# PROFITABILITY AND RESOURCE USE EFFICIENCY ON MAIZE PRODUCTION IN SOME SELECTED AREAS OF CHANDPUR DISTRICT

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# PROFITABILITY AND RESOURCE USE EFFICIENCY ON MAIZE PRODUCTION IN SOME SELECTED AREAS OF CHANDPUR DISTRICT

**BY**

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**CERTIFICATE**

This is to certify that the thesis entitled **“PROFITABILITY AND RESOURCE USE EFFICIENCY ON MAIZE PRODUCTION IN SOME SELECTED AREAS OF CHANDPUR DISTRICT”** submitted to the Department of Agricultural Economics, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science (MS) in Agricultural Economics** embodies the result of a piece of *bona-fide* research work carried out by **Marioum Akter, Registration No. 14-05946** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

I further certify that any help or source of information, received during the course of this investigation has been duly acknowledged.

Dated: June,2021

Dhaka, Bangladesh

**(Dr.Fauzia Yasmin)**

Director(TTMU)

**Bangladesh Agricultural Research Council**

# DEDICATED TO MY BELOVED PARENTS

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# ABSTRACT

The study was undertaken to assess resource use efficiency and estimate maize production profitability in six villages of North Matlab and four villages of Faridgonj in Chandpur district. A total of 100 farmers were randomly sampled for primary data. The study's showed that maize production is a profitable business. The total cost of output per hectare was Tk. 115604.98. Gross returns, gross margin, and net returns were Tk. 177980.2 per hectare, Tk. 93123.02 per hectare, and Tk 67523.02 per hectare, respectively. Maize yields per hectare were discovered to be 9880.421 kg. The Benefit Cost Ratio (BCR) was 1.61, implying that a taka invested in maize cultivation yielded Tk. 1.61 in the study area. At North Matlab, BCR was found 1.61, and at Faridgonj 1.42 respectively. On the basis of the size of the difficulty faced by farmers, high seed prices, natural calamities, and low grain prices placed first, second, and third, respectively. New varieties, lower seed prices, a fair price for maize produced, competent extension services, and access to credit and storage facilities can all help to improve the current production situation.

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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| BARI | : Bangladesh Agricultural Research Institute |
| AEZ | : Agro Ecological zone |
| BB | : Bangladesh Bank |

| | |
|---|---|
| BBS | : Bangladesh Bureau of Statistic |
| BCR | :Benefit Cost Ratio |
| BDT | : Bangladeshi Taka |
| BER | : Bangladesh Economic Review |
| DAE | : Department of Agricultural Extension |
| *et al.* | : and others (at elli) |
| GDP | : Gross Domestic Product |
| GR | : Gross Return |
| ha | : Hectare |
| HIES | : Household Income and Expenditure Survey |
| HSC | : Higher Secondary Certificate |
| HYV | : High Yielding Variety |
| IOC | : Interest on Operating Capital |
| kcal | : Kilocalorie |
| kg | : Kilogram |
| Ln | : Natural Logarithm |
| ML | : Maximum Likelihood |
| MoP | : Muriate of Potash |
| M.Ton | : Metric Ton |
| NGO | : Non Government Organization |
| No. | : Number |
| t | : Ton |
| TC | : Total Cost |
| TFC | : Total Fixed Cost |
| Tk. | : Taka |

| | |
|---|---|
| TSP | : Triple Super Phosphate |
| TVC | : Total Variable Cost |
| Govt. | : Government |
| IRRI | : International Rice Research Institute |
| US | : United States |
| USDA | : United States Department of Agriculture |
| $ | : Dollar |

# CHAPTER 1
# INTRODUCTION

## 1.1 Background to the Study

Bangladesh is a developing country whose economy is based on agriculture. Agriculture has been a fundamental engine of Bangladesh's economic growth, contributing to the country's socio-economic advancement and long-term economic development by guaranteeing food security, creating jobs, developing human resources, and alleviating poverty. In 2020-21, the target GDP growth rate was 6.8 percent, which was much higher than the previous fiscal year's growth rate of 5.2 percent (BER, 2021). Agriculture's contribution to GDP fell by 0.45 percentage point to 12.03% among the major sectors of GDP (BER, 2021). Bangladesh is known as one of the most sensitive areas to the effects of global warming and climate change due to its agriculture-based economy. This is due to its unusual geographic location, floodplain dominance, low elevation, high population density, and excessive reliance on nature for resources and services. When cyclones hit the country, the entire harvest might be wiped away in a matter of hours. Bangladesh is located between 88°10' and 92°41' East longitudes and 20°34' and 26°38' North latitudes, forming the world's largest delta. The vast delta runs from the foothills of the Himalayan Mountains in the north to the Bay of Bengal in the south, and is mostly flat.

Bangladesh has a total population of 162.10 million people and a population density of 1.40 and 1130, respectively, making it the seventh most populous agrarian nation in the world. (BER, 2021). About 26.40 percent of the people in the country live in rural areas (BER, 2021). Approximately 40.06 percent of the nation's workforce is employed in agriculture (BER, 2021). The final data showed that the broad sectors of agriculture, industry, and services had respective sector shares of 12.03 percent, 36.01 percent, and 51.92 percent (Figure 1.1); in the prior fiscal year, those shares were 12.52 percent, 34.94 percent, and 52.54 percent).

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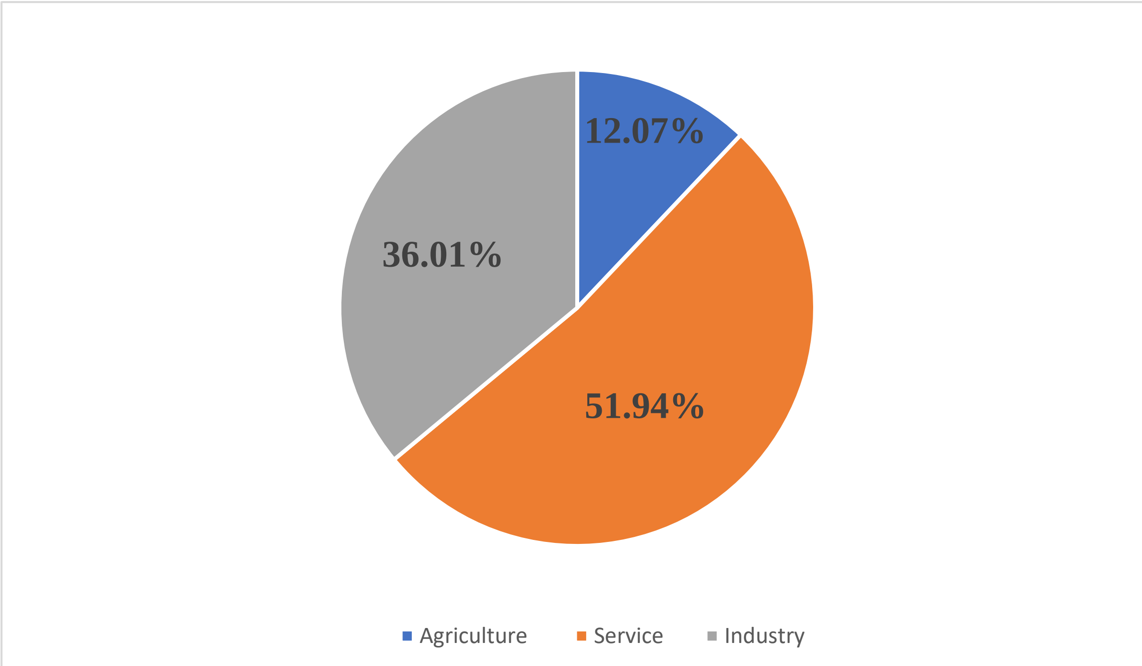


Figure 1.1: Contributions of Three Broad Sectors to the Country`s GDP

Source: BBS, 2020

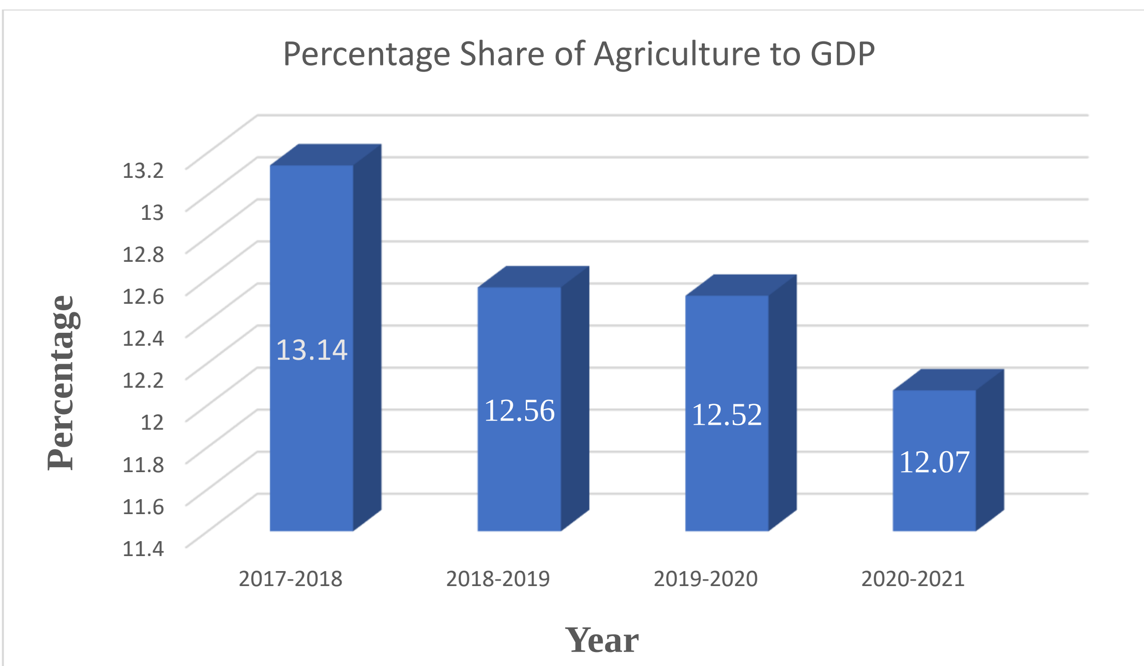


Figure 1.2: Contributions of Agriculture Sector to the Country`s GDP

Source: BBS, 2020

Agriculture grew at the fastest rate among the three broad sectors, at 4.19 percent of GDP, up from 2.97 percent the previous fiscal year. Agriculture and forestry grew at a rate of 3.47 percent of GDP under the broad agriculture sector. In FY2020-21, the broad industry sector grew at a rate of 12.06 percent of GDP, up from 10.22 percent the previous fiscal year. The broad service sector's growth slowed marginally to 6.39 percent in FY2017-18, down from 6.69 percent in FY2016-17

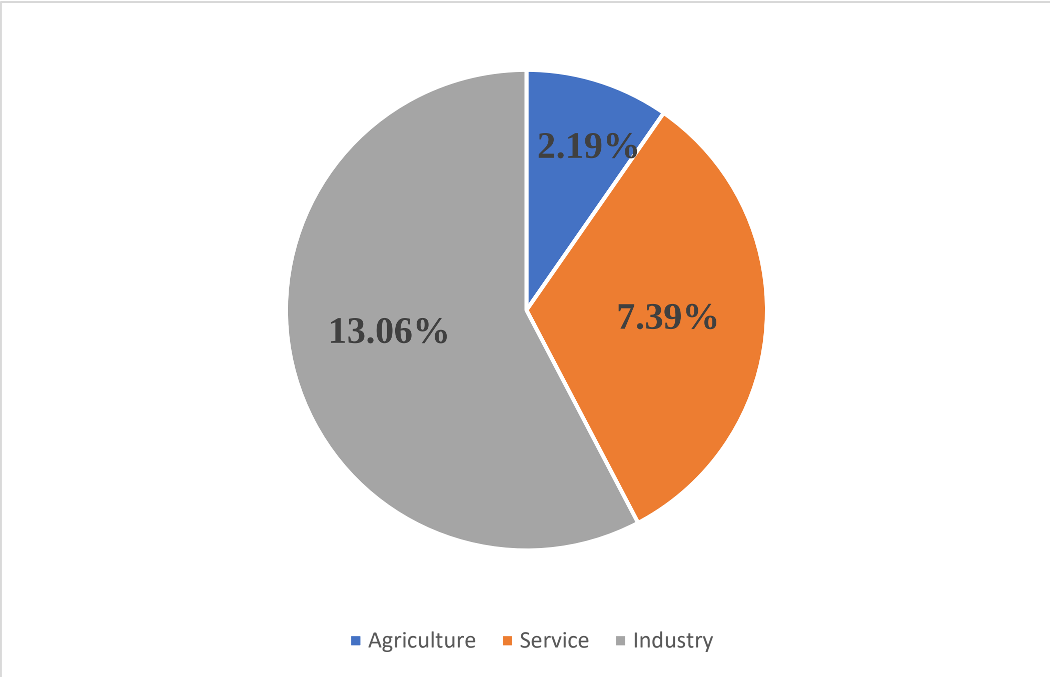


Figure 1.4: GDP Growth Rate of Broad Sectors

Source: BBS, 2020

Despite increases in the percentage of fisheries, livestock, and forestry in agricultural GDP, the crop sub-sector accounts for 7.51 percent of total agricultural GDP (BER, 2020). (Table 1.1). Although the crop sub-contribution sector's to GDP declined somewhat from 9.49 percent in 2019-20 to 7.51 percent in 2020-21.

**Table 1.1: Contributions and Share of Agriculture Sub-sectors to the Country`s GDP, 2020-2021**

| Sub-sectors | Contributions to GDP (%) | Percentage Share to GDP |
|---|---|---|
| Crops and horticulture | 7.94 | 3.06 |
| Animal farming | 2.56 | 3.40 |
| Forest | 1.62 | 5.51 |
| Fisheries | 3.56 | 6.37 |

Source: BBS, 2020

There has been an upward trend in food production during the previous few years. Around 413.25 lakh metric tons (MT) of food grains were produced (BBS, 2020). Only 2.20 percent of total cropped land was used for maize production, with rice accounting for the majority of the remaining 74.85 percent of total cultivated land (Figure 1.5).

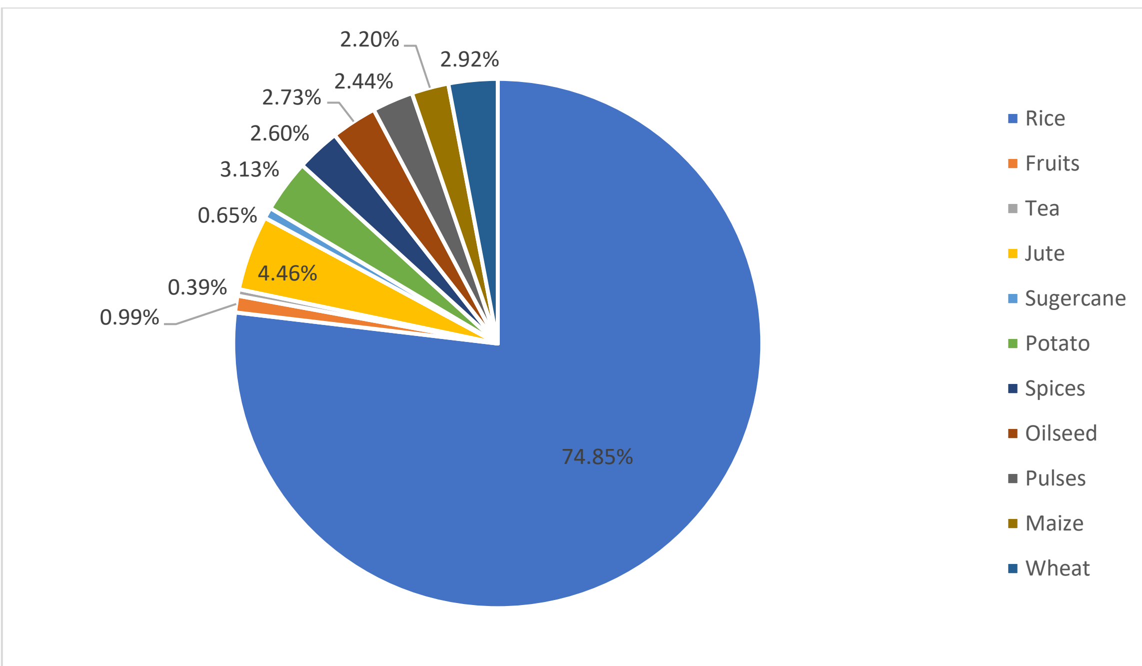


Figure 1.5: Area under Cultivation of Different Crops in Bangladesh, 2019-2020
Source: BBS, 2020

Bangladesh is also one of the world's most densely populated countries (964 people per square kilometer), with a population of 142.3 million people, 75 percent of whom live in rural areas (BBS, 2010). Within a decade, the poverty rate fell 15.7 percentage points (from 40% in 2005 to 24.3 percent in 2016). (BBS, 2020).

### 1.2 Present Status of Maize Production in Bangladesh

Maize (Zea mays) is a photo-insensitive crop that belongs to the Grammies family. Maize has gained prominence in recent years as a promising crop for enhancing Bangladesh's agricultural progress (Rahman et al, 2014). Maize is one of the oldest crops in Bangladesh, and after rice and wheat, it is the third most significant cereal crop, with the highest grain output and various uses. It is most widely used in the poultry and fish feed industries, as well as in baking and other items for human consumption such as popcorn and fried corn (Rahman et al, 2016). Because to its soil conditions, terrain, and climate, Bangladesh has the potential to improve maize production area Despite the fact that maize expansion was unsuccessful in Bangladesh throughout the 1960s due

to the government's push to promote a rice-based Green Revolution technology, maize production and yield have exploded in recent years (Rahman et al, 2014).

From 804000 acres in 2014-15, the area under maize cultivation climbed to 973000 acres in 2020-21. The yield rate grew from 2826 kg per acre in 2014-15 to 3540 kg per acre in 2020-21, indicating an upward trend. In 2020-21, the total volume of maize production was 4700 thousand

.

**Table 1.2: Area, Productivity and Production of Maize from 2019-20to 2020-2021.**

| Crop | 2018-2019 | | | 2019-2020 | | | 2020-2021 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Area '000' Acres | Per hectare Yield (Kg) | Production '000' M.Tons | Area '000' hectares | Per hectare Yield (Kg) | Production '000' M.Tons | Area '000' hectares | Per hectare Yield (Kg) | Production '000' M.Tons |
| **Maize** | 1099884 | 3245 | 3569321 | 1165594 | 3444.86 | 4015306 | 1185652 | 3471.88 | 4116438 |

Source: BBS, 2020

**Table 1.3: Indices of Area and Production of Maize (Base: 1984-85=100)**

| Crop | Area | | | | | Production | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
| **Maize** | 6220 | 8139 | 8624 | 8876 | 10332 | 47330 | 64941 | 69480 | 74788 | 92520 |

Source: BBS, 2020

**Table 1.4: Area and Production of Kharif Maize in Chandpur District.**

| Division | 2018-19 | | 2019-20 | | 2020-21 | |
|---|---|---|---|---|---|---|
| | Area (hectares) | Production (M. Ton) | Area (hectares) | Production (M. Ton) | Area (hectares) | Production (M. Ton ) |
| Chandpur | 177008 | 449466 | 192426 | 487277 | 206440.73 | 552764 |
| Bangladesh | 1099884 | 356932 | 1165594 | 4015306 | 1185652 | 4116438 |

Source: BBS, 2020

**Table 1.6: Total Cultivated Area and Net Cropped Area.**

| Region | Total Area ('000' hectares) | | | | | Net cropped area ('000' hectares) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 | 2020-21 |
| Dhaka | 1838 | 1838 | 1851 | 1851 | 1851 | 948 | 950 | 960 | 1011 | 849 |
| Chandpur | 2333 | 2333 | 2339 | 2339 | 2339 | 1735 | 1738 | 1747 | 1804 | 1821 |
| Bangladesh | 36669 | 36669 | 36465 | 36465 | 36465 | 19594 | 19543 | 19581 | 19596 | 19636 |

Source: BBS, 2020

### 1.3 Origin and Status of Maize

Maize (Zea mays ssp. mays) is a plant that originated in Mexico and Central America and belongs to the Maydae tribe of the Poaceae family. Maize, often known as corn, is a cereal grain that was cultivated 10,000 years ago by indigenous peoples in southern Mexico. Most historians agree that maize was domesticated in Mexico's Tehuacán Valley. Corn farming was transmitted to South America from Mexico in two waves, according to Embrapa's DNA study: the first, more than 6000 years ago, traveled over the Andes; the second, more recently, spread via the Amazon. Cultivation evidence has been discovered in Peru dating back to around 6700 years. The second wave swept into South America's lowlands some 2000 years ago. Maize cultivation in Bangladesh began in the early ninth century (1809) in the districts of Rangpur and Dinajpur (Begum and Khatun, 2006).

Maize has become a staple meal in many parts of the world, with maize output exceeding wheat and rice combined. However, only a small portion of this maize is consumed by humans; the majority is utilized for corn ethanol, animal feed, and other maize products like corn starch and corn syrup. Dent corn, flint corn, pod corn, popcorn, flour corn, and sweet corn are the six basic varieties of maize ("Maize," n.d.).

### 1.4 Nutritive Value of Maize

In many parts of the world, maize and cornmeal (ground dried maize) are basic foods. Raw, yellow sweet maize kernels contain 76 percent water, 19 percent carbs, 3% protein, and 1% fat, providing 360 kJ (86 kcal) of energy. Maize kernels contain 86 calories per 100 grams and are a rich source of the B vitamins, thiamin, niacin, pantothenic acid (B5), and folate (10-19 percent of the Daily Value). They also include dietary fiber and the important minerals magnesium and phosphorus in moderate amounts, while other nutrients are in little amounts. The necessary amino acids tryptophan and lysine are insufficient in maize, which explains its inferior rank as a protein source.

## 1.5 Uses

### 1.5.1 Human Food

Maize has become a staple meal in many parts of the world, with maize output exceeding wheat and rice combined. However, only a small portion of this maize is consumed by humans; the majority is utilized for corn ethanol, animal feed, and other maize products like corn starch and corn syrup. Dent corn, flint corn, pod corn, popcorn, flour corn, and sweet corn are the six main varieties of maize. Maize is one of the most important sources of starch. Maize flour is a common ingredient in both home cooking and many processed foods. Maize also provides a significant amount of cooking oil (corn oil) and maize gluten. Corn flakes, popcorn ("Maize," n.d.).

### 1.5.2 Feed and Fodder for Livestock

Maize is an important source of grain feed and livestock fodder. It's fed to cattle in a variety of methods. The dried kernels are used as feed when it is grown as a grain crop. They're frequently left on the cob for storage in a corn crib, or they're shelled and stored in a grain bin. The remains of the plant (corn stover) can be utilized as fodder, bedding (litter), or soil amendment after the grain is used for feed. When the entire maize plant (grain, stalks, and leaves) is used for fodder, it is usually chopped all at once and ensilaged, as the ensilaged form has a better digestibility and palatability than the dry form. When the entire maize plant (grain including stalks and leaves) is used for fodder, it is usually cut all at once and ensilaged, as ensilaged maize has a better digestibility and palatability than dried maize. For ruminants, maize silage is one of the most beneficial forages. Prior to the widespread adoption of ensilaging, it was customary to gather the corn into shocks after harvesting, where it would dry out more. It was then stored for weeks to months before being fed to the livestock, with or without a further shift under the cover of a barn ("Maize," n. d.).

### 1.5.3 Chemicals

Maize starch can also be used to create a wide range of chemical goods, including textiles, adhesives, and polymers. The abundant watery residue of maize wet milling known as corn steep liquor is widely utilized in biochemical research and industry as a culture medium to grow many types of microorganisms. The food coloring chysanthemin is found in purple corn ("Maize," n. d.).

## 1.6 Statement of the Problem

Maize is the world's third most significant grain crop. Every year, about 1.2 million tons of maize are consumed, of which only 42% is produced domestically and the rest is imported from other countries (BBS, 2005). More than 90% of maize is utilized for poultry feed, with the remainder going to the fish industry and human food products. The country has a lot of potential for increasing and improving maize output. In Bangladesh, maize is a relatively young crop with great market potential. The country's poultry industry is expanding, resulting in increased need for maize. Farmers that grow maize aren't totally aware of the advantages of doing so. They have no desire to invest. They are unwilling to invest in maize production because they lack adequate knowledge of maize farming and marketing practices. Bangladesh is experiencing malnutrition as a result of its fast population growth and low crop output. Traditional crops such as rice and wheat appear to be unable to supply the nutritional needs of the growing population. As a result, it is past time to introduce a new crop, such as maize, into the country's current cropping schedule. Maize could be a viable grain crop for providing nutritional support to the rural people. Furthermore, the rural setting is more conducive to the cultivation of this crop. The economics of maize farming must be made known to farmers in order for it to spread properly.

In recent years, Bangladesh's maize production and yield have increased dramatically. During the same period, maize cropped area expanded from 2,654 ha in 1972 to 385200 ha in 2017, production increased from 2,249 to 3025392 M.ton, and yield increased from 0.85 t/acre to 7.76 t/ha. In terms of yield rate (7.76 t/ha), maize has surpassed Boro rice (4.02 t/ha) and wheat (3.158 t/ha) to take first place among cereals (BBS, 2018). Maize has a vast genetic variety that allows it to thrive in any environment, and it is grown in

Bangladesh both in the winter and summer, albeit the former is the more common pattern. Maize demand is rising globally, including in Bangladesh and India.

## 1.7 Objectives of the Study

**The present study was undertaken to achieve the following objectives:**

- To identify the socio-demographic profile of maize farmers
- To estimate the profitability of maize cultivation
- To calculate the Resource use efficiency of maize cultivation.

## 1.8 Justification of the Study

Bangladesh's overall economic growth is mostly dependent on the development of the agriculture sector, as it is an agro-based economy. Although Bangladesh's agro-climatic conditions are favorable for the cultivation of a wide range of crops, rice production currently occupies 74.85% of total cultivated land. Demand for other cereal crops has expanded dramatically as a result of rising population. Maize is one of the crop in Bangladesh, and it is farmed all year round.

Prior to focusing on maize production, it is necessary to have relevant and adequate information on many areas of production at the farm level. Such production knowledge is also required for growers to make suitable decisions when selecting enterprises within limited resources.

Maize production can be increased by improving the resource use efficiency of maize utilizing already available technology. Farmers are often thought to be inefficient when it comes to growing maize, and there are significant inefficiency variances within farm groups.

Future strategies aimed at the development of maize by policymakers, researchers, NGOs, and extension agents will clearly help farmers in terms of increased production, increased revenue, and the establishment of self-employment opportunities.

# CHAPTER 2

# REVIEW OF LITERATURE

In relation to the current study, this chapter reviews a few related studies. Maize production in Bangladesh has been the subject of a small number of socioeconomic studies, which have shown that it is a more lucrative crop than rice, mustard, and (Hussain et al., 1995) The technological effectiveness of maize production in Bangladesh was very briefly studied. Again, some of these research might not be totally relevant to the current topic, but their conclusions, analytical methods, and suggestions have a significant impact on it. Below is a review of a few recent research projects that are pertinent to the studies being undertaken now.

**Abawiera et al. (2016)** used cross-sectional data gathered from 576 maize farmers in the four main agro ecological zones of Ghana using a structured questionnaire to investigate the technical efficiency of maize production in Ghana. This study used a multi-stage sampling technique. The approach made use of descriptive statistics and stochastic frontier analysis. Ghanaian maize growers had a mean technical efficiency estimate of 58.1%. The study also showed that the technical efficiency of maize producers in Ghana will grow with an increase in educational level, maize farming experience, extension contact, as well as the usage of fertilizer and better seeds. In a similar vein, male maize farmers in Ghana were technically more productive than female farmers. Membership in a farmer association also statistically increased technical knowledge. The coefficients of age, experience, and farm size were significant with expected negative signs, indicating that as age, experience, and farm size grow, the impacts of inefficiency on onion output diminish. With a mean value of 83 percent, onion farms' technical efficiency ranged from 58 to 99 percent. It means that there is potential to employ production technologies more effectively to boost output per hectare of an onion farm by 17% without paying any more expenses.

**Alam et al. (2012)** used a stochastic frontier production function that included a model for the effects of technical inefficiency to estimate the levels and factors that affect the technical efficiency of Bangladeshi tilapia farmers at the farm level. We used primary data collected from fifty tilapia producers in the Jessore district. The tilapia farmers' average technical efficiency was 78 percent, which meant that they produced 22 percent less than the boundary. The study, Maize-rice Cropping Systems in Bangladesh: Status and Research Needs, was done by Ali et al. in 2009.

**Ali et al. in 2009** The study, Maize-rice Cropping Systems in Bangladesh: Status and Research Needs, was done by. The study indicated that hybrid maize was a developing high value cereal crop in Bangladesh that was cultivated in intensive M-R cropping systems and had one of the highest average farm yields (5.7 tha-1) in Asia. It was expected that in the near future, its expansion would keep growing at a rate of roughly 15% yearly. The main agricultural system is maize-T. Aman rice, although it is currently diversifying with a variety of other crops, including potato. In Bangladesh, maize-rice farming systems are growing. Bangladesh has of of the highest maize yields in Asia, with average agricultural yields of roughly 5.7 .

**Baree (2012).** The technical effectiveness of onion (Allium cepa L.) farms in Bangladesh was examined by. In total, 225 sample farmers from the 15 villages in Santhia Upazila of the Pabna district were chosen. The calculated positive and significant values of the production elasticity with regard to land, labor, and capital costs were 0.3026, 0.0718, and 0.0442, respectively. It was determined that seed and irrigation had negligible effects, with negative values of 0.0045 and 0.0007. The coefficients of age, experience, and farm size were significant and showed expectedly negative signals, indicating that as age, experience, and farm size grow, the impacts of inefficiency on onion output diminish. Onion farms' technical effectiveness ranged from 58 to 99 percent .

**Begum et al. (2016)** calculated a translog stochastic production function to investigate the factors that affect the technical effectiveness of Bangladesh's freshwater prawn farming. 90 farmers were chosen at random from three villages in southwest Bangladesh (Fakirhat upazila, Bagerhat district). Technical efficiency levels ranged from 9.50 to 99.94% with a mean of 65%, indicating that a significant 35 percent of potential output can be recovered by eliminating inefficiency.

**Begum et al. (2010)** conducted an analysis of potato production productivity. The farmers in Lalmonirhat Sadar and Aditmari Upazila produced 19897.88 kg and 21208.47 kg of potatoes per acre, respectively. In Lalmonirhat Sadar and Aditmari Upazila, the benefit-cost ratio was 1.52 and 1.56, respectively. Begum et al. (2010) examined the productivity of potato production, finding that it ranged from 81 to 99 percent overall, 97 to 99 percent in Lalmonirhat Sadar, and 72 to 99 percent in Aditmari Upazila. The farmers in Lalmonirhat Sadar and Aditmari Upazila produced 19897.88 kg and 21208.47 kg of potatoes per acre, respectively. In Lalmonirhat Sadar and Aditmari Upazila,

**Bempomaa and Acuah (2014)** used the stochastic frontier approach for single-stage modeling to examine the productivity of maize farmers in Ghana's Ejura-Sekyedumase District. Technical efficiency and its drivers were calculated for 306 maize producers, and it was discovered that land, labor, and fertilizer positively influenced output while agrochemicals and seeds negatively impacted output. Farmers were technically efficient to the tune of 67 percent on average, which suggests that 33 percent of maize production was not achieved. The return to scale, which gauges farmers' production, was 1.22. Aditmari and all regions, respectively, which showed that the cost of production could be decreased on average by 4% while maintaining aggregate output constant.Farmers were technically efficient to the tune of 67 percent on average, which suggests that 33 percent of maize production was not achieved.

**Ferdausi et al. (2014** In order to ascertain the profitability and resource consumption effectiveness of maize production across various farm size groupings, performed research. From five villages in the Bogra district, 65 farmers—30 small, 30 middle-sized, and 5 large—were randomly selected for the study. It was estimated that the total cost of producing maize would be Tk 46278 for all farmers, Tk 41263, Tk 53554, and Tk 48715 for small, medium, and large farmers, respectively. The estimated gross margins from maize production for small, medium, and large farmers were Tk 67592, 64694, and 74089, respectively

**Haque (2013)** examined the technical efficiency of onion growers and estimated the profitability of onion cultivation. 150 farmers, or 75 farmers from each upazila, participated in the primary data collection. This investigation made use of the Cobb-Douglas stochastic frontier production function. The parameter coefficients were highly significant and had a beneficial impact on onion production. The significant value of and 2 shows that the production of onions suffers from significant technological inefficiencies.

**Hossain (2016)** In Bangladesh's Bogra district, which is where the most chili is produced, Hossain (2016) examined the technical efficacy of the industry. The Shibganj Upazila of Bogra districts' three villages produced a total of 50 chili growers. The study made use of a stochastic frontier production function of the Cobb-Douglas type. The cost of insecticide has the lowest elasticity (31.1444) and the largest (31.1440) for land used for chili production (0.0401). The sample's technical efficiency is often 88 percent. Nearly one was the projected company efficiency. However, by implementing the technology and the processes, it was possible to boost chilli production,

**Hasan et al. (2016)** assessed the Boro rice fields' technical efficiency and pinpointed the critical factors that affect the farms' level of technical inefficiency. Using a multistage random sampling technique, primary data from 112 rice-producing farms in the Jhenaidah district were gathered using the Cobb-Douglas stochastic production frontier strategy. The average technical efficiency for boro rice production is 0.92, which shows that the study area has a high level of technological efficiency. Labor expenditures, irrigation, seed, and plowing all have an impact on the yield of boro rice. The efficiency of Boro rice production is significantly impacted by a number of important parameters, including farm size, age, education, training, and loan**.**

**Islam et al. (2011)** In 2016, Hossain evaluated the technical effectiveness of Bangladesh's leading chili-producing district, Bogra. In total, 50 chili farmers were selected from the Shibganj Upazila's three villages in Bogra. The Cobb-Douglas type stochastic frontier production function was employed in the investigation. The area used for producing chili had the maximum elasticity (31.1434) while the expense of pesticides had the lowest elasticity (21.1434). (0.0401

**Kabir and co. (2015)** The purpose of the study is to determine how bioslurry will affect Bangladesh's output of boro rice. For the purpose of measuring the effectiveness of Boro production in four districts of Bangladesh—Mymensingh, Pabna, Thakurgaon, and Dinajpur—Translog production function through Stochastic Frontier Approach (SFA) was used. The technical efficiency of farms was impacted by slurry factors. Slurry demonstrated a considerable favorable interaction with biogas users, allowing households to enhance overall output.

**Khandoker et al. (2018)** looked into the economic viability of growing winter maize in Bangladesh's districts that are prone to drought. For the study, 200 farmers were selected, with 50 from each district being randomly selected. The total cost of maize cultivation per hectare in drought-prone areas and usual conditions, respectively, was discovered to be Tk. 92,582 and Tk. 79,594. Normal and drought-prone areas produced 7576 kg and 8729 kg of yield per hectare, respectively.

**Memon et al. (2016)** looked on the output of hybrid maize in Sindh's Mirpurkhas region in 2014–15. A four-stage sampling design was used to gather the data in the field. For 100 farmers from the twelve villages, it was determined using the Cobb-Douglas production function how responsive the dependent variable (yield) was to the independent variables (fertilizer, animal labor, human labor, water application, pesticide application, number of plowing, weeding, farmyard manure, seed rate application, and other maize crop inputs). In the research region, the technical efficiency for maize farms was 0.48, with the majority of farms having a technical efficiency below 0.50. The technological efficiency of maize producers as a whole ranged from 0.177 to 0.980.

**Musaba et al. (2014).** The technical effectiveness of smallholder maize producers in Zambia was evaluated). A systematic questionnaire was used to gather information from 100 randomly chosen smallholder maize farmers in Zambia's Masaiti area. The gathered data were examined using descriptive statistics and a stochastic frontier production function method. The computed stochastic frontier Cobb-Douglas production function demonstrated that the key parameters affecting maize productivity were the size of the maize area and fertilizer.

**Mango et al. (2015)** In order to identify crucial entry points for policy, examined the technical efficiency of maize production in Zimbabwe's smallholder farming groups after the fast-track land reform of 2000. He used a stochastic frontier production model with a linearized Cobb-Douglas production function to ascertain the production elasticity coefficients of inputs, technical efficiency, and efficiency drivers on a random sample of 522 smallholder maize producers.

**Mulinga (2013).** The technical efficacy of maize production in Rwanda's Musanze and Bugesera areas is estimated by Face-to-face interviews with a random sample of 276 farmers were used to gather primary data using multi-stage and pre-tested questionnaires. The technical efficiency of producing maize was estimated using the Stochastic Production Frontier (SPF) methodology,

**Rahman et al. (2016)** assessed the competitiveness, profitability, input demand, and output supply of Bangladeshi maize production. From the two primary maize-growing regions in northern Bangladesh, 165 farmers in all were selected (the Dinajpur and Lalmonirhat districts). The Policy Analysis Matrix (PAM) and the translog profit function were used in the investigation.

**Uddin et al. (2017)** A stochastic Frontier technique was employed by to calculate the Bangladeshi maize production efficiency. 120 maize farmers in Bangladesh's Thakurgaon district, where maize farming is most prevalent, provided the primary data, which was collected. The Translog Stochastic Frontier production function is used to evaluate the technical efficacy of maize for both the Rabi and Kharif seasons. This study concluded that Thakuegaon's maize production was not technically efficient and that, with existing technology, productivity could be increased by 12.5% and 8%, respectively, in the Rabi and Kharif seasons. While Kharif season maize has a mean technical efficiency of 92 percent, Rabi season maize has a mean technical efficiency of 87.5 percent. Fertilizer and irrigation had a positive impact on the rabi season, but they had a detrimental impact on farm size. In attempt to shed light on the causes of Ghana's low maize production.

**Wongnaa (2016)** To understand the reasons behind Ghana's low maize productivity, looked at the economic productivity and efficiency of maize producers. Cross-sectional data from 576 maize farmers in eight districts across four agro ecological zones in Ghana were gathered using a multi-stage sampling technique. To analyze the data and produce the results, a multinomial logit model and a stochastic frontier production function were utilized. According to the study, higher educational attainment, credit scores, extension contacts, experience levels, maize pricing, group membership, and a ready market would all lead to greater utilization of maize productivity-enhancing technology. The production of maize was found to be favorably correlated with inputs such as fertilizer, insecticides, manure, herbicide, seed, and land. The results for technical effectiveness were 61.2 percent, 70.2 percent, 49.9 percent, and 66 percent.

# CHAPTER 3

# METHODOLOGY

## 3.1 Introduction

Various steps were taken in the process of the study in order to determine the optimal method for achieving the research objectives. Any study's methodology is an essential and important component. The suitable methodology utilized in the study has a significant impact on the trustworthiness of a certain study finding. The methodology is a broad research approach that explains how research will be conducted and, among other things, specifies the methodologies that will be used. Methods establish the means or modes of data collection, or, in some cases, how a specific outcome is to be calculated, as defined in the methodology. The author has a significant amount of responsibility for properly detailing the methods and procedures to be used in selecting the study areas, data sources, and analyses as well as interpretations in order to reach a relevant result.

## 3.2 Sampling Frame

The sampling frame for this study was purposefully chosen to include areas where maize farming was intensive.Sixvillages,(Doshani,Hanirpar,Kolakanda,Jorkali,chengarchar,Mohonpur) under North Matlab upazila and Four villages (Sahapur,Mirpur,Keura,Koraitoli) under Faridgonj upazilla at Chandpur district, A total of 100 maize growers were chosen as study samples. The following were the important factors to consider when choosing study areas

i. A large number of maize growers are available and maize grows well and farmers use a good portion of their land for producing maize in these study areas.
ii. These villages had some identical characteristics like topography, soil and climatic conditions for producing maize.
iii. Easy accessibility and good communication facilities in these villages.
iv. The researcher was familiar with the local language and other socio- economic characteristics of the farmers in the selected villages and the anticipated cooperation from respondents was high which indicated the likelihood of obtaining a reasonably accurate set of data.

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### 3.2.1 Sample Size

Any research effort must include sampling as a critical component. Time and budgetary considerations guided the selection of the survey's geographic scope and sample size. The larger the sample size, the lower the error and the higher the accuracy of the result when drawing conclusions about the population as a whole based on that sample. It is sometimes believed that a sample size of 60 respondent is the absolute minimum for a larger population to provide sufficient certainty for decision-making. Statistical formula was used to establish a sample size of 100 maize farmers in the study area (50 from North Matlab and 50 from Faridgonj districts) (Arkin & Colton 1963). There were 33513 homes combined in the upazilas of North Matlab and Faridgonj.

### 3.2.2 Sample Selection Procedure

For this study, farm-level data was collected directly from each respondent via an interview method. Because each unit of the population has an equal chance of being selected, simple random sampling is the best technique to avoid bias in the sample selection process (Scheaffer, 1979). Maize producers were sampled using a simple random sampling technique. This study employed farm-level, cross-sectional data from two districts for the maize crop in 2018. Villages from two upazilas in each district were purposefully chosen based on maize productivity during the previous ten years. Then, using a simple random sampling procedure.villages were chosen from each upazila, and the ultimate sampling units (households) were chosen using a random sampling method.

### 3.3 Data Collection Procedure

Primary data was gathered from maize growers using a field survey and direct interviews. Farmers' socioeconomic characteristics, maize production techniques, input consumption, labor utilization, output, cropping pattern of the study, natural and socioeconomic constraints, prices, and market activities were among the data collected. The researchers conducted a field survey, a review of past studies, interviews with competent maize producers, and direct observation.

### 3.3.1 Design of Questionnaire

A semi-structured questionnaire was prepared to collect relevant data from the respondents. Because the success of the survey is dependent on the accuracy of the survey schedule, a draft questionnaire was created for pre-testing to ensure that the questions were relevant and that the farmers' responses were accurate. After pre-testing, the final survey schedule and questionnaire were created, with any necessary corrections, modifications, and adjustments. The following headings were used to develop the questionnaires for this study:

### 3.3.2 Questionnaire Pattern for Maize Producers

A) General information of the sample farmers;

B) Family composition of the sample farmers, no of members engaged in farming.

C) Age of farmer and years of experience in farming.

D) Occupational and educational status of sample farmers;

E) Information about total land, cultivable land, orchard, pond, leased land;

F) Production cost of maize;

G) Amount of yield obtained from maize and selling price of output.

H) Training and loan facility for maize production;

I) Cropping pattern of the study area;

J) Problem faced by the farmers in producing maize.

### 3.3.3 Data Collection Techniques

The researcher used a semi-structured questionnaire to collect data from primary and secondary sources. To achieve the study's aims, interviews and survey methodologies were used. Following the establishment of the survey schedule, field level primary data was obtained from farmers by direct interview. Before the study began, the farmers were given a brief explanation of the study's goal. Respondents were assured that the information they supplied would be kept private.

Researchers must rely on memory recall for basic information such as labor use, wages, and input costs because producers' records regarding farm activities are unavailable. During the interview session, data was recorded and information was double-checked.

Secondary data was gathered from a variety of research materials and papers, including:

- ✓ Statistical Yearbook of Bangladesh,
- ✓ Bangladesh Economic Reviews,
- ✓ Related published papers, books,
- ✓ Website of Bangladesh Bank (BB)
- ✓ MS thesis of Sher-e-Bangla Agricultural University
- ✓ The national and international journals, articles and publications and. Internet

### 3.4 Period of Data Collection

Farming is a seasonal business. Rabi and Kharif I are the two agricultural seasons in which maize can be sown. Farmers typically sow maize in November and February to March, harvesting after five to six months in the Rabi season and three to four months in the Kharif I season, depending on weather and soil and land conditions. The researcher collected data for the current study from September to December 2020 with the support of an agricultural extension officer from the selected area.

### 3.5 Processing, Editing and Tabulation of Data

The title of the study was both intriguing and daunting. The data collection technique was also too difficult. For the sake of consistency and completeness, the collected data was examined and validated. Before entering the data into the computer, it was edited and coded. Following the completion of data gathering, raw data was edited, coded, and placed into a computer using the Microsoft Excel software. The acquired data was analyzed using two separate statistical software programs, SPSS and STATA. Because these were basic calculations, commonly used, and easy to grasp, descriptive analysis was done with the help of SPSS, and results were presented in tabular and graphical form. In addition, functional analysis was used to arrive at the desired results. The data was analyzed for technical efficiency using the software Microsoft Excel and the statistical application STATA.

### 3.6 Analytical Techniques

The data was examined in order to meet the study's objectives. In this investigation, a variety of analytical procedures were used. For a large part of the data analysis, the tabular technique was used. This technique was chosen because of its natural ability to convey the most accurate picture of the farm economy in the simplest way possible. To evaluate data and define socioeconomic features of maize growers, input consumption, costs and returns of maize production, and generate undiscounted benefit cost ratios, relatively simple statistical techniques such as percentage and arithmetic mean or average were used (BCR). The Cobb-Douglas type stochastic frontier production function was employed in the current study to estimate the level of technical efficiency in a manner consistent with the theory of production function.

#### 3.6.1 Economic Profitability Analysis

The set of financial prices was used to assess maize's net economic returns. During the time period under consideration in this study, the financial prices were market prices received by farmers for outputs and paid for acquired inputs. The following were the cost items found for the study:

- Land preparation
- Human labour
- Seed
- Fertilizer
- Insecticide
- Irrigation
- Land use

The value of the primary products was used to assess the crop returns. Variable cost, fixed cost, and total cost were discussed in this study. Land preparation, human labor, seed, fertilizers (e.g. urea, TSP, MoP), pesticides, irrigation, and interest on operating capital were all included in the total variable cost (TVC). Only the rental value of land was included in the fixed cost (FC). Total cost (TC) accounted for both total variable and fixed costs.

##### 3.6.1.1 Cost of Land Preparation

Land preparation is regarded as one of the most crucial aspects of the manufacturing process. Ploughing, laddering, and other actions required for maize cultivation included plowing, laddering, and other activities to prepare the soil for seedling planting. The number of ploughings varied from farm to farm and location to location, according to the findings.

#### 3.6.1.2 Cost of Human Labor

One of the key cost components for cost of production was the cost of human labor. Land preparation, seeding and transplanting, weeding, fertilizer and insecticide treatment, irrigation, harvesting and hauling, threshing, cleaning, drying, and storing are all examples of operations that require it. The recorded man-days per hectare were multiplied by the wage per man-day for a specific operation to compute human labor cost.

#### 3.6.1.3 Cost of Seed

Seed prices varied dramatically based on its quality and availability. The cost of seed was calculated using market prices of acknowledged maize seeds. To calculate the cost of seeds for the study regions, the total quantity of seed required per hectare was multiplied by the market price of seed.

#### 3.6.1.4 Cost of Urea

One of the most important fertilizers used in maize cultivation was urea. The cost of urea was calculated using market prices. The cost of urea was calculated by multiplying the recorded unit of urea per hectare by the market price of urea.

#### 3.6.1.5 Cost of TSP

The cost of TSP was also calculated using market prices. TSP cost was calculated by multiplying the recorded unit of TSP per hectare by the market price of TSP.

#### 3.6.1.6 Cost of MoP

MoP was one of the three primary fertilizers used in maize cultivation. The market price of MoP was multiplied by per unit of that input per hectare for a certain activity to compute the cost of MoP per hectare.

#### 3.6.1.7 Cost of Insecticides

Farmers employed a variety of insecticides on their crops for a total of 2-3 times to keep pests and illnesses at bay. The cost of insecticides was determined using the market price per hectare of the insecticides employed in the study locations.

#### 3.6.1.8 Cost of Irrigation

Increased maize yield is aided by better water management. The cost of irrigation varies by region. It was determined based on how many times per hectare irrigation was required and how much it cost.

### 3.6.1.9 Interest on Operating Capital

The opportunity cost principle was used to calculate interest on working capital. Because all expenditures were not incurred at the start or at any single point in time, the operating capital really represented the average operating cost across the period. Because the cost was incurred over the course of the entire production cycle, interest on operating capital was calculated for maize at a rate of 10% per year for four months. The following formula was used to compute interest on operating capital:

IOC= AIit

Where,
IOC= Interest on operating capital

i= Rate of interest AI= Total

investment

/ 3 t = Total time period of a cycle

### 3.6.1.10 Land Use Costs

The opportunity cost of using land per hectare for a four-month cropping cycle was used to compute the land usage cost. As a result, the cost of land use was calculated using the cash rental value of the land.

### 3.6.1.11 Calculation of Returns

#### 3.6.1.11.1 Gross Return

Per hectare gross return was calculated by multiplying the total amount of product and byproduct by their respective per unit prices.

Gross Return= (Quantity of the product * Average price of the product) + Value of by product.

#### 3.6.1.11.2 Gross Margin

Gross margin was calculated by deducting variable cost from gross return .. Farmers, in general, prefer a high rate of return over a variable cost of production. The farmers' motivation for applying the gross margin analysis is to maximize profits over variable costs. On a TVC basis, gross margin was determined. The gross margin per hectare was calculated by deducting variable costs from gross return. That is to say,

Gross margin = Gross return – Variable cost

#### 3.6.1.11.3 Net Return

Net return or profit was calculated by deducting the total production cost from the total return or gross return. That is,

Net return = Gross margin – Fixed cost

The following profit equation was used to assess the profitability of maize production at the farm level:

$$\pi = P_r Q_r + P_b Q_b - \sum_{i=1}^{n} (P_{xi} X_i) - \text{TFC}$$

Where,

$\pi$ = Profit per hectare for producing maize

$P_r$ = Per unit price of maize (Tk. /Kg)

$Q_r$ = Quantity of maize (Kg/ha)

$P_b$= Per unit price of by-products (Tk. /kg)

$Q_b$= Quantity of by-products (Kg/ha)

$P_{xi}$= Per unit price of the ith (Variable) inputs (Tk. /kg) $X_i$

= Quantity of the ith inputs (Kg/ha) i = 1, 2, 3………..n

and

TFC = Total fixed cost

#### 3.6.1.11.4 Undiscounted Benefit Cost Ratio (BCR

Average return to each taka spent on production is an important criterion for measuring profitability. Undiscounted BCR was estimated as the ratio of total return to total cost per hectare.

$$\text{BCR} = \frac{\text{Total Return (Gross Return)}}{\text{Total Cost}}$$

BCR>1, the return from maize production was economically Viable

BCR<1, the return was not economically viable; and

BCR=1, there exist economic breakeven point of maize production

### 3.6.2. Resource use efficiency

The Cobb-Douglas production function was used for functional analysis. It is the most widely used model for fitting agricultural production data, because of its mathematical properties, ease of interpretation and computational simplicity (Heady and Dillon, 1969). It is a homogeneous function that provides a scale factor enabling one to measure the return to scale and to interpret the elasticity coefficients with relative ease. Thus, Cobb-Douglas specification provides an adequate representation of the agricultural production technology. The production of mud crab is likely to be influenced by different factors like human labour, urea, seed,Insecticide, Irrigation, and Tsp etc. The functional form of the Cobb- Douglas regression equation was as follows:

$$Y = AX_1^{\beta_1} X_2^{\beta_2} \text{--------------------------------} X_n^{\beta n} e^{ui}$$

The production function was converted to logarithmic form so that it could be solved by least square method i.e.

$$\ln Y = \alpha + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \beta_n \ln X_n +$$

$U_i$ The empirical production function was the following:

$$\ln Y = \alpha + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + U_i$$

Where,

$Y$ = Return from maize production(Tk./ha);

$X_1$ = Human labor cost (Tk./ha);

$X_2$ = Urea cost (Tk./ha);

$X_3$ = Seed cost (Tk./ha);

$X_4$ = Insecticide cost (Tk./ha);

$X_5$ = Irrigation (Tk./ha);

$X_6$ = Tsp costs

(Tk./ha); $\alpha$ = Intercept;

$\beta_1$, $\beta_2$ ---- $\beta_6$ = Coefficients of the respective variables to be estimated; and $U_i$ = Error term.

In order to analyze the resource use efficiency, the ratio of marginal value product (MVP) to the marginal factor cost (MFC) for each input was computed and tested for its equality to 1,

i.e. $\frac{MVP}{MFC} = r$

Where,

MVP = Value of change in output resulting from a unit change in variable input (Tk.) and MFC = Price paid for the unit of variable input (Tk.).

Under this method, the decision rules are that, when;

r >1, the level of resource use is below the optimum level, implying underutilization of resources. Increasing the rate of use of that resource will help to increase productivity.

r <1, the level of resources use is above the optimum level, implying over utilization of resources. Reducing the rate of use of that resource will help to improve productivity.

r = 1, the level of resource use is at optimum implying efficient resource utilization.

The marginal productivity of a particular resource represents the additional to gross returns in value term caused by an additional unit of that resource, while other inputs are held constant. When the marginal physical product (MPP) is multiplied by the product price per unit, the MVP is obtained. The most reliable, perhaps the most useful estimate of MVP is obtained by taking resources ($X_i$) as well as gross return (Y) at their geometric means (Dhawan and Bansal, 1977). Since all the variables of the regression model were measured in monetary value, the slope coefficient of those explanatory variables in the function represented the MVPs, which are calculated by multiplying the production co-efficient of given resources with the ratio of geometric mean (GM) of gross return to the GM of the given resources, i.e.;

$$\ln Y = \ln \alpha + \beta_i \ln X_i$$

$$\frac{dY}{dX_i} = \beta_i \frac{Y}{X_i}$$

Therefore, MVP ($X_i$) = $b_i \frac{\bar{Y}(GM)}{\bar{X}_i(GM)}$

Where,

$\bar{Y}$ = Mean value (GM) of gross return in Tk.

$\bar{X}_i$ = Mean value (GM) of different variable input in Tk. i = 1, 2,……………..

MFC is the price of input per unit. If the MFC of all the inputs expressed in terms of an additional taka in calculating the ratio of MVP to MFC, the denominator will always be one, and therefore, the ratio will be equal to their respective MVP.

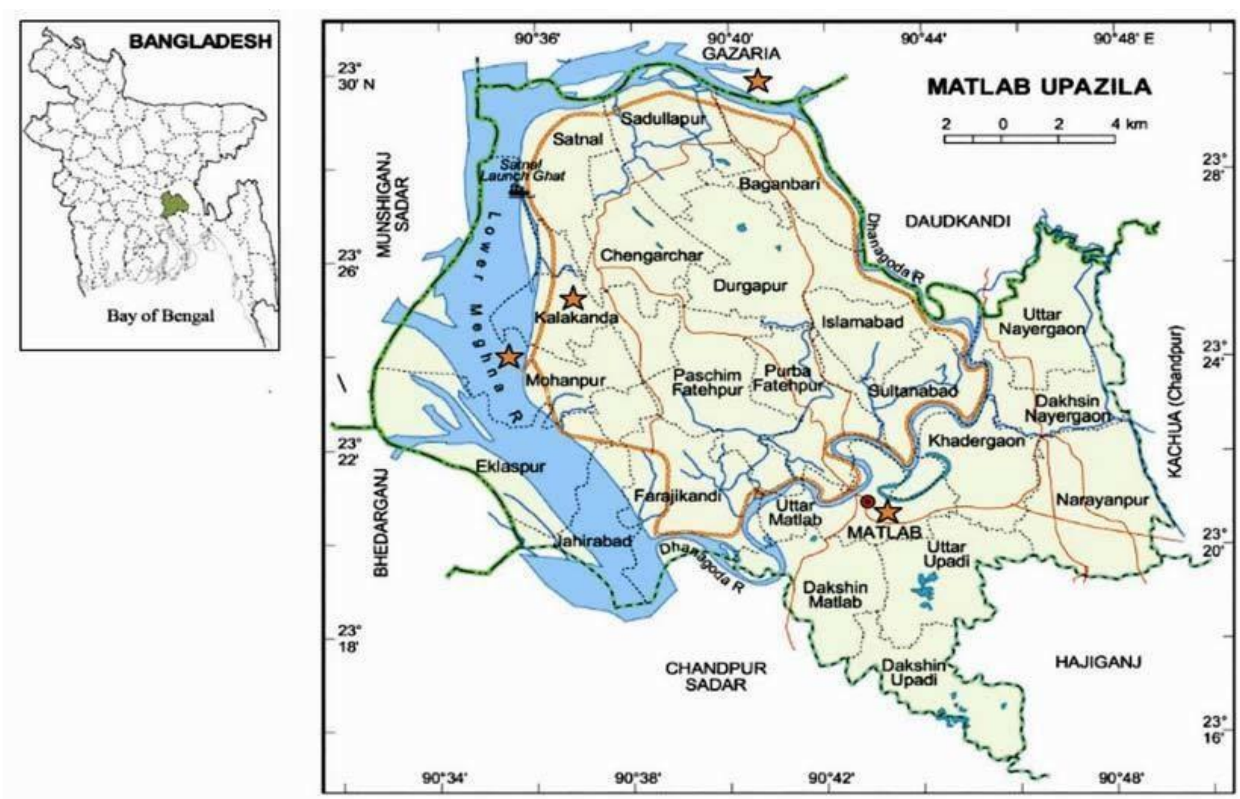
# CHAPTER 4

# DESCRIPTION OF THE STUDY AREA

### 4.1 Introduction

Knowing the physical features of the subject area is critical for any research because it provides an overall picture of agriculture. This chapter provides a brief description of the research area's characteristics. Understanding and interpreting the study's findings, as well as knowing the agricultural activities, future development opportunities, and potentials of the study area, requires knowledge of the study area. This chapter discusses the research area's location, area, population, monthly average temperature and rainfall, agriculture, occupation, cropping patterns, communication, and marketing facilities. However, knowing the climate and topography of the research areas is critical for the production of any crop.

## 4.2 Location




**Map: Map of North Matlab upozilla**


Map 2 :Map of North Matlab and Faridgonj upozilla

### 4.3 Physical Features, Topography and Soil Condition

The Chandpur district is located between latitudes 23° 00' and 23° 30' north and 90° 32' and 91° 02' east. It is located in the low-lying eastern portion of the Meghna River Floodplain. The scenery is characteristic of a meandering floodplain, with wide ridges and basins. Any sort of soil can be used to grow maize. Maize should be grown in well-drained soil, particularly a sandy loam. The study showed that low-lying terrain, highland to medium highland land, and soils with silt loams and silty clay loams at North Matlab and Faridgonj upazila were mostly favorable for maize cultivation all year long.

**Table 4.2: Occurrence of Flood during the Year 2018-2021 (Yes/No)**

| Upazila | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|
| North Matlab | No | No | No | No |
| **Faridgonj** | No | No | No | No |

Source: BBS, 2020b

**Table 4.3: Broad Classification of Area.**

| Upazila | Total area | Land area | Reserve forest | Riverine area |
|---|---|---|---|---|
| **North Matlab** | 244.31 | 157.31 | 0 | 87.0 |
| **Farifgonj** | 185.16 | 158.68 | 0 | 12.00 |

Source: BBS, 2020

### 4.4 Area and Population

**Table 4.4: Number of Household, Population and Density, 2021**

| Upazila | Household | Population | | | Sex ratio (M/F) | Average size of household | Density Per sq.km. |
|---|---|---|---|---|---|---|---|
| | | Male | Female | Total | | | |
| **North Matlab** | 33513 | 65815 | 73503 | 139318 | 90 | 4.15 | 570 |
| **Faridgonj** | 46711 | 92010 | 92173 | 184183 | 100 | 3.94 | 995 |

**Source: BBS, 2020**

v

### 4.5 Land and Agriculture

The two districts have a total cultivable land area of 195000 acres and 394000 acres, respectively. One of the main crops grown in the study areas is maize. In North Matlab upazila, mustard, chili, paddy, jute, onion, sesame, coriander, garlic, potato, groundnut, and brinjal thrive well. Wheat, sugarcane, garlic, pulses, onion, paddy, turmeric, and mustard, on the other hand, grow well in Faridgonj upazila. It is evident from the study that, cropping pattern in the study areas are almost same and it were onion-maize-aman, maize-irri rice- fellow, mustard-jute-aman in North Matlab upazila and the scenario was Maize-turmeric-irri rice, sugarcane- sugarcane- sugarcane, maize-pulses-irri rice, pulses-maize-irri rce, wheatmaize-irri rice for Faridgonj upazila. Land under cropped in the study areas are given in Figure 4.2.

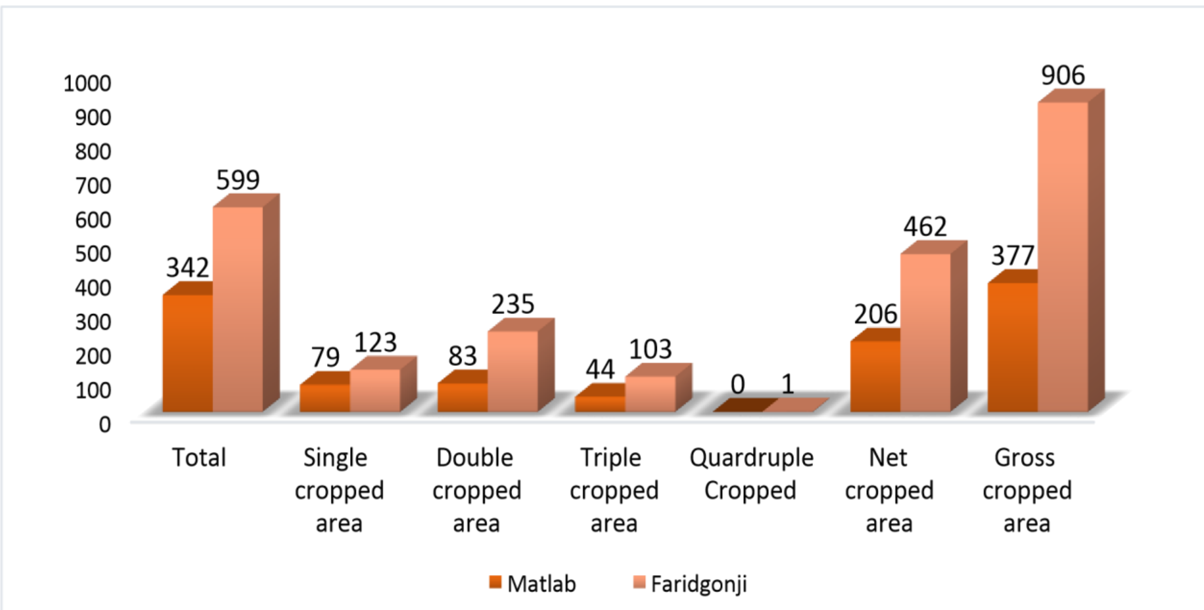



Figure 4.2: Information of Land under the Study Areas

Source: BBS, 2020

Note: Area in '000' hectares

# CHAPTER 5
# SOCIO-DEMOGRAPHIC PROFILE OF MAIZE FARMERS

## 5.1 Introduction

The main goal of this section was to determine the maize farmers' socioeconomic characteristics and to provide basic information about the observation locations. Socioeconomic characteristics is a word used by social scientists to describe a wide range of social and economic elements. Socio variables include a variety of demographic and social elements such as age structure, racial composition ratio, marital status, and so on. The term "economic" refers to the state of the economy, such as income, unemployment rate, and so on. An individual's decision-making behavior is heavily influenced by his socioeconomic circumstances. Due to a lack of time and resources, it was not able to collect all of the data on the sample farmers' socioeconomic characteristics. Because there are several connected variables that characterize an individual and influence the development of behavior and personality of that person, 65 (49.62 percent) and 66 (50.38 percent) farmers were selected for the current study from the upazilas of North Matlab and Faridgonj . Age, education, experience, major and minor occupations, family size, number of family members engaged in agriculture, land ownership, availability of credit, extension, and training facilities, and other socioeconomic factors were addressed in this study.

## 5.2 Age

In this study, all types of farmers in the study area were divided into three age groups: 0-14 years, 15-64 years, and 65 years and older. The table showed that the majority of the maize farmers in the study area were in their forties. In two upazilas, all of the sample farmers were men, and none of them were younger than 15 years old. In North Matlab upazila, 76.9% of the population was between the ages of 15 and 64, with only 23.1 percent being 65 or older (Figure 5.1). In Faridgonj upazila, on the other hand, 87.9% of the population was between the ages of 15 and 64, while only 12.1% was 65 or older (Figure 5.1). The bulk of the sample farmers were in the 15-64 year old age category, according to the findings.

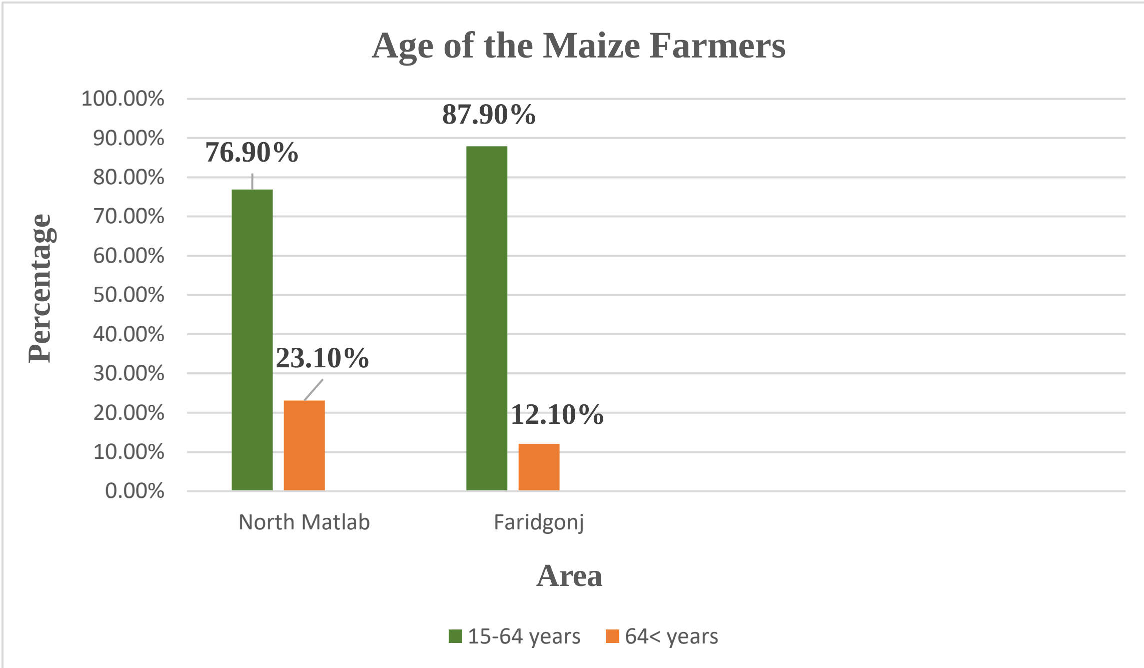



Figure 5.1: Age of the Maize Farmers in Study Area

Source: Field survey, 2020.

### 5.3 Sex Ratio, Dependency Ratio

North Matlab and Chandpur upazilas had average family sizes of 4.15 and 3.94 respectively (BBS, 2019). According to collected data, the average family size of maize producing farmers was 5.04, which was greater than the average family size of two upazilas. The sex ratio in Matlab and Chandpur upazilas was found to be 117 and 120 males per 100 women, respectively (Average 5.2), which was much higher than the national figure of 90 for Matlab and 100 for Faridgonj upazila (BBS, 2019c), perhaps due to the survey's sample framework. Both ratios were far higher than the national overall sex ratio of 100.2 men per 100 females (BBS, SVRS-2019). The study population's dependency ratios were calculated to be 30 and 13.79 .

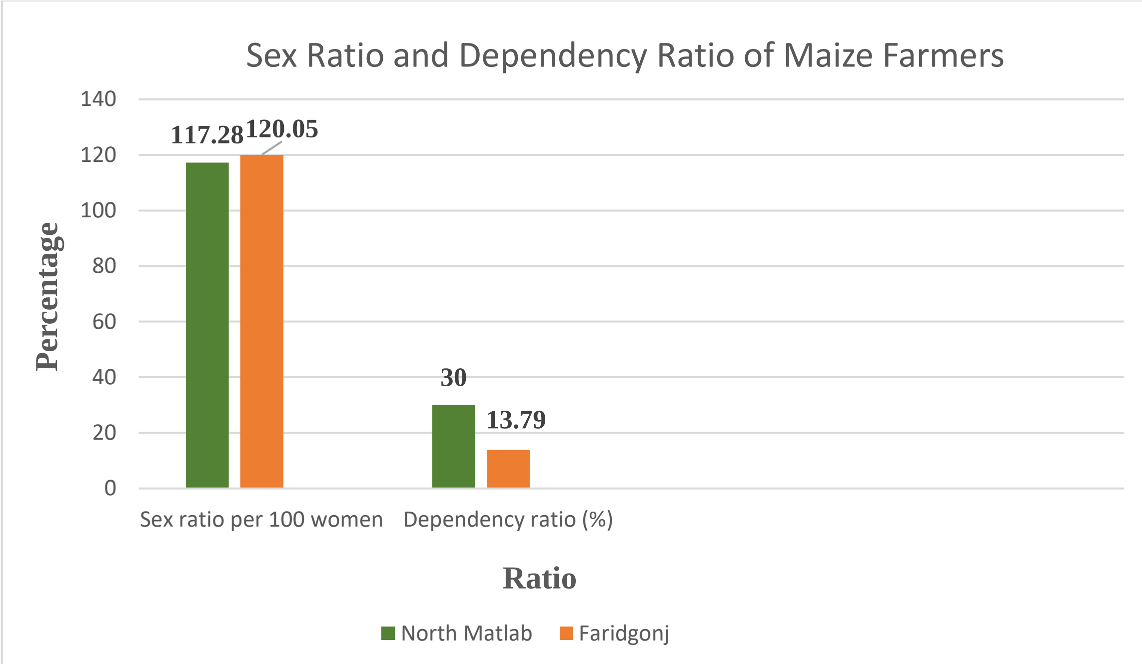



Figure 5.2: Sex Ratio of Family Members and Dependency Ratio of Maize Farmers

Source: Field survey, 2020.

### 5.4 Education

Education is a sign of a community's social growth. Education is critical for reducing poverty and inequality, promoting health, and facilitating the application of knowledge. People who are more educated have better access to relevant information about food and livelihood systems. Higher levels of education are likewise linked to higher levels of income, which is in turn linked to higher wages. Educated farmers have a key role in advancing agricultural growth and influencing the widespread adoption of new farming technology and scientific information.

In North Matlab upazila, about 13.80 percent of the study population had no education, about 24.60 percent were literate or could only read/write, about 20.00 percent had completed primary level education, about 33.80 percent had secondary and only 1.50 percent had higher secondary level education, and only 6.20 percent had attained/completed graduation level education.

Out of 66 farmers studied in Faridgonj upazila, 25.80 percent had no education, 45.50 percent were literate only, 19.70 percent had primary education, 4.50 percent had completed their secondary level education, 3.00 percent had completed their higher secondary education, and only 1.50 percent had completed their higher education.

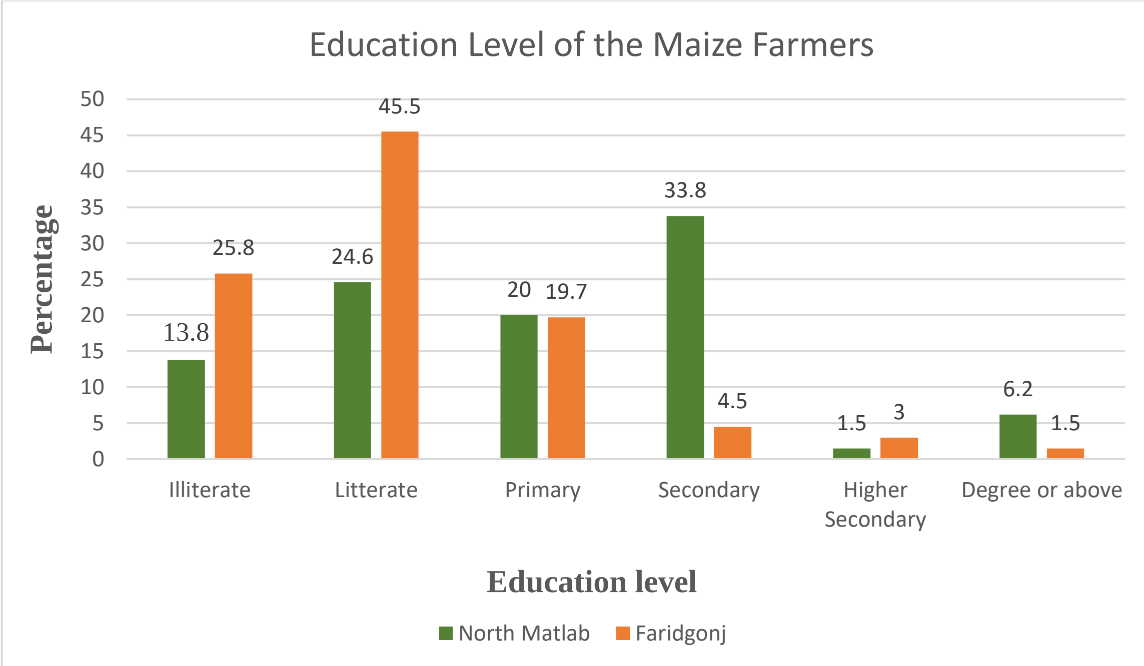



Figure 5.3: Education of the Maize Farmers in Study Area

Source: Field survey, 2020.

### 5.5 Farmer's Professional Distribution Percentage

The occupation of the people refers to the labor that individuals do for a living on a regular basis throughout the year. The distribution of primary occupations changes substantially depending on how involved they are and how much money they receive from their current employment.

#### 5.5.1 Major Occupation

In North Matlab upazila, roughly 80.00 percent (out of 65) of the studied population aged 15 years or more were engaged in agriculture, 12.30 percent in business, and only 7.70 percent were engaged in service as their main activity. Agriculture, business, and service were the main occupations of around 57.60 percent, 36.40 percent, and 6.10 percent (out of 66) in Faridgonj upazila, respectively

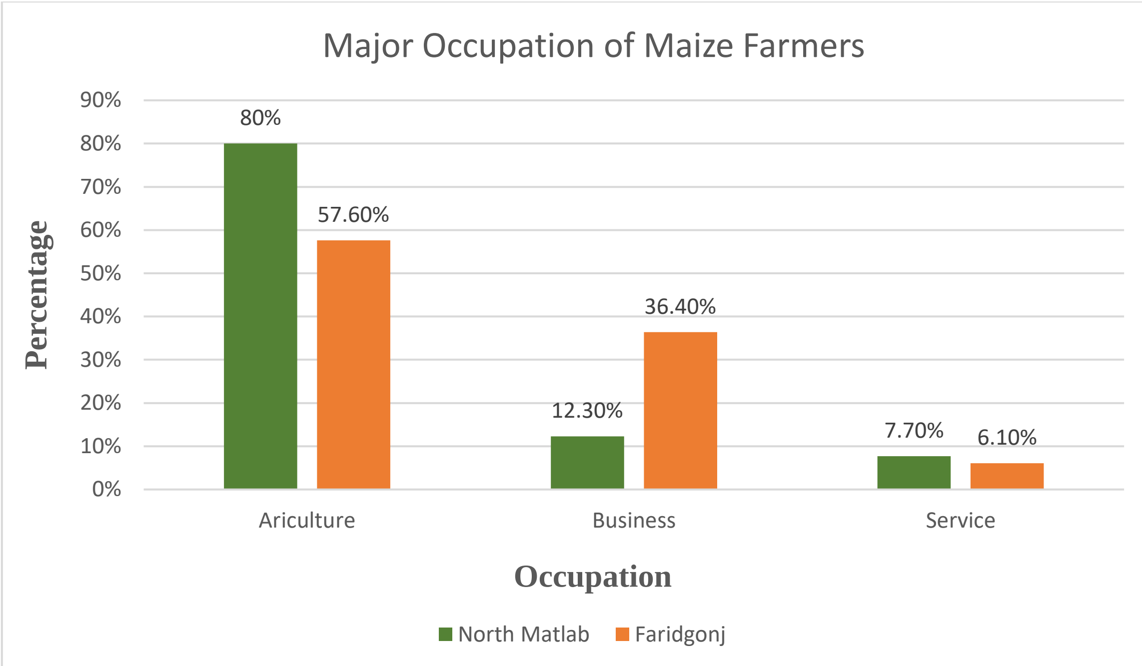



Figure 5.4: Major Occupation of the Maize Farmers in Study Area

Source: Field survey, 2020.

### 5.5.2 Minor Occupation

The minor occupational status of the sample farmers is depicted in the diagram below (Figure 5.5). According to the data, around 44.4 percent and 55.6 percent of farmers in North Matlab upazila were involved in agriculture and business as a secondary activity. In Faridgonj upazila, on the other hand, about 41.3 percent and 58.7% of farmers (out of 66) were engaged in agriculture and business as a secondary activity.

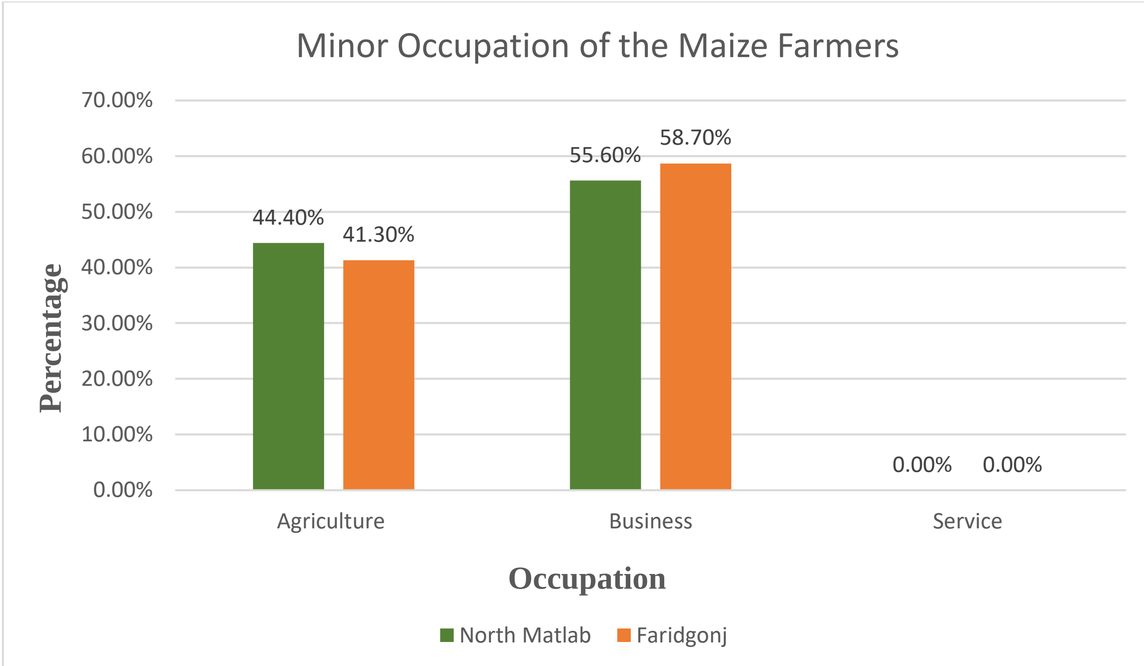



Figure 5.4: Minor Occupation of the Maize Farmers in Study Area

Source: Field survey, 2020.

**Maize cultivated land**

**Table 5.1: Size of Land for Maize Cultivation.**

| **Criteria** | **North Matlab** | | | **Faridgonj** | | |
|---|---|---|---|---|---|---|
| | **Mean** | **Max** | **Min** | **Mean** | **Max** | **Min** |
| **Maize land(ha)** | 0.14 | 0.67 | 0.02 | 0.17 | 0.81 | 0.04 |

Source: Field Survey, 2020.

## 5.7 Land Ownership

When comparing the two upazilas, a household in North Matlab upazila held significantly more land than a home in Faridgonj upazila. According to the statistics collected, on average 0.60 hectares of land was owned by a household in North Matlab upazila (out of 65 household). A household's minimum and maximum land size were found to be 4.11 ha and 0.02 ha, respectively. On the other hand, according to observed statistics, the average size of a household's land in Faridgonj upazila was 1.47 ha (out of 66). In that location, the smallest and largest parcels of land owned by a household were found to be 6.53 hectares and 0.06 ha, respectively (Table 5.2).

**Table 5.2: Size of Land Ownership by the Household.**

| Criteria | North Matlab | | | Faridgonj | | |
|---|---|---|---|---|---|---|
| | Mean | Max | Min | Mean | Max | Min |
| Total land(ha) | 0.60 | 4.11 | 0.02 | 1.47 | 6.53 | 0.06 |

Source: Field Survey, 2020

### 5.8 Family Size

In the research region, a family size is defined as the total number of people living together under the same roof with the same family head. In the research area, the average family size in both upazilas was 5, which was higher than the country's average family size of 4.06. (HIES, 2016). Families in North Matlab upazila had a maximum of 14 people and a minimum of three individuals in each home. Households in Faridgonj upazila, on the other hand, had a maximum of 8 members and a minimum of 2 members (Table 5.3).

**Table 5.3: Size of Household of Maize Farmers in the Study Area**

| Criteria | North Matlab | | | Faridgonj | | |
|---|---|---|---|---|---|---|
| | Mean | Max | Min | Mean | Max | Min |
| **Family size** | 5 | 14 | 3 | 5 | 8 | 2 |

Source: Field Survey, 2020.

According to the size of their families, the total number of people in all families was classified into three categories. Table 5.5 shows the varying family sizes among maize producers. In North Matlab upazila and Faridgonj upazila, respectively, roughly 66.20 percent and 75.80 percent of maize farmer families had two to five people. Around 29.20 percent and 4.60 percent of families in North Matlab upazila had 6-10 people and more than 10 members, respectively. In Faridgonj upazila, about 24.20 percent of families had 6-10 people (Figure 5.7).

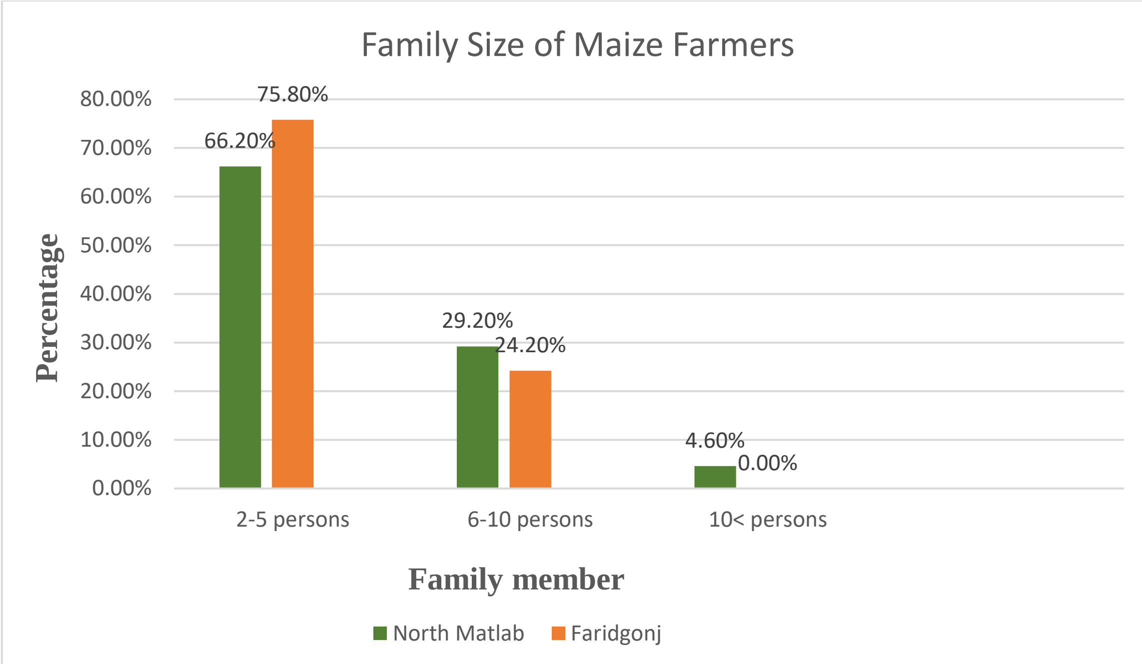



Figure 5.7: Family Size of Maize Farmers in the Study Area Source:

Field Survey, 2020.

### 5.9 No of Family Member Engaged in Agriculture

On the basis of observed data, 1 person from each family was engaged in agriculture in both upazilas (out of 131). Maximum 5 members of a household in North Matlab upazila and 3 members of a family in Faridgonj upazila were directly employed in agriculture (Table 5.4).

**Table 5.4: Involvement of Members of a Household in Maize Farming**

| Criteria | North Matlab | | | Faridgonj | | |
|---|---|---|---|---|---|---|
| | Mean | Max | Min | Mean | Max | Min |
| Engagement in Agriculture | 1 | 5 | 1 | 1 | 3 | 1 |

Source: Field Survey, 2020

In this study, family members' involvement in maize production was divided into five categories: 1 member involvement, 2 people involvement, 3 people involvement, 4 people involvement, and 5 people involvement. Figure 5.8 shows that only one individual is involved in agriculture in around 69.80 percent and

86.20 percent of households in North Matlab and Faridgonj upazilas, respectively. In North Matlab upazila, roughly 25.40 percent of households had two people working in agriculture, and about 1.60 percent of families had three, four, or five people working in agriculture. About 12.30 percent and 1.50 percent of households in Faridgonj upazila had two and three people working in agriculture, respectively.

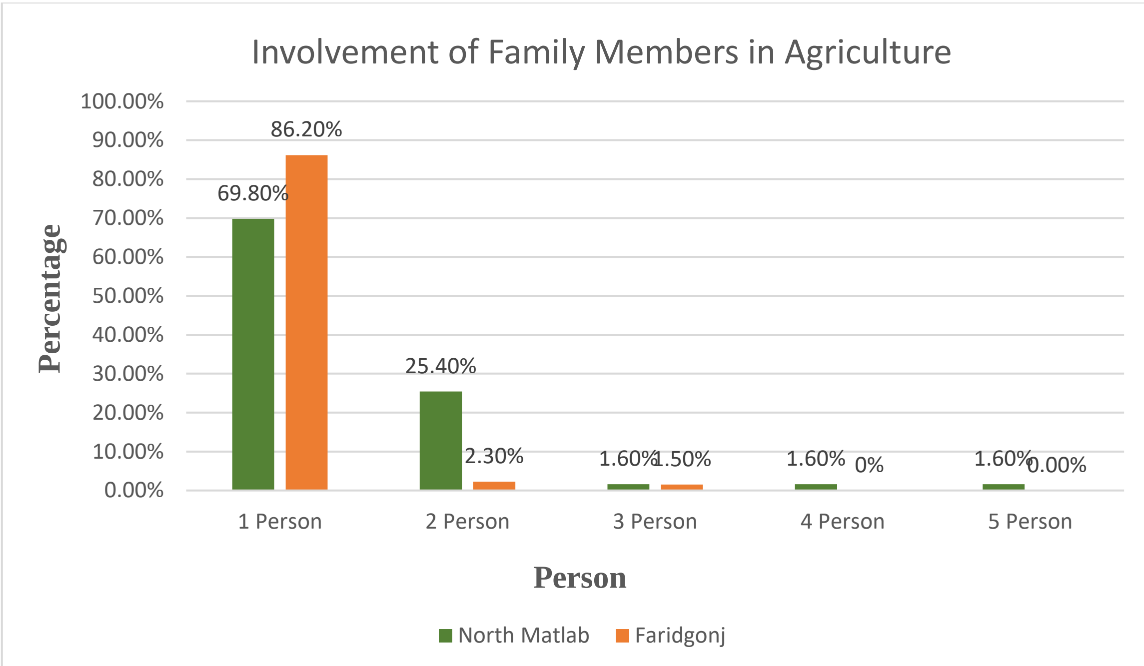



Figure 5.8: Involvement of Family Members in Agriculture

Source: Field Survey, 2020.

**5.10 Extension Service**

In North Matlab upazila and Faridgonj upazila, respectively, 56.90 percent and 68.20 percent of farmers had direct or indirect touch with agricultural extension officers. They learned valuable information about various agricultural technologies related to maize farming from officers, however in the case of maize farming, 43.10 percent and 31.80 percent of farmers depended on their traditional farming expertise because they did not have contact with extension officers.

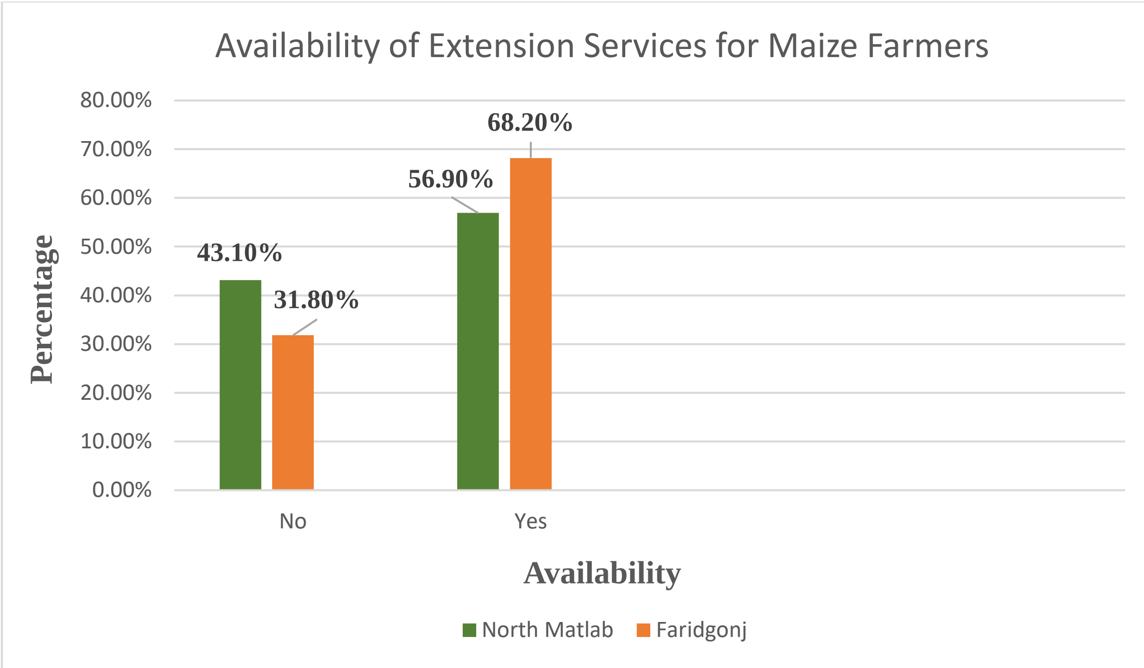



Figure 5.9: Availability of Extension Services for Maize Farmers

Source: Field Survey, 2020

### 5.11 Credit Facility

A certain amount of capital is essential for every type of farming operation. In the research area, the majority of the farmers lacked access to loans for maize planting. In North Matlab and Faridgonj upazilas, respectively, about 30.80 and 47.00 percent of farmers took out loans from banks and non-governmental organizations for maize growing. In the research areas, approximately 69.20 percent and 53.00 percent of farmers used their own funds for maize growing, respectively (Figure 5.10).

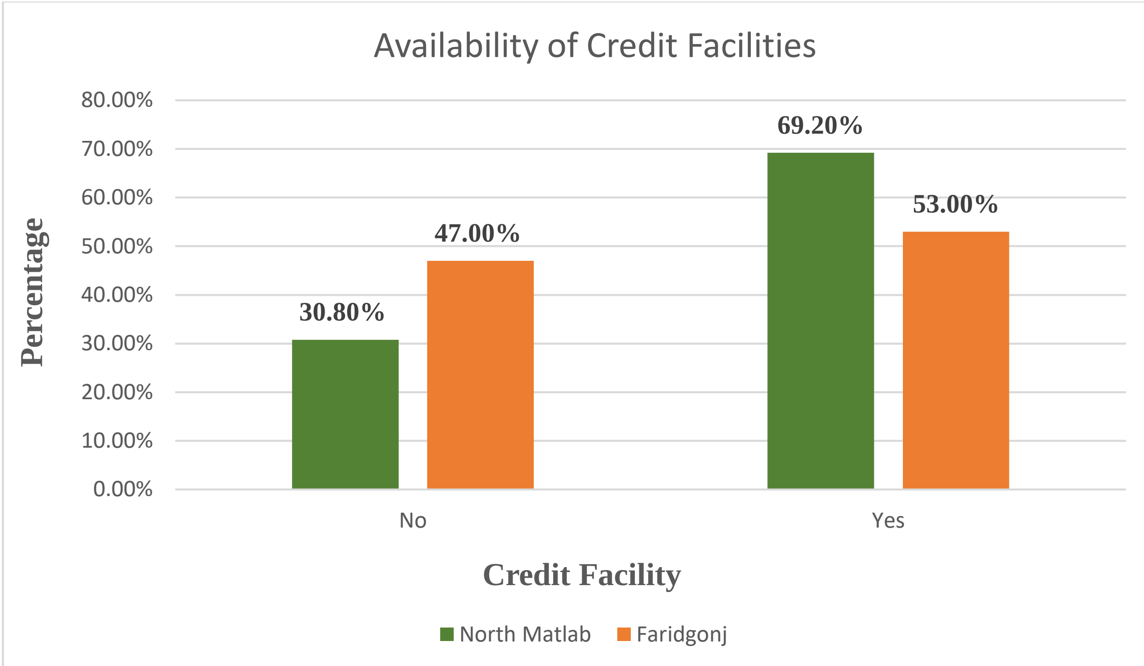



Figure 5.10: Availability of Credit Facilities for Maize Farmers

Source: Field Survey, 2020.

### 5.12Training Facility

40.00 percent of the farmers in North Mataab upazila who responded to the survey received training in various sophisticated agricultural methods, whereas 60.00 percent did not. In Faridgonj upazila, on the other hand, 37.90 percent of respondent farmers received training on the production of various agricultural crops, while 62.10 percent of farmers did not receive crop cultivation training.

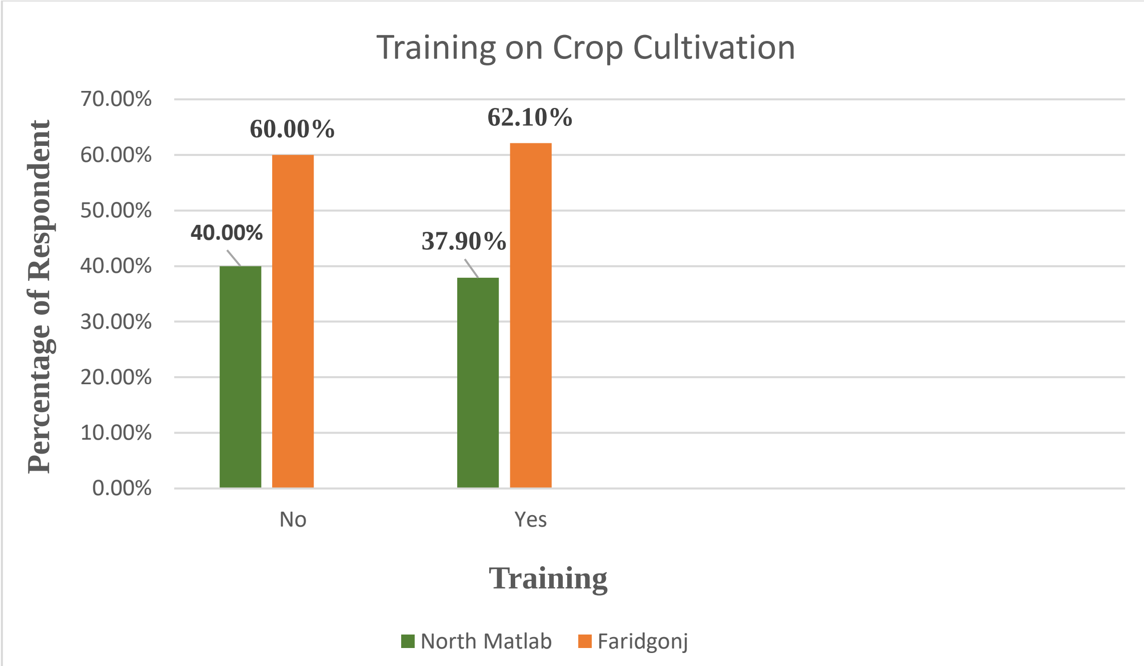



Figure 5.11: Training on Crop Cultivation

Source: Field Survey, 2020.

### 5.13 Concluding Remarks

The socioeconomic characteristics of the sample farmers from two separate upazilas were examined in this chapter. It is clear from the preceding comments that there are some differences in socio-economic characteristics among maize farmers in two upazilas, North Matlab and Faridgonj .The extent of the differences, however, was not noteworthy.

# CHAPTER 6

# PROFITABILITY OF MAIZE PRODUCTION

## 6.1 Introduction

Cost plays a critical role in the producers' decision-making. The costs were divided into two categories: variable and fixed costs. The major goal of this chapter is to evaluate maize production costs, returns, and profitability. Profitability is a crucial consideration when deciding whether or not to grow a crop on a farm. The net return, gross margin, and undiscounted benefit-cost are all used in this chapter to calculate production profitability. To get the total cost of production, the costs of all products were added together. The value of the products and by-products was used to assess the crop returns.

## 6.2 Profitability of Maize Production

### 6.2.1 Variable Costs

#### 6.2.1.1 Cost of Land Preparation

The most crucial part of the manufacturing process is land preparation. Plowing, laddering, and other actions required to prepare the land for maize cultivation included plowing, laddering, and other tasks Thus, the average cost of land preparation for maize production was Tk. 8130 per hectare, accounting for 7.54 percent of the operating cost (Table 6.1). The most crucial part of the manufacturing process is land preparation. Plowing, laddering, and other actions required to prepare the land for maize cultivation included plowing, laddering, and other tasks.

#### 6.2.1.2 Cost of Human Labor

One of the most significant cost components in the production process is human labor. It's one of the most significant and widely utilized ingredients in maize production. Land preparation, sowing, weeding, fertilizer and insecticide treatment, irrigation, harvesting and hauling, threshing, cleaning, drying, and storing are all examples of operations that require it. The average price of human labor was Tk. 370 per man-day, and the amount of human labor employed in maize production was found to be around 110 man-days per hectare. As a result, the total cost of human labor was determined to be Tk. 40700 or 37.37 percent of the overall cost (Table 6.1).

#### 6.2.1.3 Cost of Seed

Seed prices varied dramatically based on its quality and availability. The average price of seed was Tk. 500 per kg, and the amount of seed utilized in maize production was found to be around 19.04 kg per hectare and the cost of seed for maize production was Tk 9000 which account 7.35% of the operating cost.

#### 6.2.1.4 Cost of Urea

Farmers in the study area utilized a variety of fertilizers. Farmers utilized urea 265 kg per hectare on average among the various types of fertilizers used. The cost of urea per hectare was Tk. 4637.5 or 4.12 percent of the overall cost (Table 6.1).

#### 6.2.1.5 Cost of TSP

The rate of application of TSP was 125 kg per hectare, which was lower than the rate of application of other fertilizers. TSP cost an average of Tk.2875, accounting for 2.59 percent of the overall cost (Table 6.1).

#### 62.1.6 Cost of MoP

The amount of MoP applied per hectare was 220 kg. For maize production, the MoP cost per hectare was Tk.3900, accounting for 3.57 percent of the overall cost (Table 6.1).

#### 6.2.1.7 Cost of Insecticides

To maintain their crops free of pests and diseases, farmers utilized a variety of insecticides. Insecticides used in maize production were employed in such little quantities and at such low costs that they were not worth mentioning. Insecticides for maize production cost an average of Tk. 730.45 per hectare, accounting for 0.68 percent of the overall cost (Table 6.1).

#### 6.2.1.8 Cost of Irrigation

One of the most significant costs in maize cultivation is irrigation. Irrigation is critical to maize production. Irrigation water applied in the right doses can assist enhance yield per hectare. The average cost of irrigation per hectare was found to be Tk. 12017.47, accounting for 11.23 percent of the overall expenditure (Table 6.1).

**Table 6.1: Per Hectare Cost of Maize Production**

| Items of Cost | Quantity (Unit/ha) | Rate (Tk./Kg) | Cost (Tk./ha) | Percentage of Total Cost |
|---|---|---|---|---|
| Land preparation | 3 | 2710.04 | 8130.12 | 7.54 |
| Human labor (hired) | 11 | 400 | 40000 | 37.37 |
| Family labor | 2 | 400 | 800 | 1.59 |
| Seed | 18 | 500 | 9000 | 7.35 |
| Urea | 266 | 16 | 4240 | 4.11 |
| TSP | 125.0 | 22 | 2750 | 2.59 |
| MoP | 220 | 15 | 3300 | 3.57 |
| Cost of Insecticides | | | 730.45 | 0.68 |
| Cost of Irrigation | | | 12017.48 | 11.23 |
| **A. Total Operating Cost (TOC)** | | | 82385.42 | 74.44 |
| Interest on operating capital @ of 9 percent for months | | | 2471.56 | 2.48 |
| **B. Total Variable Cost (TVC)** | | | 84856.98 | 76.92 |
| Rental value of land | | | 25600 | 23.07 |
| **C. Total Fixed Cost (TFC)** | | | 25600 | 23.07 |
| **D. Total cost (B+C)** | | | 110456.9826 | 100 |

Source: Field Survey,2020

### . 6.2.1.9 Interest on Operating Capital

It should be emphasized that interest on operational capital was computed by factoring in all operating costs incurred during the maize production period. Interest on maize production operational capital was estimated at Tk. 2471.56 per hectare, or 2.48 percent of the total cost (Table 6.1). It should be emphasized that interest on operational capital was computed by factoring in all operating costs incurred during the maize production period. Interest on maize production operational capital was estimated at Tk. 2471.56 per hectare, or 2.48 percent of the total cost (Table 6.1).

#### 6.2.1.10 Total Variable Cost

As a result of the various cost categories listed above, it was determined that the overall variable cost of maize production was Tk. 84856.9826 per hectare, or 76.92 percent of the total cost (Table 6.1).

### 6.2.2 Fixed Cost

#### 6.2.2.1 Rental Value of Land

The opportunity cost of using land per hectare for a three-month cropping cycle was used to calculate the rental value of land. The cost of land use was calculated using the cash rental value of the land. The land usage cost was found to be Tk. 25600 per hectare based on data collected from maize farmers, accounting for 23.07 percent of the overall cost (Table 6.1).

### 6.2.3 Total Cost (TC) of Maize Production

The total cost was computed by putting all variable and fixed input costs together. The overall cost of producing maize per hectare was found to be Tk. 110456.98.19 in this study (Table 6.1).

### 6.2.4 Return of Maize Production

#### 6.2.4.1 Gross Return

Table 6.2 shows the return on maize cultivation per hectare. The entire amount of produce multiplied by the respective per unit price yielded the per hectare gross return. the average maize price was Tk. 17.00, as shown in the table(6.2).As a result, the gross return per hectare was calculated to be Tk 177980 (Table 6.2).

#### 6.2.4.2 Gross Margin

The gross margin is the profit after deducting variable costs. The whole variable cost was subtracted from the gross return to arrive at the gross margin. The gross margin was found to be Tk 93123.02per acre based on the data (Table 6.2).

#### 6.2.4.3 Net Return

Net return or profit was calculated by deducting the total production cost from the gross return. On the basis of the data the net return was estimated as Tk 67523.02per hectare (Table 6.2).

**Table 6.2: Per Hectare Cost and Return of Maize production**

| Measuring Criteria | Yield (kg/ha) | Unit price | Cost (Tk./ha) |
|---|---|---|---|
| Main Product Value | 9880 | 17 | 167960 |
| By Product Value | | | 10020 |
| Gross Return (GR) | | | 177980 |
| Total Variable Cost (TVC) | | | 84856.98 |
| Total Cost (TC) | | | 110456.98 |
| Gross Margin (GR-TVC) | | | 93123.02 |
| Net Return (GR-TC) | | | 67523.02 |
| BCR (undiscounted)(GR/TC) | | | 1.61 |

Source: Field Survey, 2020

### 6.2.5 Benefit Cost Ratio (Undiscounted)

The Benefit Cost Ratio (BCR) is a relative metric for comparing benefit to expense per unit of cost. The Benefit Cost Ratio (BCR) was discovered to be 1.61. implying that a taka invested in maize cultivation yielded Tk. 1.61 in return (Table 6.2). According to the calculations above, maize farming is profitable in Bangladesh.

### 6.3 Profitability of Maize Production by Region

**Table 6.3: Cost and Economic Returns of Maize Cultivation in Two Upazilas.**

| | **North Matlab** | | **Faridgonj** | |
|---|---|---|---|---|
| **Items of Cost** | **Cost (Tk./ha)** | **percent of Total Cost** | **Cost (Tk./ha)** | **% of Total Cost** |
| Land preparation | 8130 | 6.18 | 8877.48 | 9.15 |
| Human labour | 40700.47 | 42.51 | 30320.35 | 31.26 |
| Seed | 9000.69 | 6.63 | 7951.32 | 8.19 |
| Urea | 4637.5 | 3.52 | 4654.31 | 4.79 |
| TSP | 2875.76 | 2.35 | 2803 | 2.89 |
| MoP | 4290.76 | 3.15 | 3947.93 | 4.07 |
| Cost of Insecticides | 730.72 | 0.94 | 354.96 | 0.36 |
| Cost of Irrigation | 12017.48 | 9.41 | 12996.42 | 13.40 |
| **A. Total Operating Cost (TOC)** | 82385.01 | 74.71 | 71905.77 | 74.13 |
| Interest on operating capital @ of 10percent for months | 2471.07 | 2.49 | 2396.86 | 2.47 |
| **B. Total Variable Cost (TVC)** | 84856.98.08 | 77.20 | 74302.63 | 76.59 |
| Rental value of land | 25600.15 | 22.79 | 22700.26 | 23.40 |
| **C. Total Fixed Cost (TFC)** | 25600.15 | 22.79 | 22700.26 | 23.40 |
| **D. Total cost (B+C)** | 110456.23 | 100 | 97002.89 | 100 |
| Average yield (kg/ha) | 9880 | | 9771.27 | |
| Gross Return (GR) (Tk) | 177980.16 | | 154398.96 | |
| Gross Margin (GR-TVC) (Tk) | 93123.08 | | 80096.33 | |
| Net Return (GR-TC) (Tk) | 67523.93 | | 57396.07 | |
| **BCR (undiscounted)(GR/TC)** | 1.61 | | 1.42 | |

Source: Field Survey, 2020.

#### 6.3.1 Yield by Region

North Matlab upazila is a district in Bangladesh. The average yield per hectare was 9880.421 kg/ha. Farmers Faridgonj upazila had the highest production (9771.27 kg/ha), followed by farmersNorth Matlab upazila (9880.37 kg/ha).

### 6.3.2 Costs by Region

#### 6.3.2.1 Variable Cost:

The average variable cost of maize cultivation was Tk. 82319.81 per hectare, which was higher than the variable cost of Faridgonj (Tk. 90460.08 per ha) (Tk. 74302.63 per ha). In North Matlab, human labor accounted for 42.51 percent of variable costs, followed by cost of irrigation (9.41 percent), cost of fertilizers (9.02 percent), seed cost (6.63 percent), and land preparation cost (6.18 percent), while in Faridgonj upazila, human labor, cost of irrigation, cost of fertilizers, land preparation cost, and seed cost accounted for 31.26 percent, 13.40 percent, 11.75 percent, 9.15 percent, and 8.19 percent, respectively (Table 10).

#### 6.3.2.2 Fixed Cost:

Land use cost, which is the rental value of land in this example, was a fixed expense. The total fixed cost per hectare was Tk. 25600.15 on average. The fixed cost varied only due to variations in land usage costs in two distinct upazilas, with North Matlab upazila paying Tk. 26715.15 per hectare and Faridgonj upazila paying Tk. 22700.26 per hectare (Table 10).

#### 6.3.2.3 Total Cost:

Total production cost of maize was Tk. 107012.19 per hectare, which was higher

North Matlab upazila (Tk. 117175.23 per ha) and lower at Faridgonj upazila

(Tk. 97002.89 per ha).

### 6.3.4 Returns by Region

Tk. 151323.72 per hectare was the average gross return, with a gross margin of Tk. 69003.91 per hectare and a net return of Tk. 44311.53 per hectare. When comparing the two regions, Faridgonj upazila's gross return, gross margin, and net returns were higher than North Matlab upazila's. At Faridgonj upazila, gross return, gross margin, and net returns were Tk. 154398.96 per ha, Tk. 80096.33 per ha, and Tk. 57396.07 per ha, respectively; at North Matlab upazila, gross return, gross margin, and net returns were Tk. 148201.16 per ha, Tk. 57741.08 per ha, and Tk. 31025.93 per ha, respectively. The Benefit Cost Ratio (BCR) for North Matlab and Faridgonj upazilas was determined to be 1.61 and 1.42, respectively.

### 6.4 Concluding Remarks

The various cost elements and their application doses, yields, and returns per hectare of maize agriculture are easily understood from the previous discussion. Maize production required very little insecticides, and the amount of fertilizer and irrigation required was similarly little compared to other crops. The most essential factor in increasing maize yield and profitability was the timely and efficient application of these inputs. On the basis of the foregoing discussion, it can be safely stated that maize agriculture was more profitable in Faridgonj upazila than in North Matlab upazila. North Matlab upazila has a greater cost of maize farming than Faridgonj upazila. Maize cultivation would assist farmers in increasing their revenue.

# CHAPTER 7

# RESOURCE USE EFFICIENCY OF MAIZE PRODUCTION

Cobb-Douglas production function was applied to determine the affecting factors and resource use efficiency of mud crab fattening practices in the study area. Findings of the research are being discussed in this chapter.

### 7.1. Factors Affecting the Return from Maize

In order to assess the contribution of different inputs like cost on human labor, irrigation, Urea, Tsp, Mop, Zinc, Insecticide etc , Cobb Douglas production function model was used.. The estimated values of co-efficient and related statistics of Cobb Douglas production function have been presented in Table 7.1.

**Table 7.1** Estimated Co-efficient and Their Related Statistics of Production Function of Maize

| Explanatory Variable | Co-efficient | Sd. Error |
|---|---|---|
| Intercept | 1.15 | 1.35 |
| Human labor *($X_1$)* | 0.17** | 0.06 |
| Seed *($X_2$)* | 0.60*** | 0.20 |
| Urea*($X_3$)* | 0.12** | 0.05 |
| Insecticide *($X_4$)* | -0.02 | 0.03 |
| Irrigation*($X_5$)* | 0.11 | 0.08 |
| Tsp *($X_6$)* | 0.08 | 0.13 |
| Adjusted $R^2$ | 65.79% | |
| F-value | 46.26*** | |
| Return to scale | 1.02 | |

**Note**: *** and ** indicate significant at 1% and 5% level respectively.

The co-efficient for human labor and urea were positive and significant at 5% level.

The co-efficient of seed was also positive and significant at 1% level.

## 7.2. Interpretation of the Production Function

**Human labor** ***($X_1$)***

The regression co-efficient of human labor cost was 0.17 which was significant at 5 percent level of significance. It indicates that considering all other factors constant, one percent increment of cost of human labor would increase gross return from maize by 0.17 percent.

**Seed** ***($X_2$)***

The regression co-efficient for the costs of seed was 0.60 which was significant at 1 percent level of significance. It indicates that considering all other factors constant, one percent increasing costs on seeds would increase gross return from maize by 0.60 percent.

**Urea*($X_3$)***

The regression co-efficient of urea cost was 0.12 which was significant at 5 percent level of significance. It indicates that considering all other factors constant, one percent increasing cost on urea would increase gross return from maize by 0.12 percent.

**Insecticide*($X_4$)***

The regression co-efficient for the cost of insecticide application was -0.02 which was not. significant.

**Irrigation*($X_5$)***

The regression co-efficient for the cost of Irrigation was 0.11 but not significant at the desired level of significance.

**Tsp** ***($X_6$)***

The regression co-efficient for the cost incurred by other variables was 0.08 which was positive not significant at the desired level of significance.

**Adjusted $R^2$**

The co-efficient of multiple determinations, Adjusted $R^2$ of the model were 0.6579, which indicates that about 65.79 percent of the variations in gross return of maize have been explained by the explanatory variables included in the model.

**F -Value**

The F - values of the equation derived 46.26 which were highly significant at 1 percent level of significance, implying that all the explanatory variables were important for explaining the variations in gross returns of the operators.

**Returns to scale:**

The summation of all the production co-efficient indicates returns to scale. For the maize, the summation of the coefficients was 1.02 which means that the production functions exhibit increasing returns to scale. An increasing amount of investment in this venture would further increase the returns from the land.

**7.3. Findings of the Resource Use Efficiency of Maize**

Resource use efficiency means how efficiently the farmers can use their resources in the production process. Because of the scarcity of resources, its efficient use is important. For calculating resource use efficiency, six input factors like cost on human labor, urea,seed, tsp, Irrigation and insecticide were considered.

**Table 7.2: Resource Use Efficiency of Maize**

| | **Geometric mean (GM)** | **$\bar{Y}$(GM)/$\bar{X}$(GM)** | **Co-efficient** | **MVP(X)** | **R=MVP/MFC** | **Decision rule** |
|---|---|---|---|---|---|---|
| Yield of Maize(Y) | 167960.47 | | | | | |
| Human labor($X_1$) | 40071.1 | 4.19 | 0.17 | 4.68 | 4.68 | Under utilization |
| Seed($X_2$) | 8553.70 | 19.63 | 0.60 | 11.778 | 11.778 | Under-utilization |
| Urea($X_3$) | 4291.47 | 39.13 | 0.12 | 4.69 | 4.69 | Under-utilization |
| Insecticide($X_4$) | 730.45 | 229.94 | 0.02 | 4.59 | 4.59 | Over-utilizatiom |
| Irrigation($X_5$) | 12017.5 | 13.97 | 0.11 | 0.53 | 0.53 | Under-utilization |
| Tsp($X_6$) | 2867.70 | 58.56 | 0.08 | 3.6 | 3.6 | Oveer-utilization |

From the Table 7.2, it is evident that the ratios of marginal value products (MVP) and marginal factor cost (MFC) of human labor, seeds, urea and tsp were greater than unity which indicates the under-utilization of those resources. Increment of use of those resources would be helpful to further increase the productivity. Same ratios for insecticide and irrigation were less than unity, thereby indicating over-utilization of the said variables. Reduction of use of those resources would be helpful to further improvement of the productivity. Hence, resources employed on human labor, seed, Urea and Tsp were underutilized in the Maize production of Chandpur, North Matlab and Faridgonj upazila whereas tsp and insecticides were over-utilized.

# CHAPTER 8

# PROBLEMS OF MAIZE PRODUCTION

## 8.1 Introduction

The purpose of this chapter is to determine the scope of the challenges faced by maize producers. Maize production was fraught with difficulties for farmers. The issues were social, cultural, financial, and technical in nature. This chapter seeks to depict some of the socioeconomic issues and limits that come with growing maize. According to the farmers' opinions, the issues and limits they confront were identified. The primary issues and limits associated with maize farming are mentioned here

## 8.2 High Price of Seeds

One of the most significant constraints on maize production in the study area was the high cost of seeds. According to Table 8.1, around 73.8 percent of maize growers in North Matlab Upazila rated this as a serious problem, whereas approximately 72.7 percent of maize farmers in Faridgonj Upazila identified this as a serious problem. In North Matlab and Faridgonj Upazilas, respectively, high seed prices were a moderate difficulty for 16.9% and 12.1 percent of respondents (Table 8.1). This problem was rated as severe by 73.3 percent of farmers on average (Table 8.2).

## 8.3 High Price of Fertilizers

Fertilizers are an important input for enhancing farm maize production. Fertilizer prices are rising on a daily basis. The most common issue faced by small maize growers was the high expense of fertilizer. In North Matlab Upazila, 44.2 percent of maize producers reported a moderate problem, while 43.9 percent of maize farmers in Faridgonj Upazila reported a high problem. In North Matlab and Faridgonj Upazilas, respectively, high seed prices were a serious problem for 36.9% and a moderate concern for 22.7 percent of respondents (Table 8.1). This problem was rated as severe by 40.5 percent of farmers on average (Table 8.2).

## 8.4 Lack of Irrigation Water

Irrigation is an essential component of maize cultivation. Maize yield varies a lot depending on how much irrigation water is used. Few farmers in the study areas had their own shallow tube wells, but the majority of farmers did not have their own deep tube wells, and as a result, they had to pay a higher fee for irrigation water. In Faridgonj upazila, the source of was also unavailable. Table 8.1 shows that in North Matlab Upazila, 47.7% of maize growers rated this as a moderate difficulty, while in Faridgonj Upazila, 48.5 percent rated it as a moderate problem. Irrigation water shortages were cited by 38.5 percent and 47 percent of respondents in North Matlab and Faridgonj Upazilas, respectively, as a serious issue (Table 8.1). On an average about 42.7 percent of farmers reported this problem as severe (Table 8.2).

### 8.5 Low Price of Grains

The biggest issue with maize cultivation was the low grain price. This was cited as a significant problem by 56.9% of maize producers in North Matlab Upazila and 62.1 percent of maize farmers in Faridgonj Upazila. Low grain prices were a moderate problem for 23.2 percent of respondents in North Matlab and 22.7 percent of respondents in Faridgonj Upazila, respectively (Table 8.1). This problem was rated as severe by 49.5 percent of farmers on average (Table 8.2).

### 8.6 Lack of Suitable Land

Lack of suitable land was cited as a moderate concern by 47.7% of maize producers in North Matlab Upazila and 51.5 percent of maize farmers in Faridgonj Upazila. In North Matlab and Faridgonj Upazilas, respectively, this problem was rated as a low problem by 36.9% and 34.8 percent of respondents. This was a serious difficulty for a few farmers in both upazilas (Table 8.1). Approximately 14.5 percent of farmers rated the condition as severe (Table 8.2).

### 8.7 Inadequate Extension Service

During the study, some farmers stated that they did not receive the necessary extension services from the Department of Agricultural Extension on better maize farming methods (DAE). About 47.7% of maize growers in north Matlab Upazila and 34.8 percent of maize farmers in Faridgonj Upazila regarded this as a moderate concern for maize farming (Table 8.1). In North Matlab and Faridgonj Upazilas, respectively, around 30.8 percent and 43.9 percent of respondents said this was a minor issue (Table 8.1). This was a serious difficulty for a few farmers in both upazilas. This problem was rated as severe by 21.4 percent of farmers on average (Table 8.2).

## 8.8 Natural Calamities

About 76.9% of maize growers in North Matlab Upazila and 66.7 percent of maize farmers in Faridgonj Upazila reported this as a serious concern for maize farming (Table 8.1). In North Matlab and Faridgonj Upazilas, this problem was rated as a moderate problem by 15.4 percent and 28.8 percent of respondents, respectively. Few farmers in both upazilas have this difficulty (Table 8.1). This problem was rated as severe by 71.8 percent of farmers on average (Table 8.2).

## 8.9 Lack of Quality Seeds

One of the most significant constraints to maize production in the study area was a lack of highquality seeds. According to Table 8.1, 41.5 percent of maize growers in Matlab Upazila reported a moderate problem, while 39.4 percent of maize farmers in Faridgonj Upazila reported a serious problem (Table 8.1). In North Matlab and Faridgonj Upazilas, respectively, lack of quality seeds was a serious concern for 30.8 percent and moderate for 30.3 percent of respondents. This problem was rated as severe by 35.1 percent of farmers on average (Table 8.2).

## 8.10 Lack of Scientific Knowledge of Farming

Despite the fact that current agricultural technologies are used in the research area, few farmers have adequate understanding of the proper doses and methods for applying modern inputs and maize production technology. This difficulty was experienced by 66.1 percent of maize producers in North Matlab upazila and 54.5 percent of maize farmers in Faridgonj upazila (Table 8.1). In North Matlab upazila and Faridgonj upazila, the problem was moderate for 29.2 percent of farmers and 30.3 percent of farmers, respectively. Approximately 11.5 percent of farmers rated the condition as severe (Table 8.2)

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## 8.11 Lack of Credit Facility

Credit was a problem for the farmers in the study area. A large sum of money was required to acquire numerous inputs such as human labor, seed, fertilizers, irrigation, and so on in order to cultivate maize. About 53.8 percent of maize farmers in North Matlab Upazila said they couldn't acquire enough credit to buy the necessary inputs for their businesses, classifying it as a high problem, while nearly 45.5 percent of maize farmers in Faridgonj Upazila said it was a moderate problem (Table 8.1). In North Matlab and Faridgonj upazilas, the problem was moderate for 35.4 percent of farmers and severe for 42.4 percent of farmers, respectively. This problem was rated as severe by 6.87 percent of farmers on average. (See Table 8.2)

**Table 8.1 Problems of Maize Production by Study Areas**

| Type of Problems | North Matlab | | | | | | | Faridgonj | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rank | Low | | Medium | | High | | Rank | Low | | Medium | | High | |
| | | No | % | No | % | No | % | | No | % | No | % | No | % |
| High price of seeds | 2nd | 6 | 9.2 | 11 | 16.9 | 48 | 73.8 | 1st | 10 | 15.2 | 8 | 12.1 | 48 | 72.7 |
| High price of fertilizers | 6th | 12 | 18.5 | 29 | 44.6 | 24 | 36.9 | 5th | 22 | 33.3 | 15 | 22.7 | 29 | 43.9 |
| Lack of irrigation facilities | 5th | 9 | 13.8 | 31 | 47.7 | 25 | 38.5 | 4th | 3 | 4.5 | 32 | 48.5 | 31 | 47 |
| Low price of grains | 3rd | 13 | 20 | 15 | 23.1 | 37 | 56.9 | 3rd | 10 | 15.2 | 15 | 22.7 | 41 | 62.1 |
| Lack of suitable land | 9th | 24 | 36.9 | 31 | 47.7 | 10 | 15.4 | 10th | 23 | 34.8 | 34 | 51.5 | 9 | 13.6 |
| Inadequate extension service | 8th | 20 | 30.8 | 31 | 47.7 | 14 | 21.5 | 8th | 29 | 43.9 | 23 | 34.8 | 14 | 21.2 |
| Natural Calamities | 1st | 5 | 7.7 | 10 | 15.4 | 50 | 76.9 | 2nd | 3 | 4.5 | 19 | 28.8 | 44 | 66.7 |
| Lack of Quality Seed | 7th | 18 | 27.7 | 27 | 41.5 | 20 | 30.8 | 7th | 20 | 30.3 | 20 | 30.3 | 26 | 39.4 |
| Lack of Scientific Knowledge | 10th | 41 | 66.1 | 19 | 29.2 | 5 | 7.7 | 9th | 36 | 54.5 | 20 | 30.3 | 10 | 15.2 |
| Lack of credit facility | 4th | 7 | 10.8 | 23 | 35.4 | 35 | 53.8 | 6th | 8 | 12.1 | 30 | 45.5 | 28 | 42.4 |

Source: Field Survey, 2020

**Table 8.2 Rank of Problems of Maize Production**

| Type of Problems | No. of farmers | Percentage of farmers | Rank |
|---|---|---|---|
| High price of seeds | 96 | 73.3 | 1st |
| Natural Calamities | 94 | 71.8 | 2nd |
| Low price of grains | 78 | 59.5 | 3rd |
| Lack of credit facility | 63 | 48.1 | 4th |
| Lack of irrigation facilities | 56 | 42.7 | 5th |
| High price of fertilizers | 53 | 40.5 | 6th |
| Lack of Quality Seed | 46 | 35.1 | 7th |
| Inadequate extension service | 28 | 21.4 | 8th |
| Lack of suitable land | 19 | 14.5 | 9th |
| Lack of Scientific Knowledge | 15 | 11.5 | 10th |

Source: Field Survey, 2020

# CHAPTER-9

# SUMMARY, CONCLUSION AND RECOMMENDATIONS

## 9.1 Introduction

This chapter focuses on the conclusion in light of the previous chapters' discussions. On the basis of the empirical findings, a conclusion has been reached. In order to improve the inefficiency of maize production in Bangladesh, policy recommendations are made.

## 9.2 Summary

Agriculture is a major contributor to Bangladesh's economic growth. The functioning of this sector is inextricably tied to economic progress. Crops are the most important contributors to agriculture and the country's total GDP, as well as to the economy's overall growth and development. This sub-performance sector's has a substantial impact on major macroeconomic goals such as job creation, poverty alleviation, human development, and food and nutritional security. In 2020-21, the GDP growth rate was 6.8 percent, which was much higher than the previous fiscal year's growth rate of 5.2 percent. Agriculture's contribution to GDP fell by 0.51 percentage point to 14.23% among the major sectors of GDP (BER, 2021). Agriculture employs roughly 40.06 percent of the country's total workforce (BER, 2021). Despite increases in the percentage of fisheries, livestock, and forestry in agricultural GDP, the crop sub-sector accounts for 7.51 percent of total agricultural GDP (BER, 2021).

Maize (Zea mays) is a photo-insensitive crop that belongs to the Grammies family. Maize is one of the oldest crops in Bangladesh, and after rice and wheat, it is the third most significant cereal crop, with the highest grain output and various uses. It is most widely used in the poultry and fish feed industries, as well as in baking and other items for human consumption such as popcorn and fried corn (Rahman et.al, 2016). Because to its soil conditions, terrain, and climate, Bangladesh has the potential to improve maize production area and yield (Hossain et. al, 2015). Only 2.20 percent of total cultivated land was used for maize cultivation (BBS, 2020).

Considering this situation, few specific objectives of the study were taken to assess the profitability and technical efficiency of maize production in few selected areas of Bangladesh. These were

1. To identify the socio-demographic profile of maize farmers

2. To calculate the resource use efficiency of maize cultivation.

3. To estimate the profitability from maize cultivation.

4. To address the problems facing by maize farmers and to suggest policy options to overcome these problems.

The data for this study was collected between September and December 2020. Primary data was gathered from maize growers using a field survey and direct interviews. Personal interviews with selected respondents were conducted using pre-tested semi structured questionnaires. Before entering the data into the computer, it was edited and coded. To remove any potential inaccuracies, all of the collected data was summarized and thoroughly analyzed. Following the completion of data gathering, raw data was edited, coded, and placed into a computer using the Microsoft Excel. The acquired data was analyzed using two separate statistical software programs, SPSS. Because these were basic calculations, the descriptive analysis was conducted with the help of SPSS, and the data was presented in tabular and graphical form.

A brief description of the research area's features has been provided. Understanding and interpreting the study's findings, as well as knowing the agricultural activities, future development opportunities, and potentials of the study area, requires knowledge of the study area. For the purpose of this study, the location, area, population, monthly average temperature and rainfall, and agriculture facilities of the chosen area were discussed.

Age, education, experience, major and minor occupations, family size, number of family members engaged in agriculture, land ownership, availability of credit, extension, and training facilities, and other socioeconomic factors were addressed in this study. In North Matlab upazila,and Faridgonj upazila Chandpur respectively, a total population of 33513 and 46711 people were sampled from 65 households in North Matlab upazila and 66 households in Faridgonj upazila (BBS, 2020). In two upazilas, all of the sample farmers were men, and none of them were younger than 15 years old. In North Matlab upazila, 76.9% of the population was between the ages of 15 and 64, with only 23.1 percent being 65 or older. In Faridgonj upazila, on the other hand, 87.9% of the population was between the ages of 15 and 64, with only 12.1% being

65 or older. North Matlab and Faridgonj upazilas had male-to-female ratios of 117 and 120, respectively, which were much higher than the national figures of 90 for North Matlab and 100 for Faridgonj upazilas (BBS, 2020). Both upazilas' sex ratios were much greater than the national sex ratio of 100.2. (BBS, SVRS-2019). The study population's reliance ratios were assessed to be 30 and 13, respectively, which were much lower than the national average.

At the farm level, economic profitability is a crucial consideration for making crop production decisions. It can be calculated using net return, gross margin, gross return, and the return-to-total-cost ratio. The average cost of land preparation for maize production was Tk. 8066.49 per hectare, accounting for 7.54 percent of the overall cost. The average price of human labor was Tk. 363.57 per man-day, and the amount of human labor employed in maize production was found to be around 110 man-days per hectare. As a result, the total cost of human labor was determined to be Tk. 39993.00, or 37.37 percent of the overall cost.

The average cost of pesticides for maize cultivation was Tk. 730.45 per hectare, while the average cost of irrigation was Tk. 12017.47 per hectare in North Matlab and Faridgonj upazilas, respectively. The total variable cost per hectare in North Matlab and Faridgonj upazilas was Tk. 84856.08 per hectare and Tk. 74302.63 per hectare, respectively.

Maize production was fraught with difficulties for farmers. Maize farmers faced a number of issues, including high seed prices, high fertilizer prices, a lack of irrigation water, low grain prices, a lack of suitable land, insufficient extension services, natural calamities, a lack of quality seeds, a lack of scientific knowledge of farming, and a lack of credit. On the basis of the size of the difficulty faced by farmers, high seed prices, natural calamities, and low grain prices placed first, second, and third, respectively. For better maize production, the government and various NGOs should take steps to reduce or eliminate these issues.

### 9.3 Conclusion

After rice and wheat, maize is the third cereal crop farmed by Bangladeshi farmers. Maize cultivation has a lot of potential in the research locations. The findings of this study show that maize production is profitable and can help farmers in the study areas better their socioeconomic situation. It is difficult to expand maize output in Bangladesh by increasing the area under cultivation due to the decreasing trend of land. However, by enhancing existing technology, production can be enhanced. Farmers are inefficient due to the ancient farming system, illiteracy, and tiny land holdings, among other factors. Farmers are technically inefficient, according to the current study, which indicates there are potential to boost productivity to a large amount using current agricultural inputs, agricultural extension services, and accessible technology. In order to start a planned maize production program at the national level, a detailed study should be conducted to evaluate the current and future demand for maize.

**Recommendations** According to the conclusions of the study, maize growing is a viable business to invest in because it can generate a lot of cash and give a lot of jobs for the people of Bangladesh. Farmers encounter a few issues when it comes to profit maximization. Policymakers should take the appropriate steps to address the problem. To boost maize production, the following specific recommendations are provided.

a) Because most maize farmers are highly efficient with the current agricultural technique and maize varieties that have been produced. To boost maize output even more, new varieties should be created.

b) Farmers' seed prices should be cut to a reasonable level. Farmers should be given subsidies for seed purchases and the adoption of new technology in order to encourage them to grow maize.

c) Through a regulated market system for farmers, the government should assure a fair price for cultivated maize.

d) Adequate extension services on better technology adoption should be offered to maize farmers, which will boost maize production and technical efficiency.

e) Low-interest institutional loans will encourage small and marginal farmers to invest in maize production. The policy of quick loan disbursement and collateral-free loans have also had a substantial positive influence.

f) Both districts' storage facilities should be improved.

**9.5 Limitations of the Study**

There are some limitations of the study. These are mentioned below:

a. The majority of the data was gathered through questioning farmers, who were not always willing to reply.

b. The information acquired was primarily relied on the farmers' memories, which were not always accurate. There could be some room for inaccuracy.

c. A broad-based and in-depth examination was limited to some extent due to resource and time restrictions.

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# APPENDICES

Table A-1: Summary Data on Sample Characteristics

| **Criteria** | **North Matlab** | **Faridgonj** |
|---|---|---|
| Soil type | Loam-60percent<br>Clay loam- 40percent | Loam-74.4percent<br>Silt loam-39.6percent |
| Land type | High land-2.7,<br>Medium high land-21.6,<br>Medium low land-37.8,<br>Low land=27,<br>Extreme low land-10.8 percent | High land-31.9,<br>Medium high land-36.2,<br>Medium low land-31.9, |
| Planting | **Rabi:** Novemver (Kartik 4-Agrahayon 1)<br>**Kharif:** February (Falgun) | **Rabi:** Novemver (Kartik 4 – Agrahayon 1)<br>**Kharif:** March (Falgun 4-Chaitra 1) |
| Harvesting | **Rabi:**15$^{th}$April-15$^{th}$ May (Boishakh)<br>**Kharif:** June (Ashar) | **Rabi:**15$^{th}$April-30$^{th}$ May (Boishakh)<br>**Kharif:** June (Jaystha 4-Ashar 1) |
| No. of irrigation | 2 | 4 |
| No. of weeding | 2 | 2 |
| No. of cultivation | 2 | 2 |
| Rabi crops | Maize, Mustard, Onion, Potato, Chili, Radish, Carrot, Sesame, Coriander, Brinjal, Rice seedling, Garlic | Maize, Wheat, Onion, Garlic, Sugarcane, Lentil, Mustard, Grass pea |
| Kharif-1 crops | Maize, IRRI rice, Jute, Chili, Sesame | Mungbean, Jute, Turmeric, Arum |
| Kharif-2 crops | Aman rice or land remain fellow | IRRI rice |
| Women involvement in threshing | 76.9percent (out of 65 respondents) | 3percent(out of 66 respondents) |
| Main competitive crops to maize | Onion, Mustard, Jute | Onion, Garlic, Sugarcane |

Source: Field Survey, 2020

Table A-3: Area and Production of Rabi Maize by Division, 2014-15 to 2016-17

| **Division** | **2014-15** | | **2015-16** | | **2016-17** | |
|---|---|---|---|---|---|---|
| | **Area** hectares) | **Production (M. Ton)** | **Area (hectares)** | **Production (M. Ton)** | **Area (hectares)** | **Production (M. Ton)** |
| Barishal | 1656 | 2933 | 1714 | 2937 | 2211 | 3267 |
| Chittagang | 20403 | 42621 | 20440 | 43448 | 37419 | 77418 |
| Dhaka | 58220 | 164071 | 70819 | 208518 | 60122 | 169337 |
| Khulna | 166450 | 579888 | 164356 | 602042 | 190005 | 719184 |
| Mymensing | 14287 | 42091 | 19503 | 70720 | 20206 | 79770 |
| Rajshahi | 73866 | 174610 | 68808 | 181174 | 84713 | 258853 |
| Rangpur | 341303 | 997329 | 372552 | 1123128 | 422258 | 1378913 |
| Sylhet | 30 | 75 | 39 | 101 | 52 | 90 |
| Bangladesh | 661928 | 1961527 | 698728 | 2161348 | 816986 | 2686832 |

Source: BBS, 2020

**Table A-4: Area and Production of Kharif Maize by Division, 2014-15 to 2020-21**

| **Division** | **2018-19** | | **2019-20** | | **2020-21** | |
|---|---|---|---|---|---|---|
| | **Area (acres)** | **Production (M. Ton)** | **Area (acres)** | **Production (M. Ton)** | **Area (acres)** | **Production (M. Ton)** |
| Barishal | 0 | 0 | 0 | 0 | 0 | 0 |
| Chittagang | 18301 | 34257 | 4771 | 7507 | 3932 | 5473 |
| Dhaka | 14907 | 28705 | 14829 | 31364 | 16654 | 33226 |
| Khulna | 1686 | 2619 | 1001 | 1461 | 779 | 1276 |
| Mymensing | 0 | 0 | 0 | 0 | 0 | 0 |
| Rajshahi | 32579 | 68984 | 28486 | 51537 | 27704 | 60828 |
| Rangpur | 73414 | 174403 | 78519 | 190373 | 96945 | 237757 |
| Sylhet | 0 | 0 | 0 | 0 | 0 | 0 |
| Bangladesh | 141941 | 310471 | 128659 | 284230 | 146014 | 338560 |

Source: BBS, 2020

**Table A-5: Acreage and Production of Maize in Bangladesh, 2000 to 2020-21**

| Year | Area in '000' acres | Production in '000' tons |
|---|---|---|
| 2000 | 8 | 4 |
| 2000-2001 | 12 | 10 |
| 2001-2002 | 49 | 64 |
| 2002-2003 | 72 | 117 |
| 2003-2004 | 124 | 241 |
| 2004-2005 | 165 | 356 |
| 2005-2006 | 243 | 522 |
| 2006-2007 | 373 | 902 |
| 2007-2008 | 553 | 1343 |
| 2008-2009 | 317 | 730 |
| 2009-2010 | 376 | 887 |
| 2010-2011 | 409 | 1018 |
| 2011-2012 | 487 | 1298 |
| 2012-2013 | 580 | 1548 |
| 2013-2014 | 759 | 2124 |
| 2014-2015 | 804 | 2272 |
| 2015-2016 | 827 | 2445 |
| 2016-2017 | 963 | 3025 |
| 2017-2018 | 990 | 3288 |
| 2018-2019 | 1040 | 4100 |
| 2019-2020 | 1200 | 4700 |
| 2020-2021 | 1500 | 5000 |

Source: BBS, 2020