent farmers opined that higher price (100%), adulterated fertilizer (100%), and dealers syndicate (91%) hinder themselves in smooth cultivation of cauliflower. A number of diseases were found in cauliflower cultivation of which 100% of the surveyed farmers opined that root rot, fruits rot, scorched leaf, spotted leaf, and the drying of the whole plants were some of the major diseases of cauliflower cultivation. Besides, drying of leaves, early blast, yellow colored leaf, stem rot, root rotten, and red colored leaf were some other diseases identified by the farmers of surveyed district.

Cauliflower farmers have to fight against a number of insects related problems of which leaf piercing, rat, caterpillar, white spider, and white flies were some of them attacked all cauliflower field in the surveyed districts. Higher wages, lack of enough workers, and unavailability in land preparation time were the major labor related problems in the aforesaid districts regarding cauliflower cultivation. All the cauliflower farmers of surveyed districts opined that the frequent fluctuation of prices and higher post-harvest loss were the main problems when they wanted to make delayed selling of cauliflower for better price. The 100% of

the surveyed farmers opined about the presence of traders syndicate in the market which compelled them to sell the cauliflower at a lower price and this occurred mostly in the peak season. Besides, climatic problems, lack of enough transport, absence of enough market functionaries, and low local demand were some market related problems regarding cauliflower cultivation in Chattogram, Feni, Satkhira, Bagerhat, Pirojpur, and Noakhali districts of Bangladesh.

Table 6.12: Problems faced by the farmers in cauliflower cultivation

Particulars	Farmer responded (%)			
	Chattogram/ Feni	Satkhira/ Bagerhat	Pirojpur/ Noakhali	All area
<b>Seed/Saplings related</b>				
Adulterated seed	100	100	100	100
Poor germination	100	100	100	100
Lack of quality seed	85	90	88	88
Higher prices of seed	90	70	65	75
Not available in time	70	72	78	73
Rotten after sowing	45	64	59	56
<b>Fertilizer related</b>				
Higher price	100	100	100	100
Adulterated fertilizer	100	100	100	100
Dealers syndicate	89	95	90	91
Artificial crisis	45	49	55	50
Wet and higher moisture	0	55	45	33
Not available in time	0	45	33	26
<b>Disease related</b>				
Root rot	100	100	100	100
Fruit rot	100	100	100	100
Scorched leaf	100	100	100	100
Spotted leaf	100	100	100	100
Drying of the whole plants	100	100	100	100
Dying of leafs	99	87	86	91
Early blast	85	90	90	88
Yellow colored leaf	75	76	80	77
Stem rot	75	79	65	73
Root rotten	68	72	70	70
Red colored leaf	55	58	62	58
<b>Insect/rat/bird related</b>				
Leaf piercing	100	100	100	100
Rat	100	100	100	100
Cater pillar	100	100	100	100
White spider	100	100	100	100
White flies	100	100	100	100
Leaf tunneling insects	95	100	87	94
Aphid	79	88	75	81
Red pumpkin beetle	65	66	65	65
Fruits piercer	54	52	50	52
Bird	45	35	52	44
Nematode	12	6	5	8
<b>Labor related</b>				

Higher wages	100	100	100	100
Lack of workers	100	100	100	100
Not available in time	100	100	100	100
<b>Store related</b>				
Frequent fluctuation of prices	100	100	100	100
Higher post-harvest loss	100	100	100	100
Lack of cold storage	95	88	85	89
Weight losses when stored	35	55	45	45
<b>Marketing related</b>				
Traders syndicates	100	100	100	100
Lower prices in peak season	100	100	100	100
Climatic problems	70	75	70	72
Lack of enough transport	65	66	70	67
Absence of enough market functionaries	65	56	60	60
Very low local demand	45	39	41	42

## 6.6 Financial Profitability of Grass Pea

### 6.6.1 Total cost of grass pea cultivation

The total cost of grass pea cultivation in Noakhali and Barguna districts is shown in Table 6.13. Total cost includes variable cost and fixed cost. Variable cost includes the cost of land preparation, hired labor, seed/seedlings, manure, fertilizers, irrigation, pesticides, and interest on operating capital, while fixed cost includes family labor and land use cost. The per hectare average total variable cost of grass pea cultivation was Tk. 40,235, which is accounted for 52.49% of total cost. The highest (10.86%) cost incurred for hired labor and the lowest cost was for the use of MoP and Gypsum application (0.06%). On the other hand, the per hectare average total fixed cost of grass pea cultivation was Tk. 36,411 accounted for 47.51% of the total cost of grass pea cultivation.

Table 6.13: Per hectare cost (Tk.) of grass pea cultivation

Particulars	Districts		All	% of total cost
	Noakhali	Barguna		
<b>Variable cost</b>				
Land preparation	377	0	189	0.25
Hired labor	9446	7207	8326	10.86
Seedlings	5664	7029	6347	8.28
Urea	843	1629	1236	1.61
TSP	517	0	258	0.34
DAP	113	0	57	0.07
MoP	91	0	45	0.06
Gypsum	96	0	48	0.06
Pesticides	2002	1899	1950	2.54
Sub-total	19149	17763	18456	24.08
Interest on operating capital	3447	3197	3322	4.33
<b>Total variable cost</b>	<b>41746</b>	<b>38723</b>	<b>40235</b>	<b>52.49</b>
<b>Fixed cost</b>				
Family labor	9296	30109	19702	25.71
Land use cost	17465	15953	16709	21.80
<b>Total fixed cost</b>	<b>26761</b>	<b>46061</b>	<b>36411</b>	<b>47.51</b>

Total cost	68506	84785	76646	100.00
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### 6.6.2 Financial profitability of grass pea cultivation

Table 6.14 provides the per hectare returns of grass pea cultivation in Noakhali and Barguna district. It is evident that the per hectare average yield of grass pea was 1.76 MT while it was highest in Barguna (1.89 MT) and lowest was in Noakhali (1.63 MT). The average selling price of grass pea at farm level was Tk. 51.50 per kg of grass pea. Between the two districts, the farmers of Noakhali got the highest price (Tk. 58 per kg) while the farmers of Barguna got the lowest average price of grass pea (Tk. 45 per kg). The average gross return and gross margin was Tk. 89,795 and Tk. 49,560 respectively for one hectare of grass pea cultivation. Besides, the per hectare average net return from grass pea was Tk. 13,149 which was found to be the highest in Noakhali (Tk. 26,034) followed by Barguna (Tk. 265). The average Benefit Cost Ratio (BCR) on total cost basis was 1.19 of which the lowest BCR was found in Barguna (1.00) while the highest BCR was 1.38 in Noakhali (Table 6.14). The average cost of one kg of grass pea cultivation was Tk. 17.96.

Table 6.14: Per hectare returns (Tk.) from grass pea cultivation

Particulars	Districts		
	Noakhali	Barguna	All
Yield (MT/ha)	1.63	1.89	1.76
Price (Tk./kg)	58.00	45.00	51.50
Gross return (GR)	94540	85050	89795
Total variable cost (TVC)	41746	38723	40235
Total fixed cost (TFC)	26761	46061	36411
Total cost (TC)	68506	84785	76646
Gross margin (GR-TVC)	52794	46327	49560
Net return (GR-TC)	26034	265	13149
BCR over total cost (GR/TC)	1.38	1.00	1.19
Cost of production (Tk./kg)	15.58	20.33	17.96

### 6.6.3 Problems faced by the farmers in grass pea cultivation

Table 6.15 provides the problems of grass pea cultivation in the study areas. Seed related problems include poor germination, lack of improved variety seed, and higher prices of seed, which were opined by 100%, 88%, and 78% of the surveyed grass pea farmers. The higher price of fertilizer was opined to be a crucial problem in the case of fertilizer application in grass pea field. All the farmers told that the mosaic virus and rotten of whole plant were the most dangerous problem in grass pea cultivation. Besides, the sudden died of plant and yellow color spotted leaf also caused significant damages in the grass pea field. A number of insects such as scorpion, wasp, aphid, caterpillar, white spider, and white flies damaged grass pea plants and fruits in the field. Rat also caused significant damages to the grass pea filed opined by 44% of the surveyed grass pea farmers.

Labor related problems include the higher wage and crisis during harvesting time which were accounted for 100% of the farmers responses. Farmers have to face various difficulties when they stored the grass pea for future consumption of which insects infestation and fungal infection were opined by about 100% and 45% of the surveyed grass pea farmers. All the farmers also mentioned the lack of advanced technology to store the grass pea for longer period. At the same time, all the farmers told that they have no idea about the commercial processing of threshed grass pea. Grass pea farmers had to face several problems when they wanted to sell the grass pea, which includes traders' syndicates and lower prices. Besides, the market related information of grass pea was unavailable from terminal market. Respondent farmers also opined that sometimes they didn't get enough traders to sell their grass pea. Nevertheless, grass pea was not much popular in the locality for consumption that compelled them to sell in the local market.

Table 6.15: Problems faced by the farmers in grass pea cultivation

Particulars	Farmer responded (%)			All
	Barguna	Satkhira and Bhola	Pirojpur/ Noakhali	
<b>Seed related</b>				
Poor germination	100	100	100	100
Lack of improved variety	85	90	88	88
Higher prices of seed	90	70	75	78
<b>Fertilizer related</b>				
Higher prices of fertilizer	100	100	100	100
<b>Disease related</b>				
Viral mosaic disease	100	100	100	100
Rotten of whole plant	100	100	100	100
Sudden died of plant	85	90	90	88
Yellow color spotted leaf	75	76	80	77
<b>Insect/rat/bird related</b>				
Scorpion	100	100	100	100
Wasp insects	100	100	100	100
Aphid	100	100	100	100
Cater pillar	100	100	100	100
White spider	100	100	100	100
White flies	65	66	65	65
Fruits piercer	54	52	50	52
Rat	45	35	52	44
<b>Labour related</b>				
Higher wages	100	100	100	100
Labor crisis during harvesting time	100	100	100	100
<b>Store related</b>				
Insects infestation	100	100	100	100
Lack of advanced technology	100	100	100	100
Fungal infection	35	55	45	45
<b>Processing related</b>				
Commercial processing method unknown	100	100	100	100
<b>Marketing related</b>				
Traders syndicates	100	100	100	100
Lower prices	70	83	69	74
No linkages with traders of terminal market	65	56	60	60
Lack of enough market functionaries	65	66	70	67
Poor number of local customer	45	39	41	42

## 6.7 Financial Profitability of Bottle Gourd

### 6.7.1 Total cost of bottle gourd cultivation

The total cost of bottle gourd cultivation in Bagerhat, Jhalokati, and Pirojpur districts has enumerated in Table 6.16. Both variable cost and fixed cost were taken into consideration for calculating the total cost of production. Variable cost included the cost for land preparation, hired labor, seedlings, manure, fertilizers, irrigation, pesticides, and interest on operating capital, while fixed cost included family labor and land use cost. Table 6.16 shows that the average total variable cost of bottle gourd cultivation was Tk. 3,38,886 per hectare which is accounted for 68.53% of total cost. The highest cost incurred for *Macha* construction (14.46%) and the lowest cost was for the use of Zinc (0.06%). On the other hand, the average total fixed cost of bottle gourd cultivation was Tk. 1,55,604 per hectare that accounted for 31.47% of the total cost.

Table 6.16: Per hectare cost (Tk.) of bottle gourd cultivation

Particulars	Districts			All	% of total cost
	Bagherhat	Jhalokati	Pirojpur		
Variable cost					
Land preparation	4592	714	6207	3838	0.78
Hired labor	26442	6161	65638	32747	6.62
Seed/Seedling	6072	24263	15678	15337	3.10
Cow dung	1847	3623	2088	2519	0.51
Composite	154	1143	0	432	0.09
Urea	3762	1719	4146	3209	0.65
TSP	7182	2484	3497	4387	0.89
DAP	5234	214	12169	5872	1.19
MoP	1687	1130	1064	1293	0.26
Gypsum	1405	0	298	568	0.11
Boron	5562	0	0	1854	0.37
Zinc sulphate	2046	0	0	682	0.14
Zinc	669	0	248	306	0.06
Irrigation	1192	2143	759	1365	0.28
Macha construction	37642	46929	130000	71524	14.46
Pesticides	18023	2471	7990	9495	1.92
Sub-total	123583	92994	249781	155452	31.44
Interest on operating capital	22245	16739	44961	27981	5.66
Total variable cost	269410	202726	544522	338886	68.53
Fixed cost					
Family labor	88014	172679	153610	138101	27.93
Land use cost	28807	8732	14970	17503	3.54
Total fixed cost	116821	181411	168580	155604	31.47
Total cost	386231	384137	713102	494490	100.00

### 6.7.2 Financial profitability of bottle gourd cultivation

Table 6.17 contains the per hectare returns of bottle gourd cultivation in Noakhali and Barguna district. It is evident that the average yield of bottle gourd was 49.47 MT per hectare, while it was the highest in Pirojpur (61.81 MT) and the lowest was in Jhalokati (34.46 MT). The average selling price of bottle gourd at farm level was Tk. 12.75 per kg of bottle gourd. Among the study areas, the farmers of Jhalokati received the highest price (Tk. 13.34 per kg), while the farmers of Bagerhat got the lowest average price of bottle gourd (Tk. 12.00 per kg). The average gross return and gross margin was Tk. 6,27,615 and Tk. 2,88,729

respectively for one hectare of bottle gourd cultivation. Besides, the per hectare average net return from its cultivation was Tk. 1,33,125 which was found to be the highest in Bagerhat (Tk. 2,39,569) followed by Pirojpur (Tk. 84,247) and Jhalokati (Tk. 75,560). The average Benefit Cost Ratio (BCR) on total cost basis was 1.31 of which the lowest BCR was found in Pirojpur (1.12), while the highest BCR was 1.62 in Bagerhat (Table). The average cost of one kg of bottle gourd cultivation was Tk. 3.73.

Table 6.17: Per hectare returns (Tk.) from bottle gourd cultivation

Particulars	Districts			
	Bagerhat	Jhalokati	Pirojpur	All
Yield (MT/ha)	52.15	34.46	61.81	49.47
Price (Tk./kg)	12.00	13.34	12.9	12.75
Gross return (GR)	625800	459696	797349	627615
Total variable cost (TVC)	269410	202726	544522	338886
Total fixed cost (TFC)	116821	181411	168580	155604
Total cost (TC)	386231	384137	713102	494490
Gross margin (GR-TVC)	356390	256970	252827	288729
Net return (GR-TC)	239569	75560	84247	133125
BCR over total cost (GR/TC)	1.62	1.20	1.12	1.31
Cost of production (Tk./kg)	3.34	3.92	3.92	3.73

### 6.7.3 Problems faced by the farmers in bottle gourd cultivation

The problems of bottle gourd cultivation in Bagerhat, Jhalokati, and Pirojpur district are presented in Table 6.18. The lower germination of bottle gourd seed was opined by all the farmers while the lack of quality seed, higher prices of seed, and wet seed were some of other problems faced by 88%, 78%, and 56% of surveyed bottle gourd farmers respectively. Fertilizer related problems included higher price, dealer's syndicate, adulterated fertilizer, un-availability, and artificial crisis. Again, bottle gourd is infested by a number of diseases of which roots rot and viral mosaic disease were opined by 100% of the bottle gourd farmers. Besides, spotted leaf, kat disease, yellow, and drying of whole plant, scorched leaf and stem were some of other diseases caused significant damages to the bottle gourd field. All the surveyed bottle gourd farmers identified some common insects viz. leaf-tunneling insect, caterpillar, red pumpkin beetle, wasp, aphid, mazra, and fruits piercer. Besides, bird also caused damages to 65% of the bottle gourd farmer's field.

Higher wage was the only labor related problem suggested by almost all the bottle gourd farmers. Bottle gourd is rotten if farmers wanted to store it to sell in future. At the same time, weight and quality loss was also a great problem in storing bottle gourd at farmer's house. This is due to the totally absence of storing system in the surveyed areas. Farmers had to face a number of market related problems as shown in Table 6.18. The fall of prices due to bad weather and in the peak season were very common for all the farmers. The syndicate of traders compelled farmers to sell their produce at a lower price. The higher cost of transportation, damaged road, and lack of quality transport caused a significant damage to bottle gourd, which in turn reduces market price. At the same time, the lack of enough traders (especially *Beparis*) in peak period sometimes caused no sell or sold at a very low price (Table 6.18).

Table 6.18: Problems faced by the farmers in bottle gourd cultivation

Particulars	Farmer responded (%)			All
	Bagherhat	Jhalokati	Pirojpur	
<b>Seed/Saplings related</b>				
Lower germination	100	100	100	100
Lack of quality seed	85	90	88	88
Higher prices of seed	90	70	75	78
Wet seed	45	64	59	56
<b>Fertilizer related</b>				
Higher price	100	100	100	100
Dealer syndicate	100	100	100	100
Adulterated fertilizer	100	100	100	100
Not available in time	65	65	63	64
Artificial crisis	45	49	55	50
<b>Disease related</b>				
Root rot	100	100	100	100
Viral mosaic disease	100	100	100	100
Spotted leaf	99	87	86	91
Kat diseases	99	87	86	91
Yellow and drying of whole plant	85	90	90	88
Scorched leafs	85	90	90	88
Scorched stem	85	90	90	88
Yellow colored and drying of leaf	75	76	80	77
Fruits rot	74	75	77	75
Root rot	75	79	65	73
Stem rot	55	58	62	58
Dumping off	45	49	55	50
Brown colored and drying of plants	45	46	40	44
<b>Insect-pest related</b>				
Leaf tunneling insect	100	100	100	100
Cater pillar	100	100	100	100
Red pumpkin beetle	100	100	100	100
Wasp	100	100	100	100
Aphid	100	100	100	100
Borer	100	100	100	100
Fruits piercer	100	100	100	100
Bird	65	66	65	65
Green insects	55	58	62	58
Insect cut off the tip	54	52	50	52
Black insects	54	52	50	52
White flies	45	49	55	50
Rat	45	35	52	44
Sting bug	45	35	52	44
Scorpion	12	6	5	8
<b>Labor related</b>				
Higher wages	100	100	100	100
<b>Store related</b>				
Rotten	100	100	100	100

Weight and quality loss	100	100	100	100
Absence of storing system	100	100	100	100
<b>Marketing related</b>				
Prices fall during bad weather	100	100	100	100
Traders syndicate	100	100	100	100
Prices fall during peak season	100	100	100	100
Higher cost of transportation	70	75	70	72
Damaged road	65	66	70	67
Lack of quality transport	65	66	70	67
Lack of enough traders in peak period	65	56	60	60
Lack of local customer	45	49	55	50
Fluctuation of prices	45	39	41	42

## 6.8 Financial Profitability of Sweet Pumpkin

### 6.8.1 Total cost of sweet pumpkin cultivation

Total cost of sweet pumpkin cultivation in Bagerhat, Jhalokati, and Pirojpur districts has shown in Table 6.19. It includes variable cost and fixed cost. Variable cost includes cost for land preparation, hired labor, seed/seedlings, manure, fertilizers, irrigation, pesticides, and interest on operating capital, while fixed cost includes family labor and land use cost. Table 6.19 shows that the per hectare average total variable cost of sweet pumpkin cultivation was Tk. 2,14,727 which is accounted for 65.02% of total cost. The highest cost incurred for hired labor (7.46%) and the lowest was for magnesium application (0.02%). On the other hand, the per hectare average total fixed cost of sweet pumpkin cultivation was Tk. 1,15,497 accounted for 34.98% of the total cost of sweet pumpkin cultivation.

Table 6.19: Per hectare cost (Tk.) of sweet pumpkin cultivation

Particulars	Districts			All	% of total cost
	Bagerhat	Jhalokathi	Pirojpur		
<b>Variable cost</b>					
Land preparation	4270	5460	3000	4243	1.28
Hired labor	18961	6753	48167	24627	7.46
Seedlings/Seed	8651	9311	5671	7878	2.39
Cow dung	376	4161	1952	2163	0.65
Composite	1461	o	0	730	0.22
Urea	3760	3257	4177	3731	1.13
TSP	6679	3682	4599	4986	1.51
DAP	1646	1172	14697	5838	1.77
MoP	1417	1405	1073	1298	0.39
Gypsum	2093	506	40	879	0.27
Boron	3438	230	220	1296	0.39
Zinc sulphate	1258	0	0	419	0.13
Magnesium	213	0	0	71	0.02
Zinc	0	0	360	120	0.04
Irrigation	697	2644	967	1436	0.43
Fencing/Macha	52944	2299	39400	31548	9.55
Pesticides	7921	5822	8690	7478	2.26
Sub-total	115784	46700	133011	98499	29.83

Interest on operating capital	20841	8406	23942	17730	5.37
<b>Total variable cost</b>	252409	101807	289965	214727	65.02
<b>Fixed cost</b>					
Family labor	92219	104763	104948	100643	30.48
Land use cost	20858	8732	14970	14853	4.50
Total fixed cost	113077	113495	119918	115497	34.98
<b>Total cost</b>	365486	215302	409882	330223	100.00

### 6.8.2 Financial profitability of sweet pumpkin cultivation

Table 6.20 provides the per hectare returns of sweet pumpkin cultivation in the study areas. The per hectare average yield of sweet pumpkin was 20.78 MT, while it was the highest in Jhalokati (24.71 MT) and the lowest was in Bagerhat (18.67 MT). The average selling price of sweet pumpkin at the farm level was Tk. 20.22 per kg of sweet pumpkin. Among the sampled districts, the farmers of Pirojpur received the highest price (Tk. 21.67 per kg) while the farmers of Jhalokati got the lowest price of sweet pumpkin (Tk. 19.00 per kg). The average gross return and gross margin was Tk. 4,17,846 and Tk. 2,03,119 respectively for one hectare of sweet pumpkin cultivation. Besides, per hectare average net return was Tk. 87,622 which was found to be the highest in Jhalokati (Tk. 2,57,188) followed by Bagerhat (Tk. 7,914) and Pirojpur (Tk. 764). The average Benefit Cost Ratio (BCR) on total cost basis was 1.40 of which the lowest BCR was found in Pirojpur (1.00) and the highest in Jhalokati (2.18). The average cost of one kg of sweet pumpkin cultivation was Tk. 7.83.

Table 6.20: Per hectare returns (Tk.) from sweet pumpkin cultivation

Particulars	Districts			
	Bagerhat	Jhalokati	Pirojpur	All area
Yield (MT/ha)	18.67	24.71	18.95	20.78
Price (Tk./kg)	20.00	19.00	21.67	20.22
Gross return (GR)	373400	469490	410646.5	417846
Total variable cost (TVC)	252409	101807	289965	214727
Total fixed cost (TFC)	113077	113495	119918	115497
Total cost (TC)	365486	215302	409882	330223
Gross margin (GR-TVC)	120991	367683	120682	203119
Net return (GR-TC)	7914	254188	764	87622
BCR over total cost (GR/TC)	1.02	2.18	1.00	1.40
Cost of production (Tk./kg)	8.01	5.86	9.63	7.83

### 6.8.3 Problems faced by the farmers in sweet pumpkin cultivation

The problems of sweet pumpkin cultivation faced by the farmers of five districts of the southern areas of Bangladesh (Table 6.21). Seed related problems include the lower germination and higher price of seed opined by 100% and 78% of the surveyed sweet pumpkin farmers. All the surveyed farmers told that they faced various difficulties due to the higher prices of fertilizers, dealers' syndicate, and adulterated fertilizer in the case of sweet pumpkin cultivation. Sometimes, they didn't get the fertilizer in time due to crisis in the market. Sweet pumpkin field were affected by a number of diseases of which viral mosaic disease, sudden died of the whole plants, and leaf curl were most common to all the pumpkin farmers. Besides, fruit rot, falling of flowers, and spotted leaf were also found in farmers filed that accounted for 91%, 88%, and 88% of farmers respectively.

Sweet pumpkin is infested by a lot of insects namely leaf tunneling insect, wasp, leaf piercing, fruits piercer, bird, rat, cater pillar, and aphid noted by all the farmers in the survey areas. Besides, white flies, sting bug,

red pumpkin beetle, and white spider were some other harmful insects in sweet pumpkin cultivation in the southern areas of Bangladesh. All the farmers opined that the wage of labor gradually reaching to beyond their ability and it is now a great problem for smooth crop production. Generally, farmers store the ripped pumpkin for future selling and according to the farmers this storing can be continued for about one year. But, they have faced some difficulties regarding the storage of sweet pumpkin. The storage-related problems are insect infestation, rotten, fungal infection, and the lack of cold storage facility (Table 6.21).

Table 6.21: Problems faced by the farmers in sweet pumpkin cultivation

Particulars	Farmer responded (%)			All areas
	Chattogram/ Feni	Bagherhat	Jhalokati/ Pirojpur	
<b>Seed/Saplings related</b>				
Lower germination	100	100	100	100
Higher price	90	70	75	78
<b>Fertilizer related</b>				
Higher price	100	100	100	100
Dealer's syndicate	100	100	100	100
Adulterated fertilizer	100	100	100	100
Crisis of fertilizer	45	49	55	50
Not available in time	75	75	73	74
Wet fertilizer	43	55	45	48
<b>Disease related</b>				
Viral mosaic disease	100	100	100	100
Sudden died of the whole plants	100	100	100	100
Leaf curl	100	100	100	100
Fruits rot	99	87	86	91
Falling of flowers	85	90	90	88
Spotted leaf	85	90	90	88
Yellow colored and drying of leaf	75	76	80	77
Leaf rot	75	79	65	73
Rotten root	55	58	62	58
Stem rot	45	49	55	50
Stem curl	45	46	40	44
<b>Insect-pests related</b>				
Leaf tunneling insects	100	100	100	100
Wasp	100	100	100	100
Leaf piercing	100	100	100	100
Fruits piercer	100	100	100	100
Bird	100	100	100	100
Rat	100	100	100	100
Cater pillar	100	100	100	100
Aphid	100	100	100	100
White flies	55	58	62	58
Sting bug	54	52	50	52
Red pumpkin beetle	54	52	50	52
White spider	45	49	55	50
<b>Labor related</b>				
Higher wages	100	100	100	100
<b>Store related</b>				

Insects infestation	100	100	100	100
Rotten	100	100	100	100
Fungal infection	95	98	95	96
Lack of cold storage	100	100	100	100
<b>Marketing related</b>				
Prices are low	70	83	69	74
Syndicates	100	100	100	100
Transport problem	65	66	70	67
Transport cost high	70	75	70	72
Prices fluctuate	100	100	100	100
Prices fall during the season	100	100	100	100
Lack of market functionaries	45	49	55	50

## 6.9 Financial and Economic Profitability of Mustard

### 6.9.1 Total cost of mustard cultivation

The total cost of mustard cultivation in Feni, Jhalokati, and Bhola districts is shown in Table 6.22. It includes variable cost and fixed cost. Variable cost includes the cost of land preparation, hired labor, seed/seedlings, manure, fertilizers, irrigation, pesticides, and interest on operating capital, while fixed cost includes family labor and land use cost. It is evident from the Table 6.22 that the per hectare average total variable cost of mustard cultivation was Tk. 1,09,533, which is accounted for 70.56% of total cost. The highest cost incurred for hired labor (17.42%) and the lowest was for cost of gypsum application (0.20%). On the other hand, the per hectare average total fixed cost of mustard cultivation was Tk. 45,693 that accounted for 29.44% of the total cost of mustard cultivation.

Table 6.22: Per hectare cost (Tk.) of mustard cultivation

Particulars	Districts			All	% of total cost
	Feni	Jhalokathi	Bhola		
<b>Variable cost</b>					
Land preparation	7426	9250	8354	8344	5.38
Hired labor	32721	15084	33338	27047	17.42
Seed	2749	2400	1208	2119	1.37
Cow dung	2090	0	267	786	0.51
Urea	1893	1701	1617	1737	1.12
TSP	2468	2906	2925	2766	1.78
DAP	0	0	1208	403	0.26
MoP	897	679	720	765	0.49
Gypsum	912	0	0	304	0.20
Irrigation	3834	0	3000	2278	1.47
Pesticides	3174	2113	5742	3676	2.37
Sub-total	58223	34133	58378	50245	32.37
Interest on operating capital	10480	6144	10508	9044	5.83
<b>Total variable cost</b>	<b>126926</b>	<b>74409</b>	<b>127265</b>	<b>109533</b>	<b>70.56</b>
<b>Fixed cost</b>					
Family labor	32721	42844	34281	36615	23.59
Land use cost	8258	8732	10244	9078	5.85
<b>Total fixed cost</b>	<b>40979</b>	<b>51576</b>	<b>44526</b>	<b>45693</b>	<b>29.44</b>
<b>Total cost</b>	<b>167905</b>	<b>125985</b>	<b>171790</b>	<b>155227</b>	<b>100.00</b>

## 6.9.2 Financial profitability of mustard cultivation

Table 6.23 provides the per hectare returns of mustard cultivation in Feni, Jhalokati, and Bhola districts. The per hectare average yield of mustard was 2.47 MT while it was highest in Jhalokati (3.07 MT) and lowest was in Bhola (2.47 MT). The average selling price of mustard at the farm level was Tk. 77.69 per kg. Among the three districts, the farmers of Feni received the highest price (Tk. 85.5 per kg) while the farmers of Jhalokati got the lowest average price of mustard (Tk. 73.13 per kg). The average gross return and gross margin was Tk. 2,17,350 and Tk. 1,07,817 respectively for one hectare of mustard cultivation. Besides, the per hectare average net return was Tk. 62,124 which was found to be the highest in Jhalokati (Tk. 98,524) followed by Feni (Tk. 75,770) and Bhola (Tk. 12,077). The average Benefit Cost Ratio (BCR) on total cost basis was 1.43 of which the lowest BCR was found in Bhola (1.07) while the highest BCR was 1.78 in Jhalokati (Table 6.23). The average cost of one kg of mustard cultivation was Tk. 23.59.

Table 6.23: Per hectare returns (Tk.) from mustard cultivation

Particulars	Districts			
	Feni	Jhalokathi	Bhola	All
Yield (MT/ha)	2.85	3.07	2.47	2.80
Price (Tk./kg)	85.50	73.13	74.44	77.69
Gross return (GR)	243675	224509	183867	217350
Total variable cost (TVC)	126926	74409	127265	109533
Total fixed cost (TFC)	40979	51576	44526	45693
Total cost (TC)	167905	125985	171790	155227
Gross margin (GR-TVC)	116749	150100	56602	107817
Net return (GR-TC)	75770	98524	12077	62124
BCR over total cost (GR/TC)	1.45	1.78	1.07	1.43
Cost of production (Tk./kg)	19.53	26.93	24.31	23.59

## 6.9.3 Problems faced by the farmers in mustard cultivation

Mustard farmers faced a number of problems in mustard cultivation. The lower germination of mustard seed was a common problem identified by all the farmers of Chattogram, Feni, Jhalokati, and Bhola districts (Table 6.24). The 88% of farmers also opined that they didn't get the BARI released high yielding variety and 78% told that they had to pay higher price for mustard seed. All the mustard farmers opined that higher prices, dealer's syndicate, and adulterated fertilizer were the main problems they faced in case of fertilizer application.

Disease in mustard field causes the sudden reduction of plant growth, white fungus, and roots rot opined by 100% of the farmers. Besides, blight, fruits burst, died of plant, less grain, and color change were some other common diseases found in mustard field in the study areas. Leaf piercing, bird, rat, caterpillar, and aphid were very common insects damaged mustard field accounted for 100% of the surveyed mustard farmers. The higher wage and lack of labor were the main problems of mustard cultivation stated almost all the respondent farmers. The storage of mustard has some problems of which one is bitter taste of oil. Farmers told that long-period stored mustard makes the taste of oil bitter. At the same time, it reduces the oil content in the mustard. In addition, insect infestation, fungal infection, and powdering of mustard seed were found due to store it (Table 6.24).

It is evident that the communication between miller and farmer in the surveyed areas were not strong. Most farmer faced difficulties to sell the mustard. They also faced difficulties in extracting oil for their own consumption due to the limited number or scarcity of machine at the local level. Mustard farmers identified some crucial problems when they wanted to sell their mustard in the market. All the farmers opined that there was no local mustard customer in their locality. Besides the rate of price was fixed mostly by the middlemen who came inside the village to buy mustard and there was no option of bargaining. Some other

market related problems included lower price, trader's syndicate, and higher transport cost as mentioned by almost all the respondent farmers in the study areas (Table 6.24).

Table 6.24: Problems faced by the farmers in mustard cultivation

Particulars	Farmers responded (%)			
	Chattogram/Feni	Jhalokati	Bhola	All
<b>Seed related</b>				
Lower germination	100	100	100	100
Lack of BARI variety seed	85	90	88	88
Higher prices of seed	90	70	75	78
<b>Fertilizer related</b>				
Higher price of fertilizer	100	100	100	100
Dealers syndicate	100	100	100	100
Adulterated fertilizer	100	100	100	100
Wet fertilizer	65	55	70	63
<b>Disease related</b>				
Sudden reduction of plant growth	100	100	100	100
White fungus	100	100	100	100
Roots rot	100	100	100	100
Blight	99	87	86	91
Fruits burst	85	90	90	88
Die of plant	85	90	90	88
Less grain	75	76	80	77
Color changes of leaf	45	49	55	50
<b>Insect/rat/bird related</b>				
Leaf piercing	100	100	100	100
Bird	100	100	100	100
Rat	100	100	100	100
Cater pillar	100	100	100	100
Aphid	100	100	100	100
Fruits piercer	92	87	86	88
Red pumpkin beetle	75	76	80	77
Grasshoppers	65	55	76	65
Scorpion	65	66	65	65
Jab	65	66	65	65
<b>Labour related</b>				
Higher wages	100	100	100	100
Lack of labor in harvesting time	100	100	100	100
<b>Store related</b>				
Bitter oil	100	100	100	100
Fungal infection	100	100	100	100
Storing reduce oil content	100	100	100	100
Insects infestation	100	100	100	100
Becomes powder	75	78	75	76
<b>Processing related</b>				
No connection with miller	100	100	100	100
Lack of enough oil extracting machine	100	100	100	100

High processing cost	75	76	80	77
<b>Marketing related</b>				
No local customer	100	100	100	100
Price rate is fixed by traders	100	100	100	100
Lower price	100	100	100	100
Trader's syndicate	100	100	100	100
Higher transport cost	70	83	69	74

## 6.10 Financial Profitability of Sunflower Cultivation

### 6.10.1 Total cost of sunflower cultivation

The total cost of sunflower cultivation has been enumerated in Table 6.25. It includes variable cost and fixed cost. Variable cost includes the cost of land preparation, hired labor, seed/seedlings, manure, fertilizers, irrigation, pesticides, and interest on operating capital, while fixed cost includes family labor and land use cost. Table 6.25 shows that the per hectare average total variable cost of sunflower cultivation was Tk. 1,67,768, which is accounted for 73.35% of total cost. The highest cost incurred for hired labor (9.24%) and the lowest was for magnesium application (0.01%). On the other hand, the per hectare average total fixed cost of sunflower cultivation was Tk. 60,944 accounted for 26.65% of the total cost.

Table 6.25: Per hectare cost (Tk.) of sunflower cultivation

Particulars	Districts			All	% of total cost
	Barguna	Patuakhali	Noakhali		
<b>Variable cost</b>					
Land preparation	10969	10745	10268	10661	4.66
Hired labor	32773	24242	6356	21124	9.24
Seed	10308	12856	14732	12632	5.52
Cow dung	287	630	71	330	0.14
Compost	1244	0	0	415	0.18
Urea	2445	3128	2589	2721	1.19
TSP	3093	3633	3951	3559	1.56
DAP	805	1016	2188	1336	0.58
MoP	1255	1354	3326	1978	0.86
Gypsum	141	33742	978	11620	5.08
Boron	0	303	0	101	0.04
Zinc sulphate	77	40	0	39	0.02
Magnesium	51	0	0	17	0.01
Zinc	0	0	429	143	0.06
Irrigation	6705	4596	6071	5791	2.53
Pesticides	6359	3990	3125	4491	1.96
Sub-total	76512	100277	54084	76958	33.65
Int. on operating capital	13772	18050	9735	13852	6.06
<b>Total variable cost</b>	<b>166797</b>	<b>218603</b>	<b>117902</b>	<b>167768</b>	<b>73.35</b>
<b>Fixed cost</b>					
Family labor	64304	34790	37388	45494	19.89
Land use cost	14476	6923	24949	15450	6.76
<b>Total fixed cost</b>	<b>78780</b>	<b>41713</b>	<b>62338</b>	<b>60944</b>	<b>26.65</b>
<b>Total cost</b>	<b>245576</b>	<b>260317</b>	<b>180240</b>	<b>228711</b>	<b>100.00</b>

### 6.10.2 Financial profitability of sunflower cultivation

Table 6.26 provides the per hectare returns of sunflower cultivation in the study areas. The average yield of sunflower was 2.23 MT/ha, while it was highest in Barguna (2.64 MT/ha) and lowest was in Noakhali (1.70 MT/ha). The average selling price of sunflower at the farm level was Tk. 119.7 per kg. Among the three districts, the farmers of Barguna received the highest price (Tk. 136.5 per kg) while the farmers of Noakhali got the lowest average price of sunflower (Tk. 108.0 per kg). The average gross return and gross margin was Tk. 2,71,393 and Tk. 1,03,626 respectively for one hectare of sunflower cultivation. Besides, per hectare average net return was Tk. 42,682, which was found to be the highest in Barguna (Tk. 1,14,784) followed by Patuakhali (Tk. 9,903) and Bhola (Tk. 3,360). The average Benefit Cost Ratio (BCR) on total cost basis was 1.17 of which the lowest BCR was found in Noakhali (1.02) and the highest BCR was 1.47 in Barguna (Table 6.26). The average cost of sunflower cultivation was Tk. 36.63/kg.

Table 6.26: Per hectare returns (Tk.) from sunflower cultivation

Particulars	Districts			
	Barguna	Patuakhali	Noakhali	All
Yield (MT/ha)	2.64	2.36	1.70	2.23
Price (Tk./kg)	136.5	114.5	108.0	119.7
Gross return (GR)	360360	270220	183600	271393
Total variable cost (TVC)	166797	218603	117902	167768
Total fixed cost (TFC)	78780	41713	62338	60944
Total cost (TC)	245576	260317	180240	228711
Gross margin (GR-TVC)	193563	51617	65698	103626
Net return (GR-TC)	114784	9903	3360	42682
BCR over total cost (GR/TC)	1.47	1.04	1.02	1.17
Cost of production (Tk./kg)	30.08	37.71	42.09	36.63

### 6.10.3 Problems faced by the farmers in sunflower cultivation

The problems of sunflower cultivation in Barguna, Patuakhali and Noakhali district were presented in Table 6.27. A plethora of problems were found from farm level of which seed related problems include the higher prices of seed, lower germination, and the lack of HYV seed as mentioned by 100%, 78%, and 88% of the respondent sunflower farmers. Higher price, dealer's syndicate, and adulterated fertilizer were the most crucial problems in the case of applying fertilizer. Sunflower field was infested by many diseases as shown in Table 6.27. Most farmers mentioned three common diseases viz. tobacco streak virus, leaves curl, and necrosis diseases. Besides, drying of flowers, yellow color and drying of leaf and plant, dumping off, root rot, etc. were some other common diseases found in the study areas.

Pigeon and parrot caused significant damages to the sunflower as opined by the majority of farmers. Different insects such as caterpillar, white spider, and white flies were also mentioned by 100% of the surveyed sunflower farmers. Sunflower field also affected by aphid, red pumpkin beetle, wasp, grasshoppers, majra, and scorpion. Labor related problems included higher wage and crisis during harvesting time opined by all the farmers of the above three districts. The storage of sunflower has several problems. The most well-known problem was bitter taste of oil if farmer stored sunflower for a longer period (Table 6.27).

Most respondent farmers in the study areas wanted to process and extract oil from sunflower commercially. But they told about the poor demand of sunflower oil in their locality. Besides, there is oil extracting machine specially for sunflower. If they want to extract oil from sunflower, they have to do it in the mustard oil extracting machine. Farmer also told about the lower price of oil. Sunflower farmers had to face a number of problems regarding selling the sunflower as a seed or as oil due to a number of reasons such as

very poor local demand, lower prices of oil, no established national market, and lack of market functionaries in their area (Table 6.27).

Table 6.27: Problems faced by the farmers in sunflower cultivation

Particulars	Farmers responded (%)			
	Barguna	Patuakhali	Noakhali	All area
<b>Seed related</b>				
Higher prices of seed	100	100	100	100
Lack of HYV seed	85	90	88	88
Lower germination	90	70	75	78
<b>Fertilizer related</b>				
Higher price	100	100	100	100
Dealer's syndicate	100	100	100	100
Adulterated fertilizer	100	100	100	100
Wet fertilizer	65	55	70	63
Not available in time	45	49	55	50
<b>Disease related</b>				
Tobacco streak virus	100	100	100	100
Leafs curl	100	100	100	100
Necrosis disease	100	100	100	100
Dying flowers	100	95	97	97
Yellow color and drying leaf	99	87	86	91
Yellow color and drying plant	85	90	90	88
Dumping off	85	90	90	88
Root rot	85	79	85	83
Yellow and drying fruit	75	76	80	77
Spotted leaves	75	79	65	73
Stem rot	45	49	55	50
<b>Insects and pests related</b>				
Pigeon	100	100	100	100
Bird (parrot)	100	100	100	100
Cater pillar	100	100	100	100
White spider	100	100	100	100
White flies	100	100	100	100
Aphid	76	89	80	82
Red pumpkin beetle	76	72	77	75
Wasp	65	67	72	68
Grasshoppers	65	55	76	65
Majra	65	66	65	65
Scorpion	54	52	50	52
<b>Labor related</b>				
Higher wages	100	100	100	100
Crisis during harvesting time	100	100	100	100
<b>Storage related</b>				
Bitter taste of oil	100	100	100	100
Insect infestation	100	100	100	100
Fungal infection	100	100	100	100
No knowledge on advanced storing	100	100	100	100
Germination	65	55	70	63

Ants	65	66	65	65
<b>Processing related</b>				
No local market for oil	100	100	100	100
Absence oil extracting machine	100	100	100	100
Lower prices of oil	100	100	100	100
Lack of advanced mechanism	85	79	85	83
Processing method unknown	95	99	95	96
<b>Marketing related</b>				
Very poor local demand	100	100	100	100
Lower prices of oil	100	100	100	100
No established national market	100	100	100	100
Lack of market functionaries	100	100	100	100

## 6.11 Financial Profitability of Tomato

### 6.11.1 Total cost of tomato cultivation

The total cost of tomato cultivation in the study areas has been enumerated in Table 6.28. It includes variable cost and fixed cost. The variable cost included the cost of land preparation, hired labor, seed/seedlings, manure, fertilizers, irrigation, pesticides, and interest on operating capital, while the fixed cost included family labor and land use cost. Table 6.28 reveals that the average total variable cost of tomato cultivation was Tk. 34,3871 per hectare, which is accounted for 71.19% of total cost of tomato cultivation. The highest cost incurred for hired labor (9.38%) and the lowest cost was for magnesium application (0.06%). On the other hand, the per hectare average total fixed cost was estimated at Tk. 1,39,170, which was 28.81% of the total cost of tomato cultivation.

Table 6.28: Per hectare cost (Tk.) of tomato cultivation

Particulars	Districts			All	% of total cost
	Satkhira	Bagerhat	Noakhali		
<b>Variable cost</b>					
Land preparation	8930	8325	11775	9677	2.00
Hired labor	40476	40476	54994	45315	9.38
Seedlings	15877	21670	23218	20255	4.19
Cow dung	12863	687	1126	4892	1.01
Compost	0	4350	200	1517	0.31
Urea	4959	8771	7210	6980	1.44
TSP	7379	17275	20747	15134	3.13
DAP	6866	2648	4593	4702	0.97
MoP	2574	3992	1516	2694	0.56
Gypsum	1559	8753	2350	4221	0.87
Boron	1128	2445	360	1311	0.27
Zinc sulphate	297	2470	380	1049	0.22
Magnesium	0	880	0	293	0.06
Zinc	72	1460	0	511	0.11
Irrigation	9743	4420	10550	8238	1.71
Fencing/Macha	0	3575	2500	2025	0.42
Pesticides	36124	35855	14800	28926	5.99
Sub-total	148848	168051	156318	157739	32.66
Interest on operating capital	26793	30249	28137	28393	5.88

Total variable cost	324488	366351	340773	343871	71.19
Fixed cost					
Family labor	31714	162384	145875	113324	23.46
Land use cost	38158	21319	18058	25845	5.35
Total fixed cost	69872	183704	163933	139170	28.81
Total cost	394360	550055	504706	483040	100.00

### 6.11.2 Financial profitability of tomato cultivation

The per hectare returns from tomato cultivation in Satkhira, Bagerhat, and Noakhali districts are in Table 6.29. The average yield of tomato was 44.65 MT per hectare, while it was the highest in Bagerhat (51.94 MT/ha) and the lowest was in Noakhali (32.67 MT/ha). The average selling price of tomato at farm level was Tk. 17.55/kg. Among the study areas, the farmers of Bagerhat received the highest price (Tk. 20.43 per kg), while the farmers of Satkhira got the lowest average price of tomato (Tk. 14.93 per kg). The average gross return and gross margin was estimated at Tk. 7,87,498 and Tk. 4,43,628 respectively for one hectare of tomato cultivation. Besides, the average net return from tomato cultivation was Tk. 3,04,458/ha, which was found to be the highest in Bagerhat (Tk. 5,11,079/ha) followed by Satkhira (Tk. 3,42,137/ha) and Noakhali (Tk. 60,158/ha). The average Benefit Cost Ratio (BCR) on total cost basis was 1.64 of which the lowest BCR was found in Noakhali (1.12), while the highest BCR was 1.87 in Satkhira (Table 6.29). The average cost of one kg of tomato cultivation was Tk. 9.68.

**Table 6.29: Per hectare returns (Tk.) from tomato cultivation**

Particulars	Districts			
	Satkhira	Bagerhat	Noakhali	All area
Yield (MT/ha)	49.33	51.94	32.67	44.65
Price (Tk./kg)	14.93	20.43	17.29	17.55
Gross return (GR)	736497	1061134	564864	787498
Total variable cost (TVC)	324488	366351	340773	343871
Total fixed cost (TFC)	69872	183704	163933	139170
Total cost (TC)	394360	550055	504706	483040
Gross margin (GR-TVC)	412008	694783	224092	443628
Net return (GR-TC)	342137	511079	60158	304458
BCR over total cost (GR/TC)	1.87	1.93	1.12	1.64
Cost of production (Tk./kg)	8.14	8.06	12.84	9.68

### 6.11.3 Problems faced by the farmers in tomato cultivation

The problems of tomato cultivation in Chattogram, Feni, Satkhira, Bagerhat, Noakhali, and Laxmipur districts of Bangladesh are shown in Table 6.30. The lower germination of seed was the common problem of all the farmers of the surveyed districts. Besides, 88% of them mentioned that they did not get enough BARI variety seed in the market and seed seller demands higher prices from them. Fertilizer related problems included dealer's syndicate, adulteration, and higher price opined by 100%, 100%, and 69% of the tomato farmers. A number of diseases attacked tomato field of which all the surveyed farmers opined that three diseases namely tomato yellow leaf curl virus, *Alternariasolani* fungus, and spotted leaf were very common to them. Besides, the early blight and fruit rot of tomato mentioned by 91% of the farmers of surveyed districts.

Bird was the main enemy of tomato field as indicated by all the farmers. At the same time, 100% of the farmers mentioned some other insects such as caterpillar, white spider, white flies, fruit, and leaf piercer in the tomato field. The higher wage and lack of labor in harvesting time were the major two problems in the case of labor related problems in all the surveyed districts for tomato cultivation. All the farmers demand

cold storage for storing their produce and selling them in the future, as they had to sell at lower prices in the peak period. Even in the peak period sometimes, prices turned to as much lower that they did not harvest tomato from the field. Color changes and rotten of tomato were also very common due to storing as opined by 92% and 76% of the farmers. Besides, all the farmers told that they had no linkage with the commercial processor such as PRAN or Square, while 82% of the farmers told that they had very limited knowledge about commercial processing (Table 6.30).

The marketing of tomato included a plethora of problems of which falling of prices in the peak harvesting season, lower average price, and trader's syndicate were the major one as opined by 100% of the surveyed tomato farmers. Besides 74% of the farmers stated that tomato had a higher post-harvest loss and this is due to the lack of suitable transport and damaged road. Most of the respondent farmers (72%) told that they had to give 2-4 kg of tomato extra against 40 kg of tomato to the traders (*Beparis*). At the same time, 60% of the farmer told that sometimes they did not get enough traders if the weather turned bad (Table 6.30).

Table 6.30: Problems faced by the farmers in tomato cultivation

Particulars	Farmers responded (%)			
	Chattogram/ Feni	Satkhira/ Bagherhat	Noakhali/ Laxmipur	All area
<b>Seed/Saplings related</b>				
Lower germination	100	100	100	100
Lack of BARI variety seed	85	90	88	88
Higher prices of seed	90	90	85	88
Rotten after sowing	65	55	70	63
Not available in time	30	30	30	30
<b>Fertilizer related</b>				
Dealer's syndicate	100	100	100	100
Adulteration	100	100	100	100
Higher price	65	74	68	69
Wet fertilizer	65	69	65	66
Not available in time	65	55	70	63
Artificial crisis	45	55	50	50
<b>Disease related</b>				
Tomato yellow leaf curl virus	100	100	100	100
Alternaria solani fungus	100	100	100	100
Spotted leaf	100	100	100	100
Early blight	99	87	86	91
Fruit rot	99	87	86	91
Sudden died of the whole plants	85	90	90	88
Red and drying plant	75	76	80	77
Blossom drop	74	75	77	75
Red rust	55	58	62	58
Dumping off and root rot	55	58	62	58
<b>Insects and Pests related</b>				
Bird	100	100	100	100
Cater pillar	100	100	100	100
White spider	100	100	100	100
White flies	100	100	100	100
Fruits piercer	100	100	100	100
Leaf piercer	100	100	100	100

Aphid	88	77	80	82
Cutworms	83	75	80	79
Wasp	76	72	77	75
Red pumpkin beetle	65	67	72	68
Grass hopper	65	55	76	65
Mazra insects	65	66	65	65
Green peach aphid	65	66	65	65
<b>Labor related</b>				
Higher wages	100	100	100	100
Lack of labor in harvesting time	100	100	100	100
<b>Store related</b>				
Absence of cold storage	100	100	100	100
Color changes	95	90	90	92
Rotten	76	75	77	76
<b>Processing related</b>				
No linkage with the processor	100	100	100	100
Lack of technical knowledge	81	85	80	82
<b>Marketing related</b>				
Prices fall during the peak harvesting season	100	100	100	100
Lower average price	100	100	100	100
Traders syndicates	100	100	100	100
Lack of suitable transport and good road to reduce post-harvest loss	70	83	69	74
High transport cost	75	68	79	74
Very low demand in the peak season	77	60	85	74
Weight problems	70	75	70	72
Lack of traders during bad weather	65	56	60	60
Very poor local customer	45	32	38	38

## 6.12 Financial Profitability of Potato

### 6.12.1 Total cost of potato cultivation

The total cost of potato cultivation in Chattogram and Satkhira districts has been enumerated in Table 6.31. It includes variable cost and fixed cost. Variable cost includes the cost of land preparation, hired labor, seed/seedlings, manure, fertilizers, irrigation, pesticides, and interest on operating capital, while the fixed cost includes family labor and land use cost. Table 6.31 reveals that the per hectare average total variable cost of potato cultivation was Tk. 3,60,154 which is accounted for 81.55% of total cost. The highest cost incurred for hired labor (10.13%) and the lowest was for the cost of magnesium application (0.04%). On the other hand, the average total fixed cost of potato cultivation was Tk. 81,479/ha that accounted for 18.45% of the total cost cultivation.

Table 6.31: Per hectare cost (Tk.) of potato cultivation

Particulars	Districts		All area	% of total cost
	Chattogram	Satkhira		
<b>Variable cost</b>				
Land preparation	15954	15458	15706	3.56
Hired labor	44947	44552	44749	10.13
Seed	22412	43183	32798	7.43
Cow dung	14549	7437	10993	2.49
Compost	89	100	94	0.02
Urea	5092	5493	5292	1.20
TSP	7851	9897	8874	2.01
DAP	333	6488	3411	0.77
MoP	2555	4146	3350	0.76
Gypsum	14463	2571	8517	1.93
Boron	196	4258	2227	0.50
Zinc sulphate	0	600	300	0.07
Magnesium	333	0	167	0.04
Zinc	0	846	423	0.10
Irrigation	17500	7717	12608	2.85
Pesticides	14480	16917	15698	3.55
Sub-total	160754	169662	165208	37.41
Interest on operating capital	28936	30539	29737	6.73
<b>Total variable cost</b>	<b>350444</b>	<b>369863</b>	<b>360154</b>	<b>81.55</b>
<b>Fixed cost</b>				
Family labor	60931	67911	64421	14.59
Land use cost	8872	25244	17058	3.86
<b>Total fixed cost</b>	<b>69803</b>	<b>93155</b>	<b>81479</b>	<b>18.45</b>
<b>Total cost</b>	<b>420247</b>	<b>463019</b>	<b>441633</b>	<b>100.00</b>

### 6.12.2 Financial profitability of potato cultivation

Table 6.32 provides the per hectare returns of potato cultivation in Chattogram and Satkhira districts. It is evident that the per hectare average yield of potato was 27.40 MT, while it was highest in Satkhira (28.11 MT) and lowest was in Chattogram (26.69 MT). The average selling price of potato at the farm level was Tk. 22.75 per kg of potato. The farmers of Chattogram received the highest price (Tk. 28.0 per kg), while the farmers of Satkhira got the lowest average price of potato (Tk. 17.5 per kg). The average gross return and gross margin was Tk. 6,19,623 and Tk. 2,59,469 respectively for one hectare of potato cultivation. Besides, the per hectare average net return was Tk. 1,77,990 which was found to be the highest in Chattogram (Tk. 3,27,073) followed by Satkhira (Tk. 28,906). The average Benefit Cost Ratio (BCR) on total cost basis was 1.42 of which the lowest BCR was found in Satkhira (1.06) while the highest BCR was 1.78 in Chattogram (Table 6.32). The average cost of one kg of potato cultivation was Tk. 7.31.

Table 6.32: Per hectare returns (Tk.) from potato cultivation

Particulars	Districts		
	Chattogram	Satkhira	All
Yield (MT/ha)	26.69	28.11	27.40
Price (Tk./kg)	28.00	17.50	22.75
Gross return (GR)	747320	491925	619623
Total variable cost (TVC)	350444	369863	360154
Total fixed cost (TFC)	69803	93155	81479
Total cost (TC)	420247	463019	441633
Gross margin (GR-TVC)	396876	122062	259469
Net return (GR-TC)	327073	28906	177990
BCR over total cost (GR/TC)	1.78	1.06	1.42
Cost of production (Tk./kg)	7.57	7.04	7.31

### 6.12.3 Problems faced by the farmers in potato cultivation

The potato farmers of Chattogram and Satkhira districts faced a number of problems, which is shown in Table 6.33. All the farmers mentioned adulterated seed and lower germination as common seed related problems in potato cultivation, while the higher price and rotten of seed after sowing were identified by 90% and 60% of surveyed potato farmers respectively. Fertilizer related problems included dealer's syndicate, adulteration and had to pay higher prices other than the government fixed prices. A number of diseases were found in the potato field as mentioned by the surveyed potato farmers. Potato leaf roll virus, late blight, early blight, and violet root rot were some of the dangerous diseases that affect potato field of surveyed districts. Besides, more than 90% of the farmers told about the presence of another two crucial diseases viz. pink rot and pythium leak and black dot (Table 6.33).

The insects of potato included potato leafhopper, green potato bug, caterpillar, and potato flea beetle found by all the surveyed potato farmers. Farmer also defined rat as their main enemy in the potato field. Besides, nematode, stem borer, jassids, aphid, cutworms, thrips, and potato weevil were some other insects cause significant economic losses of potato. Labor related problems included the higher wage and lack of workers in harvesting time as opined by all the potato farmers in the surveyed districts. Potato farmer had to face a rotten problem in the case of storing potato for future home consumption or selling. They opined that due to the absence of cold storage they have no option to store potato rather they have to sell it even the price is low. Most of the potato farmers (86%) mentioned that they have no knowledge about commercial processing. If they got this option then it will be highly advantages for them (Table 6.33).

The marketing of potato involved a lot of problems of which lower price, trader's syndicate and the sudden fall of prices during peak season were opined by all the surveyed farmers, while higher transport cost, limited local customer, lack of transport, and weight problem were mentioned by 77%, 73%, 61%, and 59% of the total surveyed potato farmers of Chattogram and Satkhira district respectively (Table 6.33).

Table 6.33: Problems faced by the farmers in potato cultivation

Particulars	Farmer responded (%)		
	Chattogram	Satkhira	All area
<b>Seed related</b>			
Adulterated seed	100	100	100
Lower germination	100	100	100
Higher prices	90	90	90
Rotten after sowing	65	55	60
<b>Fertilizer related</b>			
Dealer's syndicate	100	100	100
Adulterated fertilizer	100	100	100
Higher price	65	74	70
<b>Disease related</b>			
Potato leaf roll virus	100	100	100
Late blight	100	100	100
Early blight	100	100	100
Violet root rot	100	100	100
Pink Rot and Pythium Leak	99	87	93
Black dot	99	87	93
Silver Scurf	85	90	88
Potato virus Y	85	88	87
Stem rot	74	75	75
Common scab	65	85	75
Black Scurf and Rhizoctonia Canker	55	58	57
<b>Insects and Pests related</b>			
Potato leafhopper	100	100	100
Rat	100	100	100
Green potato bug	100	100	100
Cater pillar	100	100	100
Potato flea beetle	100	100	100
Nematode	95	90	93
Stem borer	75	72	74
Jassids	65	70	68
Aphid	55	58	57
Cutworms	55	50	53
Thrips	39	34	37
Potato weevil	12	16	14
<b>Labor related</b>			
Higher wages	100	100	100
Lack of workers in harvesting season	100	100	100
<b>Store related</b>			
Rotten	100	100	100
Lack of cold storage	100	100	100
Insects infestation	95	90	93
White fungus	40	35	38
Limited knowledge on advanced system	15	14	15
<b>Processing related</b>			

No knowledge about commercial processing	85	88	86
<b>Marketing related</b>			
Lower price	100	100	100
Traders syndicates	100	100	100
Sudden fall of prices during peak season	100	100	100
Higher transport cost	70	83	77
Limited local customer	70	75	73
Lack of enough transport to carry in Upazila or district level	65	56	61
Weight problem	55	62	59

### 6.13 Financial Profitability of Felon

#### 6.13.1 Total cost of felon cultivation

The total cost of felon cultivation in the study areas is shown in Table 6.34. The total cost of production consists of variable cost and fixed cost. Variable cost included the cost of land preparation, hired labor, seed, manure, fertilizers, irrigation, pesticides, and interest on operating capital, while fixed cost included family labor and land use cost. The average total variable cost of felon cultivation was Tk. 65,246 per hectare which is accounted for 44.13% of total cost. The highest cost incurred for hired labor (9.83%) and the lowest cost was for gypsum application (0.09%). On the other hand, the per hectare average total fixed cost of felon cultivation was estimated at Tk. 82,609 accounted for 55.87% of the total cost of felon cultivation (Table 6.34).

Table 6.34: Per hectare cost (Tk.) of felon cultivation

Particulars	Districts				% of total cost
	Chattogram	Feni	Lakshmipur	All	
<b>Variable cost</b>					
Land preparation	7302	6188	6484	6658	4.50
Hired labor	16684	6032	20895	14537	9.83
Seed	2982	2392	3824	3066	2.07
Cow dung	344	1006	194	515	0.36
Urea	375	344	348	356	0.24
TSP	496	348	2801	1215	0.82
DAP	4	42	1187	411	0.28
MoP	60	162	842	355	0.24
Gypsum	133	0	268	134	0.09
Irrigation	343	1044	0	462	0.31
Pesticides	1693	1318	3574	2195	1.49
Sub-total	30416	18883.10526	40488.42	29929	20.25
Interest on operating capital	5475	3399	7288	5387	3.65
<b>Total variable cost</b>	66307	41165	88265	65246	44.13
<b>Fixed cost</b>					
Family labor	64528	76327	65431	68762	46.51
Land use cost	8682	7802	25057	13847	9.37
<b>Total fixed cost</b>	73211	84129	90488	82609	55.87
<b>Total cost</b>	139518	125294	178752	147855	100.00

### 6.13.1 Financial profitability of felon cultivation

The per hectare returns of felon cultivation in Chattogram, Feni and Laxmipur districts are shown in Table 6.35. The per hectare average yield of felon was 2.96 MT, while it was highest in Laxmipur (3.09 MT) and lowest was in Feni (2.84 MT). The average selling price of felon at the farm level was Tk. 68.15/kg. The farmers of Feni received the highest price (Tk. 70.8 per kg), while the farmers of Laxmipur got the lowest average price of felon (Tk. 64.35 per kg). The average gross return and gross margin was Tk. 2,01,459 and Tk. 1,36,214 respectively for one hectare of felon cultivation. Besides, the per hectare average net return was Tk. 53,605 which was found to be the highest in Feni (Tk. 75,778) followed by Chattogram (Tk. 64,947) and Laxmipur (Tk. 20,089). The average Benefit Cost Ratio (BCR) on total cost basis was 1.39 of which the lowest BCR was found in Laxmipur (1.11), while the highest BCR was 1.60 in Chattogram (Table 6.35). The average cost of one kg of felon cultivation was Tk. 28.03.

Table 6.35: Per hectare returns (Tk.) from felon cultivation

Particulars	Districts			
	Chattogram	Feni	Lakshmipur	All
Yield (MT/ha)	2.95	2.84	3.09	2.96
Price (Tk./kg)	69.31	70.8	64.35	68.15
Gross return (GR)	204465	201072	198842	201459
Total variable cost (TVC)	66307	41165	88265	65246
Total fixed cost (TFC)	73211	84129	90488	82609
Total cost (TC)	139518	125294	178752	147855
Gross margin (GR-TVC)	138158	159907	110577	136214
Net return (GR-TC)	64947	75778	20089	53605
BCR over total cost (GR/TC)	1.47	1.60	1.11	1.39
Cost of production (Tk./kg)	32.55	26.00	25.54	28.03

### 6.13.3 Problems faced by the farmers in felon cultivation

The felon farmers of the study areas encountered multi-dimensional problems during felon cultivation. These problems are presented in Table 6.36. Table 6.36 reveals that the lack of HYV seed and lower germination were the two major seed related problems in the case of felon cultivation in the surveyed districts. Besides, limited supply in the market and the higher price of seed were also mentioned by the respondent felon farmers. Fertilizer related problems included higher price, dealer's syndicate, and adulterated fertilizer as opined by all the felon farmers.

Felon plants were affected by some diseases as opined by the felon farmers. They mentioned some common diseases such as brown and white leaf, leaf curl, anthracnose, and shortened plants. Some other diseases includes burning the plants, stunted growth, goes downhill, black and drying leaf, viral mosaic disease, etc. Table 6.36 further shows that a number of insects in the felon field of which grasshoppers, jassids, aphids, rat, and caterpillar were the major one as told by all the farmers whereas fruit and leaf borer, bird, white flies, and sting bug were mentioned by 65%, 65%, 52%, and 44% of the surveyed felon farmers.

The female workers mainly harvest felon in two to three times. However, getting necessary labor in harvesting time was difficult as all the female labor were busy at that time in different felon field. Most of the time they did not make the three time harvesting due to the lack of labor. Mainly farmer stores felon for family consumption and seed purposes. Two problems were arisen due to storing of felon of which one is fungal infection and another one is color changes of felon as opined by 100% and 63% of the respondents respectively. Farmers had no knowledge on commercial processing of felon. Felon farmer had to face a number of marketing problems, which includes lower market price, lower demand on local market, lack of market functionaries, and lack of market information (Table 6.36).

Table 6.36: Problems faced by the farmers in felon cultivation

Particulars	Farmer responded (%)			
	Chattogram/ Feni	Jhalokati/ Bhola	Noakhali/ Iaxmipur	All areas
<b>Seed related</b>				
Lack of HYV seed	100	100	100	100
Lower germination	100	100	100	100
Limited supply in the market	85	90	88	88
Higher price	90	70	75	78
<b>Fertilizer related</b>				
Higher price fertilizer	100	100	100	100
Dealers syndicate	100	100	100	100
Adulterated fertilizer	100	100	100	100
<b>Disease related</b>				
Brown and white leaf	100	100	100	100
Leaf curl	100	100	100	100
Anthraxnose	100	100	100	100
Shortened plants	100	100	100	100
Burning the plants	100	95	97	97
Stunted growth	99	87	86	91
Goes downhill	99	87	86	91
Black and drying leaf	85	90	90	88
Viral mosaic disease	85	90	90	88
Root rot	75	76	80	77
Yellow and drying leaf	75	76	80	77
Powdery mildew	75	79	65	73
Mycelium fungus	55	58	62	58
Red and drying plants	55	58	62	58
Dumping off and die	45	49	55	50
Stem rot	45	49	55	50
<b>Insects and pest related</b>				
Grasshoppers	100	100	100	100
Jassids	100	100	100	100
Aphids	100	100	100	100
Rat	100	100	100	100
Cater pillar	100	100	100	100
Fruit and leaf borer	65	66	65	65
Bird	65	66	65	65
White flies	54	52	50	52
Sting bug	45	35	52	44
<b>Labor related</b>				
Lack of labor in harvesting time	100	100	100	100
<b>Store related</b>				
Fungal infection	100	100	100	100
Color changes	65	55	70	63
<b>Processing related</b>				
No knowledge or arrangement about commercial processing	100	100	100	100

<b>Marketing related</b>				
Lower price	100	100	100	100
Low demand on local market	100	100	100	100
Lack of market functionaries	70	83	69	74
Lack of market information	65	56	60	60

## 6.14 Financial Profitability of Mungbean

### 6.14.1 Total cost of mungbean cultivation

The total cost of mungbean cultivation in Chattogram, Barguna, and Jhalokati districts has been enumerated in Table 6.37. It includes variable cost and fixed cost. The variable cost includes the cost of land preparation, hired labor, seed, manure, fertilizers, irrigation, pesticides, and interest on operating capital; while fixed cost includes family labor and land use cost. Table 6.37 reveals that the per hectare average total variable cost of mungbean cultivation was Tk. 64173, which is accounted for 65.16% of the total cost of mungbean cultivation. The highest cost incurred for hired labor (16.32%) and the lowest was for cost of DAP application (0.11%). On the other hand, the per hectare average total fixed cost of mungbean cultivation was Tk. 34,300 accounted for 34.84% of the total cost of mungbean cultivation.

Table 6.37: Per hectare cost (Tk.) of mungbean cultivation

Particulars	Districts				% of total cost
	Chattogram	Barguna	Jhalokati	All	
<b>Variable cost</b>					
land preparation	5369	6853	6382	6201	6.30
Hired labor	14321	24001	9880	16067	16.32
Seed	2457	2408	2657	2508	2.55
Cow dung	167	111	0	93	0.09
Urea	357	1200	268	608	0.62
TSP	565	954	383	634	0.64
DAP	0	260	73	111	0.11
MoP	24	256	134	138	0.14
Gypsum	107	271	0	126	0.13
Pesticides	1240	3957	3634	2944	2.99
Sub-total	24620	40281	23411	29437	29.89
Interest on operating capital	4432	7251	4214	5299	5.38
<b>Total variable cost</b>	<b>53672</b>	<b>87812</b>	<b>51036</b>	<b>64173</b>	<b>65.16</b>
<b>Fixed cost</b>					
Family labor	18665	22717	36410	25931	26.34
Land use cost	8670	7704	8732	8369	8.50
<b>Total fixed cost</b>	<b>27335</b>	<b>30422</b>	<b>45143</b>	<b>34300</b>	<b>34.84</b>
<b>Total cost</b>	<b>81007</b>	<b>118234</b>	<b>96179</b>	<b>98473</b>	<b>100.00</b>

### 6.14.2 Financial profitability of mungbean cultivation

Table 6.38 contains the per hectare returns of mungbean cultivation in Chattogram, Barguna, and Jhalokati districts. The average yield of mungbean was 2.92 MT per hectare, while it was highest in Barguna (2.97 MT) and lowest was in Chattogram (2.84 MT). The average selling price of mungbean at the farm level was Tk. 73.06 per kg. The farmers of Chattogram received the highest price (Tk. 83.66/kg), while the farmers of Jhalokati got the lowest average price of mungbean (Tk. 62.67/kg). The average gross return and gross margin was Tk. 2,12,935 and Tk. 1,48,762 respectively for one hectare of mungbean cultivation.

Besides, the per hectare average net return from mungbean cultivation was Tk. 1,14,462 which was found to be the highest in Chattogram (Tk. 1,56,587) followed by Barguna (Tk. 98,101) and Jhalokati (Tk. 88,698). The average Benefit Cost Ratio (BCR) on total cost basis was 2.23 of which the lowest BCR was found in Barguna (1.83), while the highest BCR was 2.93 in Chattogram (Table 6.38). The average cost of one kg of mungbean cultivation was Tk. 23.63.

Table 6.38: Per hectare returns (Tk.) from mungbean cultivation

Particulars	Districts			
	Chattogram	Barguna	Jhalokati	All area
Yield (MT/ha)	2.84	2.97	2.95	2.92
Price (Tk./kg)	83.66	72.84	62.67	73.06
Gross return (GR)	237594.4	216334.8	184876.5	212935
Total variable cost (TVC)	53672	87812	51036	64173
Total fixed cost (TFC)	27335	30422	45143	34300
Total cost (TC)	81007	118234	96179	98473
Gross margin (GR-TVC)	183922	128523	133840	148762
Net return (GR-TC)	156587	98101	88698	114462
BCR over total cost (Gr/TC)	2.93	1.83	1.92	2.23
Cost of production (Tk./kg)	27.93	22.32	20.63	23.63

#### 6.14.3 Problems faced by the farmers in mungbean cultivation

Table 6.39 shows the problems faced by the farmers of the study areas in cultivating mungbean. Problems related to mungbean seed included the lack of BARI variety seed, lower germination, adulterated seed, higher prices of seed, seed rotten after sowing, and chewed seed. The higher prices, absence of government fixed prices, dealer's syndicate, and adulterated fertilizer were some of the common problems as mentioned by all the surveyed mungbean farmers in case of fertilizer application in mungbean (Table 6.39).

A number of diseases affect mungbean field of which early blight, shortened plants, red and drying leaf and powdery mildew were the most common in all the farmers' field. Besides, stunted plant growth and less number of seed were identified by more than 90% of the surveyed farmers. At the same time, 88% of the farmers told about the poorly nourished mungbean pod and brown colored leaf. Different insects as shown in Table 6.39 affect mungbean field. Among these insects, all the farmers listed some common insects such as white spider, beetle, white flies, aphid, bird, and rat. There were some other insects of which grasshoppers, jassids, and borer caterpillar were mentioned by 65%, 58%, 52%, and 52% of the surveyed mungbean farmers. The harvest of mungbean mainly done by the women labor and most of the time farmer had to face difficulties to find necessary labor for picking up mungbean (Table 6.39).

The storage of mungbean has some difficulties. Table 6.39 further shows that some of the problems that farmer faced during storing their mungbean. All the farmers mentioned some basic problems of storing such as insects infestation, become powder, and lack of advanced technology for storing. The problem of storing also includes white fungal infection, rotten, ants, and the changes of color as mentioned by 89%, 67%, 67%, and 63% of the farmers. Mungbean farmers faced various type of problems in selling mungbean from farmhouse or in the market. Problems include lower prices, traders syndicates, low local demand, falling of prices due to bad weather, weight problems etc. These problems opined by all the farmers of surveyed districts. Besides, 74% of the farmers told about that sometime they didn't sell their product or had to sell in lower prices due to lack of enough market functionaries. Moreover, farmer told that they had no connection or linkage with the district level traders, millers, or processors (Table 6.39).

Table 6.39: Problems faced by the farmers of mungbean cultivation

Particulars	Farmer responded (%)			
	Chattogram/ Feni	Barguna/ Bhola	Pirojpur/ Noakhali	All area
<b>Seed related</b>				
Lack of BARI variety seed	100	100	100	100
Lower germination	100	100	100	100
Adulterated seed	85	90	88	88
Higher prices	90	70	75	78
Rotten after sowing	45	64	59	56
Chewed seed	25	30	30	28
<b>Fertilizer related</b>				
Higher price	100	100	100	100
Government fixed prices not available	100	100	100	100
Dealers syndicate	100	100	100	100
Adulterated fertilizer	100	100	100	100
Date expire	28	33	32	31
<b>Disease related</b>				
Early blight	100	100	100	100
Shortened plants	100	100	100	100
Red and drying leaf	100	100	100	100
Powdery mildew	100	100	100	100
Stunted growth	100	95	97	97
Less number of seed	99	87	86	91
Poorly nourished mungbean pod	85	90	90	88
Brown colored leaf	85	90	90	88
Leaf curl	85	79	85	83
Yellow colored leaf	75	76	80	77
Root rot	75	76	80	77
Stem rot	75	76	80	77
Yellow mosaic disease	75	79	65	73
Alternaria blight	75	79	65	73
Rust	45	48	43	45
Dumping off and die	25	31	22	26
<b>Insects and Pests related</b>				
White spider	100	100	100	100
Beetle	100	100	100	100
White flies	100	100	100	100
Aphid	100	100	100	100
Bird	100	100	100	100
Rat	100	100	100	100
Grasshoppers	65	55	76	65
Jassids	54	59	60	58
Borer	54	52	50	52
Cater pillar	54	52	50	52
Weevil	22	25	22	23
Sting bug	12	6	5	8
<b>Labour related</b>				

Lack of labor during harvesting time	100	100	100	100
<b>Store related</b>				
Insects infestation	100	100	100	100
Become powder when stored	100	100	100	100
Lack of advanced storage technology	100	100	100	100
White fungal infection	95	88	85	89
Rotten	65	66	70	67
Ants	60	72	68	67
Color changes	65	55	70	63
<b>Processing related</b>				
No linkage with the miller or big processors	100	100	100	100
<b>Marketing related</b>				
Lower prices	100	100	100	100
Traders syndicates	100	100	100	100
Low demand on local market	100	100	100	100
Prices fall during bad weather	100	100	100	100
Weight problem	100	100	100	100
Lack of enough market functionaries	70	83	69	74
No linkages with district traders or millers or processors	65	56	60	60
Higher transport cost	45	39	41	42
No local customer	45	39	41	42

## CHAPTER VII

### POST-HARVEST PROCESSING AND FARM LEVEL MARKETING OF SELECTED HIGH VALUE CROPS

#### 7.1 Prelude

The overall goal of SACP project is to contribute Bangladesh's agriculture smallholders' responsiveness and competitiveness in high value crop (HVC) production and marketing of fresh and/or processed products, market linkages. The component 2 of this project is processing and marketing of HVC in which one output is developing smallholder farmers' capacity in production and post-production practices. Necessary data and information were collected from selected farmers and relevant stakeholders. Some qualitative data were also collected from field level officials of DAE and different NGOs through KII. The information of this chapter will enable to provide a clear picture on the farm level marketing and post-harvest processing of selected HVCs in SACP project catchment areas.

#### 7.2 Postharvest Activities Practiced by the Farmers

Post-harvest activities started from harvesting of crop and ended to the selling of crop. It means that it starts from the farm level and ended it to the final consumer. The present study found a number of post-harvest activities such as harvesting, cleaning, sorting, grading, improve packaging, storing, and processing (Table 7.1). Post-harvest activities were analyzed based on the farmers' responses. The postharvest activities practiced by the respondent farmers in the southern region of Bangladesh for some selected HVCs. These HVCs included vegetables (bottle gourd, okra, brinjal, cabbage, cauliflower, sweet pumpkin, tomato, cucumber), tuber crops (potato), oil seed crops (groundnut, mustard, soybean, sunflower), pulse crops (grass pea, felon, mungbean), and fruits (mango, guava, bar, watermelon, muskmelon). The percentages of different post-harvest activities of all these HVCs are shown in Table 7.1 and are described in the following sub-sequent sections.

##### **Bottle gourd**

It is evident from Table 7.1 that almost 94% of the bottle gourd farmers harvested bottle gourd by using knife whereas only 4% of them still harvested by hand. It was found that 99% of the surveyed bottle gourd farmers grade their product. They told that it provides them good market price. It was also found that 95% of them practiced sorting of bottle gourd. Storing of bottle gourd is difficult. But if the weather becomes bad then farmer have to store it for one to two days. Table 7.1 shows that only 5% of them practiced storing of bottle gourd due to bad weather. These farmer did not practicing other post-harvest functions viz. cleaning, improve packaging and processing.

##### **Okra**

Okra farmer harvested by hand as mentioned by 100% of the farmers (Table 7.1). It was found that okra farmers had to do only improve packaging to sell their product. It is evident from the Table 7.1 that 51% of the okra farmers did improved packaging to get a good market price. Okra has no necessary to cleaning, sorting, grading, storing and processing functions.

##### **Brinjal**

Table 7.1 shows that all the farmers harvested their brinjal by hand. They did not use knife as they did not know that knife can be used to harvest brinjal. These farmers have to practice some post harvest functions viz. cleaning, sorting, grading and improve packaging. It was found that 20% of the surveyed brinjal farmers clean their product. Cleaning was done either by water or by dry cloth. Besides, almost all the farmers

(99%) practiced sorting of brinjal and grading was done by 73% of them. In order to get a higher price brinjal farmers packaged the brinjal using improve packaging and this was done by 43% of the farmers.

### Cabbage

Cabbage was harvested through hand (7%) and using knife (93%). Cleaning, sorting and grading were done by the cabbage farmers (Table 7.1) as post harvest functions accounted for 90%, 94% and 99% of the total surveyed farmers. No farmer was found to practice improve packaging, storing and processing.

### Cauliflower

All the cauliflower farmers opined that they harvested cauliflower by using knife as it saves the flower from any damages. After harvesting of cauliflower, farmers practiced cleaning, sorting and grading as mentioned by 91%, 96% and 98% of the farmers respectively. They cleaned through using water and graded based on three different sizes.

Table 7.1: Postharvest activities done by the farmers in southern region of Bangladesh

High Value Crops	Crop harvesting		Postharvest activities (% of farmer responded)					
	By hand	With knife or other materials	Cleaning	Sorting	Grading	Improve packaging	Storing	Processing
<b>Vegetables</b>								
Bottle gourd	4	96	0	95	99	0	5	0
Okra	100	0	0	0	0	51	0	0
Brinjal	100	0	20	99	73	43	0	0
Cabbage	7	93	90	94	99	0	0	0
Cauliflower	0	100	91	96	98	0	0	0
Sweet pumpkin	5	95	16	90	100	0	45	0
Tomato	98	2	74	100	21	67	76	0
Cucumber	91	9	0	47	17	27	0	0
<b>Tuber crops</b>								
Potato	0	100	100	100	33	0	100	0
<b>Oil seed crops</b>								
Groundnut	100	0	100	100	2	0	100	1
Mustard	0	100	100	78	0	0	100	85
Sunflower	0	100	100	87	0	0	100	76
Soybean	100	0	100	100	0	0	83	0
<b>Pulse crops</b>								
Grass pea	100	0	100	100	0	43	100	0
Felon	70	30	100	100	0	39	100	0
Mungbean	100	0	100	100	0	56	100	0
<b>Fruits</b>								
Mango	43	57	0	45	87	13	0	0
Guava	100	0	58	83	91	35	0	0
Bar	0	100	0	23	10	36	0	0
Watermelon	0	100	0	0	0	0	0	0
Muskmelon	0	100	0	28	39	41	0	0

### Sweet pumpkin

Sweet pumpkin farmers harvested by using both the hand and with knife. It was found that 95% of the farmer collected by using knife and the rest 5% still collected through their hand. Cleaning of sweet pumpkin was done by 16% of the farmers through using dry cloth. All the farmers grade sweet pumpkin base on size as the bigger one cast higher price. Sorting was mainly done in ripped sweet pumpkin when

they wanted to store it. The Table 7.1 also shows that 45% of the farmer stored it for future selling or family consumption. Mostly they used dry wood to keep the sweet pumpkin.

### **Tomato**

Almost all the farmers (98%) harvested tomato by hand (Table 7.1) while only 2% of them used knife to harvest it. After harvesting tomato farmer practiced all the post harvest functions of which cleaning was done by 74% of the surveyed farmers. It was done through using water or dry cloth. All the farmers opined that they had to sort tomato while only 21% of them practiced grading. As a significant portion of tomato losses after harvesting so farmer were aware of tomato packaging. The 67% of the surveyed farmers practicing improve packaging. Tomato mainly collected in half ripe or matured stages. This tomato's has to keep in two to three days with a cover before selling. The 76% of the surveyed tomato farmer practiced this type of storing (Table 7.1).

### **Cucumber**

Most of the cucumber farmers (91%) harvested by hand while 9% of them used knife. Among the other post harvest operations 47% of the farmer practiced sorting and 27% practiced improve packaging (Table 7.1). Farmer told that cucumber should not be cleaned. Storing and processing were not done for cucumber while 17% did grading of cucumber in order to get good market price.

### **Potato**

It was found that potato was harvested by hand with the help of plough or spade as mentioned by all the surveyed farmers. Among the other post harvest functions potato farmer practiced cleaning, sorting, grading and storing. All the farmers cleaned and sorted potato while 33% of them practiced grading of potato. Potato mainly stored for future consumption which was done by 100% of the farmer. Farmer did not practice improve packaging for potato and they had no option to process it (Table 7.1).

### **Groundnut**

Table 7.1 shows that farmer harvested groundnut by hand fully. All the farmers practiced cleaning and sorting of groundnut while 2% of them graded their product. It was also found that 100% of the farmers stored groundnut for future selling and for future family consumption. Only 1% of them processed it and this was mainly for family consumption purposes.

### **Mustard**

Mustard was mainly harvested from the field through using sickle or chopper and then it goes under a number of post harvest operations such as cleaning, sorting, storing and processing as opined by 100%, 78%, 100% and 85% of the mustard farmers.

### **Sunflower**

Table 7.1 shows that sunflower was mainly harvested from the field through using sickle or chopper and then it goes under a number of post harvest operations such as cleaning, sorting, storing and processing as opined by 100%, 87%, 100% and 76% of the surveyed sunflower farmers. Farmer processed it mainly for extracting oil for their family consumption.

### **Soybean**

It was found that harvesting of soybean was mainly done by hand pulling and after that it goes under a number of post harvest operations such as cleaning and sorting. These two operations were practiced by all the surveyed soybean farmers in the study area. Besides, farmer stored soybean (83%) for family consumption.

### **Grass pea**

Grass pea was harvested fully by hand as mentioned by all the grass pea farmers. Farmer practiced three post harvest operations mainly for grass pea viz. cleaning, sorting, improve packaging and storing as opined by 100%, 100%, 43% and 100% of the surveyed farmers. Packaging was mainly done for family consumption and for future selling (Table 7.1).

### **Felon**

Table 7.1 shows that 70% of the felon was harvested by hand and the rest 30% was by cutting with sickle or chopper. All the surveyed felon farmers opined that they mainly did three operations to make felon ready for selling or consumption viz. cleaning, sorting and storing. In order to store mungbean, 39% of the farmers used improve packaging.

### **Mungbean**

Ripped mungbean was harvested completely through hand and this was done mainly by the women labors. After harvesting mungbean was cleaned, sorted and stored for future consumption. These operations were done by all the farmers as mentioned in the Table 7.1. At the same time, it was also found that 56% of the farmers used improve packaging to store mungbean for future family consumption and for seed purposes.

### **Mango**

It is evident from the Table 7.1 that 43% of the mango was harvested by hand following by 57% with some other special materials made for mango harvesting. Among the surveyed mango farmer 45% sorted and 87% graded their product. Only 13% of them used improved packaging materials for marketing purposes.

### **Guava**

The entire guava farmer harvested guava by hand (Table 7.1). After collecting guava farmer follow some post harvest operations for making it ready for marketing. Among these operations cleaning, sorting and grading was done by 58%, 83%, and 91% farmers respectively. Besides, 35% of the farmers used improved packaging materials for marketing purposes.

### **Bar**

Bar was mainly harvested through bamboo stick. Sorting, grading and improve packaging was done by 23%, 10% and 36% of the bar farmer as shown in Table 7.1.

### **Watermelon**

Farmer sold watermelon mostly from their field to the bepari/paiker. In this case harvesting was mainly done by this traders and it was by knife or sickle or chopper. After collecting watermelon, it transported to other markets for final consumer. No other post harvest operations were done for watermelon in the survey areas.

### **Muskmelon**

Muskmelon was harvested through using knife or sickle or chopper. Sorting and grading were done by 28% and 39% of the farmer while 41% of them used improve materials for packaging.

## **7.3 Farm Level Keeping System of Selected HVCs**

Table 7.2 shows the farm level keeping system of selected HVCs such as tuber crops, oil seed crops, pulse crops, and fruits in southern region of Bangladesh. Farmer used different media to keep the harvested product either for selling or for storing. It includes open soil, jute mate, plastic triple, bamboo basket, polythene sheet, plastic crate, plastic sack, jute sack, silver bowl, and plastic drum (Table 7.2). The farm

level keeping systems was analyzed by the percentages of farmer's responses on using these media. Farm level keeping system has described as follows:

### **Open soil**

The respondent farmers in the study areas kept some of their produces in many cases on open soil. This was mainly occurred in the case of bottle gourd (49%), sweet potato (60%), tomato (16%), potato (2%), groundnut (2%), mango (23%), watermelon (100%), and muskmelon (8%). Farmer told that they put the aforementioned produces on *Katcha* floor immediate after harvesting.

### **Jute mate**

Jute mate was used for keeping different harvested crops. It is evident that jute mate was used for brinjal, sweet potato, tomato, potato, groundnut, mustard, sunflower, grass pea, felon, mungbean, and muskmelon opined by 80%, 16%, 26%, 33%, 100%, 43%, 100%, 58%, 67%, 51%, and 3% respectively (Table 7.2).

### **Plastic triple**

Plastic triple was one of the popular keeping materials in southern region of Bangladesh. It was used by different farmers to keep brinjal, cauliflower, tomato, cucumber, potato, groundnut, mustard, sunflower, soybean, grass pea, mungbean, mango, guava, bar, and muskmelon in the survey areas.

### **Bamboo basket**

Bamboo basket was mainly used for keeping soybean, mango, guava, and muskmelon as opined by 9%, 12%, 57%, and 12% of the surveyed farmers respectively.

### **Polythene sheet**

Polythene sheet was used in keeping cabbage, sweet pumpkin, tomato, and cucumber just after harvesting. Besides, some oil seed crops such as mustard, sunflower, and soybean were also kept initially on polythene sheet. It was also found that mango, guava, and bar were kept in polythene sheet that accounted for 47%, 35%, and 21% of the surveyed farmers respectively (Table 7.2).

### **Plastic crate**

Plastic crate was used mostly for keeping fruits and vegetables. Table 7.2 shows that the respondent farmers in the study areas used plastic crates for keeping, storing and marketing of okra, brinjal, tomato, and cucumber. It was also used to keep mango (39%), guava (63%), and bar (48%).

### **Plastic sack**

Plastic sack is a popular and most used keeping material in the southern region of Bangladesh. A wide range of crops were kept and stored in plastic sack. It was found that all kinds of vegetables except tomato were kept in plastic sack as shown in Table 7.2. Besides, 33% of farmers used it for keeping potato. Besides, all the surveyed oil seed and pulse crops were kept mostly in plastic sack.

### **Jute sack**

Due to higher price and perishable feature jute sack was not used so much at farm level. This was mainly used for keeping potato as opined by 100% of the surveyed potato farmers.

### **Silver bowl**

Silver bowl was mainly used as temporary keeping material. Table 7.2 shows that the farmers of okra, tomato, and cucumber used silver bowl to collect and temporary keeping their harvested produces. But a significant number of oil seed farmers such as groundnut, mustard, sunflower, and soybean used it for keeping and temporary storing. Felon and mungbean farmers as opined by 23% and 74% of the farmers also used silver bowl. Besides, some farmers also used it for keeping fruits in the survey areas.

## Plastic drum

Plastic drum was mainly used for storing final product for longer period. It was found that the farmers of groundnut, mustard, grass pea, felon, and mungbean used plastic drum for long term storing.

Table 7.2: Farm level keeping system of selected HVCs in southern region of Bangladesh

HVCs	Farm level keeping system (% of farmer responded)*									
	Open soil	Jute mate	Plastic triple	Bamboo basket	Polythene sheet	Plastic crate	Plastic sack	Jute sack	Silver bowl	Plastic drum
<b>Vegetables</b>										
Bottle gourd	49	--	--	99	--	--	69	--	--	--
Okra	--	--	4	73	--	41	37	--	7	--
Brinjal	--	80	59	41	--	56	100	--	--	--
Cabbage	--	--	--	96	4	--	94	--	--	--
Cauliflower	--	--	17	91	--	--	83	--	--	--
S. pumpkin	60	16	--	80	20	--	24	--	--	--
Tomato	16	26	36	100	58	84	--	--	54	--
Cucumber	--	--	50	--	45	58	62	--	23	--
<b>Tuber crops</b>										
Potato	2	33	33	--	--	--	33	100	--	--
<b>Oil seed crops</b>										
Groundnut	2	100	32	--	--	--	100	--	98	23
Mustard	--	43	57	--	58	--	100	--	43	17
Sunflower	--	100	88	--	79	--	100	--	97	--
Soybean	--	--	59	9	77	--	65	--	36	5
<b>Pulses</b>										
Grass pea	--	58	34	--	--	--	100	--	--	97
Felon	--	67	--	--	--	--	100	--	23	42
Mungbean	--	51	27	--	--	--	100	--	74	18
<b>Fruits</b>										
Mango	23	--	47	12	47	39	--	--	31	--
Guava	--	--	49	57	35	63	--	--	73	--
Bar	--	--	29	--	21	48	4	--	79	--
Watermelon	100	--	--	--	--	--	--	--	--	--
Muskmelon	8	3	53	12	--	--	--	--	38	--

\*Multiple responses

## 7.4 Selling Places of Selected HVCs by Farmers

Three types of markets remain active in trading agricultural produces, which are primary market, secondary market, and terminal market. In the case of trading by the farmers of surveyed southern region of Bangladesh, it was found that farmer's product can only reached in primary and secondary market. They did not want to go to the terminal market due to their weak and/or absence of communication (Table 7.3). A significant portion of their products was sold from the crop field or farm-house. The following table shows the selling places of selected HVCs. Among the vegetables, the lion share of cucumber (54%) was sold from the farm-house, whereas the maximum portion of okra was sold in the primary market. Potato farmer sold their product in both from field/farm-house and primary market as opined by 42% and 58% of the surveyed potato farmers. Among the oil seed crops, the maximum portion of soybean farmer (86%) sold soybean from their house, while groundnut was traded mainly in the primary market (43%). Table 7.4 shows that most of the pulses were sold in the primary market and from farm-house. Among the fruits,

watermelon was sold fully from field as it was difficult to transport and higher transport cost . Mango was sold mostly in the primary market, while 19% of the harvested guava was sold in the secondary market (Table 7.3).

Table 7.3: Selling places of selected HVCs by farmer in southern region of Bangladesh

HVCs	Selling places (% of farmer responded)		
	Field/farm house	Primary market	Secondary market
<b>Vegetables</b>			
Bottle gourd	46	44	10
Okra	5	95	0
Brinjal	26	71	3
Cabbage	25	73	2
Cauliflower	28	70	2
Sweet pumpkin	53	43	4
Tomato	25	71	4
Cucumber	54	32	14
<b>Tuber crops</b>			
Potato	42	58	0
<b>Oil seed crops</b>			
Groundnut	34	43	23
Mustard	43	38	19
Sunflower	60	31	9
Soybean	86	14	0
<b>Pulse crops</b>			
Grass pea	43	46	11
Felon	41	58	1
Mungbean	47	45	8
<b>Fruits</b>			
Mango	43	57	0
Guava	33	48	19
Bar	79	21	0
Watermelon	100	0	0
Muskmelon	65	26	9

### 7.5 Types of Traders to Whom Farmer Sold the Selected HVCs

A number of market functionaries were found in the study areas. Table 7.4 shows that *Faria*, *Bepari*, *Arathdar cum Paiker*, *Paiker*, and retailer acted as the main role in trading of HVCs. Sometimes, farmers sold a few portion of their products directly to the local consumer. Study revealed that most of the time, *Bepari* and *Paiker* received the product from the primary and secondary market, while *Faria* received directly from the farm-house. Sometimes, *Aratdar* played as *Paiker* and bought directly from farmers. It was found that 43% of the harvested bottle gourd was sold to *Beparies* followed by 18% to local consumers and 16% to retailers. In the case of okra, the lion share (35%) was sold to *Beparies* and only 3% to local consumers. The maximum portion (39%) of harvested brinjal was sold to *Beparies*, whereas the lion share of cabbage (40%) was sold to *Paikers*. Cauliflower farmers sold most of the cauliflower (37%) to *Paiker* but 56% of the harvested sweet pumpkin was sold to *Beparies*. Local consumers also bought cauliflower

and sweet pumpkin directly from farmers accounted for 7% and 2% respectively. Tomato was sold mostly to the *Paikers* (43%), while 53% of the cucumber was sold to *Beparies* (Table 7.4).

Potato was sold to all the market functionaries of which the highest 41% sold to *Beparies* and the lowest 4% was sold to *Farias*. The maximum portion of groundnut, mustard, sunflower, and soybean was bought by the *Beparies*, which was accounted for 46%, 38%, 60%, and 49% respectively. *Beparies* were the dominant in the case of pulse crops, while *Paikers* were dominant in the case of fruits trading. From the above discussion, it can be concluded that *Beparies* and *Paikers* acted as dominant traders for all the selected HVCs in the southern region of Bangladesh (Table 7.4).

Table 7.4: Types of traders to whom farmer sold their HVCs in southern region of Bangladesh

HVCs	Types of traders (% of farmer responded)					
	Faria	Bepari	Arathdar cum Paiker	Paiker	Retailer	Local consumer
<b>Vegetables</b>						
Bottle gourd	13	43	2	16	8	18
Okra	27	35	4	21	10	3
Brinjal	6	39	2	31	14	8
Cabbage	2	37	0	40	18	3
Cauliflower	9	31	0	37	16	7
Sweet pumpkin	0	56	0	37	5	2
Tomato	4	38	1	43	11	3
Cucumber	3	53	5	32	7	0
<b>Tuber crops</b>						
Potato	4	41	10	22	12	11
<b>Oil seed crops</b>						
Groundnut	7	46	16	19	5	7
Mustard	11	38	0	20	13	18
Sunflower	0	60	4	27	0	9
Soybean	0	49	28	23	0	0
<b>Pulse crops</b>						
Grass pea	6	71	6	14	3	0
Felon	5	33	1	31	25	5
Mungbean	4	62	5	16	4	9
<b>Fruits</b>						
Mango	15	28	0	48	6	3
Guava	0	20	0	11	64	5
Bar	28	13	0	44	12	3
Watermelon	10	58	0	32	0	0
Muskmelon	30	0	0	0	37	33

## 7.6 Mode of Transportation used by the Farmers

Table 7.5 shows the mode of transportation generally used in the study areas to carry HVCs. The mode of transports includes head load, pulling van, electric van, bicycle, auto rickshaw, pick up, and truck. The present study showed that farmers did not have the option to use truck for carrying instead they mainly used pulling van, electric van, and auto rickshaw. Electric van was considered as the most popular vehicle to transport any agricultural produces, while pick up was considered as the least used vehicle in the surveyed areas. In some cases, they used to load on their bared head, but this was mainly in short quantities and in the case when the distance between the local market and farm-house was negligible. Still bicycle was used

for carrying a large portion of agricultural products in the study areas. Farmers did not have to bear carrying cost when they used bicycle.

Table 7.5: Types of vehicle used by the farmer to carry HVCs in southern region of Bangladesh

HVCs	Types of vehicle (% of farmer responded)						
	Head	Pulling van	Electric van	Bicycle	Auto rickshaw	Pick up	Truck
<b>Vegetables</b>							
Bottle gourd	2	21	65	0	12	0	0
Okra	7	39	37	8	9	0	0
Brinjal	1	25	18	36	12	8	0
Cabbage	2	18	60	4	14	2	0
Cauliflower	0	20	53	4	19	4	0
Sweet pumpkin	1	27	56	0	16	0	0
Tomato	6	22	51	5	15	1	0
Cucumber	0	25	49	3	22	1	0
<b>Tuber crops</b>							
Potato	5	11	66	7	11	0	0
<b>Oil seed crops</b>							
Groundnut	2	16	49	1	32	0	0
Mustard	5	8	13	3	15	0	0
Sunflower	2	27	45	5	21	0	0
Soybean	2	39	31	3	25	0	0
<b>Pulse crops</b>							
Grass pea	0	29	46	9	16	0	0
Felon	9	13	38	2	38	0	0
Mungbean	4	24	36	1	34	1	0
<b>Fruits</b>							
Mango	4	17	39	11	22	6	1
Guava	8	29	36	3	14	0	0
Bar	13	30	37	10	10	0	0
Watermelon	0	0	0	0	0	100	0
Muskmelon	25	38	27	2	8	0	0

### 7.7 Postharvest Loss of Selected HVCs

Table 7.6 shows the postharvest loss of selected HVCs. Postharvest loss was measured for one decimal of HVCs cultivation. Total postharvest loss was divided into two parts of which one is full damage and another one is partial damage. Full damage incurred when the damaged product has no option to sell at reduced prices, while product with partial damage can be sold at the reduced prices. Loss occurred mainly in vegetables such as bottle gourd, brinjal cabbage, and tomato. It was found that total loss in bottle gourd was 11.74 kg in one decimal of bottle gourd cultivation of which 89.4% was due to full damage and the rest 10.6% was due to partial damage of bottle gourd. Loss in brinjal was 11.71 kg in one decimal of brinjal cultivation where full damage was 9.61 kg and partial damage was 2.09 kg. Farmer had to bear 10.07 kg total postharvest loss in one decimal of tomato cultivation of which 9.29 kg was completely damaged and 0.78 kg was partially damaged. Among the selected HVCs, the lowest postharvest loss was occurred in mustard, which was accounted for 0.07 kg per decimal of mustard cultivation (Table 7.6).

Table 7.6: Postharvest loss of selected HVCs in the southern region of Bangladesh

HVCs	Postharvest loss (kg/decimal)		
	Full damage *	Partial damage *	Total loss
Bottle gourd	10.49 (89.4)	1.24 (10.6)	11.74
Brinjal	9.61 (82.1)	2.09 (17.8)	11.71
Cabbage	8.39 (90.3)	0.9 (9.7)	9.29
Cauliflower	5.84 (73.3)	2.13 (26.7)	7.97
Tomato	9.29 (92.3)	0.78(7.7)	10.07
Sweet pumpkin	5.49 (100)	--	5.49
Felon	0.14 (100)	--	0.14
Grass pea	0.87 (100)	--	0.87
Mungbean	0.14 (100)	--	0.14
Mustard	0.07 (100)	--	0.07
Groundnut	1.39 (98.6)	0.02 (1.4)	1.41
Sunflower	0.40 (100)	00	0.40
Potato	3.01 (98.7)	0.04 (1.3)	3.05

\* Figures in the parenthesis indicate the percentages of total

### 7.8 Stages of Postharvest Loss of Selected HVCs

Postharvest losses occurred in different stages of postharvest operations. Table 7.7 shows the percentages of postharvest loss based on different postharvest operations practiced by the farmers. These postharvest operations included harvesting, cleaning, sorting, transporting, packaging, and storing of product. Postharvest loss was classified into two parts- full damage and partial damage.

It was found that 69% of the full-damage occurred in bottle gourd during harvesting followed by 27% in sorting, and 4% during transporting. Besides, 51% of the partial-damage occurred in harvesting stage followed by 28% in sorting, 15% in transporting, and 7% in storing the bottle gourd. The highest portion of full-damages of brinjal occurred in harvesting time, which was accounted for 66.13% of the full damages. Likewise, the maximum portion of full-damages occurred in the harvesting time in the case of cauliflower, cabbage, felon, grass pea, sweet potato, mungbean, groundnut, sunflower, and tomato. In the case mustard, the maximum portion of full-damage occurred in storing stage, which was accounted for 41.35% of the total full damages. Similarly, in the case of potato the lion share of full-damages occurred in sorting stages (43.63%) followed by harvesting stage (37.97%), and storing stage (17.16%). Partial damage occurred in bottle gourd, brinjal, cabbage, cauliflower, felon, groundnut, potato, and tomato cultivation. Grass pea, sweet potato, mungbean, mustard and sunflower had no partial damages found in the survey areas (Table 7.7).

Table 7.7: Stages of postharvest loss of selected HVCs in southern region of Bangladesh

Stages	HVCs (% of losses)												
	Bottle gourd	Brinjal	Cabbage	Cauliflower	Felon	Grass pea	Sweet Potato	Mug bean	Mustard	Ground nut	Potato	Sun flower	Tomato
<b>Full damage</b>													
Harvesting	69	66.13	79.56	72.12	66.07	89.80	70.11	52.46	15.39	74.30	37.97	52.88	70.78
Cleaning	0	1.07	2.38	0	25.82	9.92	0	40.12	33.65	7.07	1.24	37.21	0.45
Sorting	27	31.99	17.90	27.55	6.10	0	28.91	1.95	9.61	17.91	43.63	2.41	27.72
Transporting	4	0.57	0.16	0	0	0	0	0	0	0	0	0	0.24
Packaging	0	0.27	0	0.33	0	0	0	0	0	0	0	0	0
Storing	0	0.10	0	0	2.01	0.28	0.98	5.47	41.35	0.72	17.16	7.50	0.81
<b>Partial damage</b>													
Harvesting	51	19.66	13.9	29.03	10	0	0	0	0	0	25.83	0	3.71
Cleaning	0	0.61	0	0	90	0	0	0	0	100	32.08	0	0
Sorting	28	53.56	72.22	70.97	0	0	0	0	0	0	35	0	93.16
Transport	15	21.07	0	0	0	0	0	0	0	0	0	0	0
Packaging	0	2.05	0	0	0	0	0	0	0	0	0	0	0
Storing	7	3.05	13.88	0	0	0	0	0	0	0	7.09	0	3.13

### **7.9 Post harvest loss of selected HVCs based on the causes of postharvest loss**

The postharvest losses of different HVCs occurred due to a number of reasons, which were enumerated in Table 7.9. These causes included insects/rodents, diseases, rotten, over mature, scratch, shrinkage, cut, late selling, and losses during harvesting time. The causes of postharvest losses were shown in two ways – full damage and partial damage (Table 7.8).

Table 7.8: Causes of postharvest loss of selected HVCs in southern region of Bangladesh

Causes	HVCs (% of losses)												
	Bottle gourd	Brinjal	Cabbage	Cauliflower	Felon	Gras pea	Sweet Potato	Mug bean	Mustard	Ground nut	Potato	Sun flower	Tomato
<b>Full damage</b>													
Insect/rodents	40.85	30.5	50.03	33.78	24.68	9.70	48.55	35.07	45.19	16.98	19.29	32.93	29.69
Disease	12.97	19.97	15.18	15.49	15.53	11.47	15.15	16.12	13.46	9.32	24.27	15.29	17.42
Rotten	29.4	29.4	21.07	40.19	46.52	76.85	34.03	37.49	9.62	62.35	37.94	18.81	33.37
Over mature	5.17	2.45	3.5	2.71	4.63	0.55	0.13	0.56	0	0.83	0	21.54	8.45
Scratch	1.23	2.85	0.89	3.91	7.48	1.27	0.25	5.55	17.31	10.02	3.26	3.18	6.42
Shrinkage	4.96	8.23	0.44	0	1.16	0.16	0.38	1.21	14.42	0.50	0.22	8.25	3.37
Cate	4.81	3.10	5.66	2.85	0	0	1.26	0	0	0	1.64	0	1.24
Late selling	0.39	0.13	0	0.33	0	0	0.25	0	0	0	4.09	0	0.04
Harvesting	0.22	3.37	2.68	0.74	0	0	0	0	0	0	9.29	0	0
All causes	59.15	100	99.45	100	100	100	100	96	100	100	100	100	100
<b>Partial damage</b>													
Insect/rodents	43.99	10.1	18.61	13.18	50	0	0	0	0	0	20.83	0	33.41
Disease	0.47	4.02	0	0	0	0	0	0	0	0	20.83	0	43.33
Rotten	0.94	23.45	13.89	14.29	0	0	0	0	0	0	0	0	9.77
Over mature	0.94	15.98	20.97	9.65	50	0	0	0	0	0	0	0	5.96
Scratch	0.70	9.21	12.5	34.48	0	0	0	0	0	100	0	0	0.73
Shrinkage	0	20.55	18.75	0	0	0	0	0	0	0	0	0	5.93
Cate	31.95	8.33	15.28	3.84	0	0	0	0	0	0	20.83	0	0.87
Late selling	3.53	0	0	0	0	0	0	0	0	0	0	0	0
Harvesting	17.48	8.36	0	24.56	0	0	0	0	0	0	37.51	0	0
All causes	100	100	100	100	100	0	0	0	0	100	100	0	100

## 7.10 Sources of Market Related Information

Farmers usually collect market related information from a number of sources. Table 7.9 shows a list of different sources. They mostly depend on other neighbouring farmers to get information about price, supply and the demand situation of different products. This was the easiest ways of getting information. It was found that 89% of the farmers received market related information from other farmers. The next important source of information was *Faria* as they were very close to the farmer. The 63% of the farmers took information from *Faria*. Some other market functionaries contributed largely to share the market related information such as retailer, wholesaler, traders from terminal market, *Paiker*, and wholesaler cum *Paiker* which were accounted for 15%, 12%, 11%, 9%, and 7% respectively. Besides, farmer got market information from local dealers and SAAO also. Print and electronic media such as television, newspaper, and radio also supplied different information to the farmers as opined by 5%, 3%, and 1% of the farmers respectively.

7.9 Sources of market related information in the study areas

Sources	No. of farmers (multiple response)	% of total surveyed farmers
Neighbouring farmers	893	89
Faria	625	63
Retailer	148	15
Wholesaler	123	12
Traders from terminal market	114	11
Paiker	89	9
Wholesaler cum Paiker	66	7
Local dealer	68	7
SAAO	47	5
Television	54	5
Newspaper	29	3
Radio	10	1
NGO	5	0.5

# CHAPTER VIII

## CONCLUSIONS AND RECOMMENDATIONS

### 8.1 Conclusions

High value crop (HVC) means those kinds of crops, which have higher profit. These crops need relatively less time and inputs than the popular cereal crops. The HVCs include vegetables, oilseeds, pulses, spices, fruits, medicinal plants, and ornamental plants. But the returns of HVCs depend on a number of factors viz. land quality, environment, availability of labour, availability of necessary inputs in time, skills, information regarding crop production technology, and postharvest operations and market infrastructure. Diversification towards HVCs is considered as a great way to improve the smallholder farmers' livelihood. The government of Bangladesh launched SACP project in 2018 focusing on improving smallholder farmers' income. With the financial support from IFAD and technical assistance from FAO, this project aims at agro product expansion, market creation, value addition, and the supply chain management of HVCs in the southern region of Bangladesh. As an important part of SACP, BARI has been demonstrating different commodity and non-commodity technologies to the project catchment area. In order to know the future impact of adopting these technologies, it is necessary to document some baseline indicators for comparison. The present baseline study was conducted to document some baseline indicators to know the impact of different interventions to be done on SACP project beneficiaries through BARI. The study documented a detailed information regarding socio-demographic features of the respondent farmers, popular cropping patterns, crop production technologies, agronomic practices, postharvest operations, the profitability of major HVCs, and the farm level marketing of selected HVCs. Both quantitative and qualitative study tools were used to collect necessary data and information.

### 8.2 Recommendations

Based on the findings obtained through this baseline study, the following recommendations were made for the betterment of the smallholder farmers of project catchment area as well as for fulfilling the overall goal of SACP project:

- Reduction of communication gap between BARI and project beneficiaries
- Strengthening coordination between BARI and other project agencies
- Demonstrating BARI developed technologies
- Demonstrating postharvest processing technologies regarding HVCs
- Strengthening market linkages
- Developing market infrastructure
- Increasing the field-day conducted by BARI
- Increasing the training on HVC production
- Should ensure the supply of necessary inputs in time
- Should ensure the fair price of agricultural commodities
- Should reduce the price of production inputs
- Should ensure the quality control of production inputs
- Should control the unfair business of market functionaries
- Strengthening the linkages of farmers with the secondary and terminal market
- Manage new market opportunities for the new HVCs

- ❑ Ensure market information at the farm level
- ❑ Ensure the easy access of farmers to the newly developed crop production technologies

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## PICTORIAL VIEWS OF BASELINE SURVEY



**Fakirhat, Bagerhat**



**Subarnachar, Noakhali**



**Kaliganj, Satkhira**



**Kaokhali, Pirojpur**



**Kachua, Bagerhat**



**Kamalnagar, Lakshmiपुर**



**Nalsity, Jhalkati**



**Mirsharai, Chattogram**



**Chagolnaiya, Feni**



**Shamnagar, Satkhira**



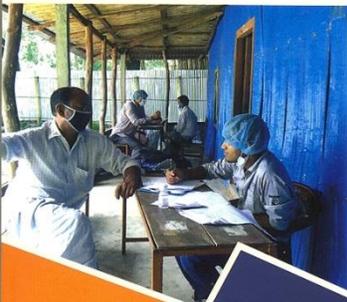
**Satkania, Chattogram**

“Verily, God is compassionate and is fond of compassion, and He gives to the compassionate what he does not give to the harsh.”

- Prophet Muhammad (SAW)

“Feed the hungry, Visit the sick, Set free captives.”

- Prophet Muhammad (SAW)



**Muhammad Shahrukh Rahman**

Principal Investigator

**Baseline survey for Smallholder Agricultural Competitiveness  
Project (SACP) in Southern Region of Bangladesh**

Agricultural Economics Division

BARI, Gazipur-1701

Mobile:+88 01741486334, Email: msr\_30bau@yahoo.com

