FINANCIAL PROFITABILITY AND FACTORS AFFECTING MUSTARD PRODUCTION IN SOME SELECTED AREAS OF PABNA DISTRICT

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CERTIFICATE

This is to certify that thesis entitled, **"PROFITABILITY ANALYSIS AND FACTORS AFFECTING MUSTARD PRODUCTION IN SOME SELECTED AREAS OF PABNA 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 (M.S.) in Agricultural Economics,** *embodies the result of a piece of bona fide research work carried out by* **KAUMUDI PROVA CHAITY,** *Registration No. 14-05814 under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

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

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ABSTRACT

Mustard is one of the most important oil crop in Bangladesh. The present study was conducted to estimate the financial profitability and factors affecting mustard production in selected areas of Pabna district. Two union named Pakshi and Sahapur in Ishwardi upazilla were purposively selected for the study. Total number of samples for the study were 75, which were selected through simple random sampling. Primary data were collected during the period of January to February, 2021. Financial profitability and Cobb-Dauglas production function model were used to achieve the main objectives of the study. The study's main findings demonstrate that mustard farming is profitable. The total cost of output per hectare was Tk. 69595.83. The gross return and net return per hectare were Tk. 92313.26 and Tk. 22717.43 respectively. Mustard yield per hectare was found to be 1711.62 kg. The Benefit Cost Ratio (BCR) was discovered to be 1.33, implying that a taka invested in mustard production yielded Tk. 1.33 in return. Returns to scale was increasing in the Cobb-Dauglas production function. Human labor, seed, TSP, and insecticide had a positive and significant effect on Mustard yield, according to the study. The study identified some of the most serious issues that mustard farmers mentioned. Financial limits, technical issues, natural problems, and marketing issues have all been identified as obstacles for mustard farmers. The most important financial challenges are the high wage rate and increased input prices. Harvesting and drying problems are the most serious technical problems in the study area. The majority of farmers recognized temperature fluctuations and seasonal variation as a critical natural problem. Transportation problem is the most prominent of the marketing issues. Hence, some suggestions were given to tackle the challenges faced by the farmers. These are; availability of all necessary inputs at a reasonable price should be ensured, a government procurement center might be set up to purchase mustard from farmers at a set price, DAE should improve the field level service provided by field workers (SAAOs) in order to provide farmers with accurate information, suggestions and advice on mustard growing etc.

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Kaumudi Prova Chaity

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CHAPTER I

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Crop production dominates Bangladesh to be an agro based country. The area of the country is 147570 square kilometers. Bangladesh's population reached to 166.3 million, up 0.98 percent from 164.7 million in 2020. Bangladesh is the eighth most populous country in the world, with a population growth rate of 110th (World Population Prospect, 2021). The growth rate of population is about 0.98 % per year and the overall male female ratio is 102.12:100 (Bangladesh Economic Review, 2021). Bangladesh's per capita income in fiscal 2020-21 stood at $2,554, according to the Bangladesh Bureau of Statistics. Approximately 25.6 percent of the population lives in extreme poverty, as assessed by their daily minimal calorie intake (Bangladesh Economic Review, 2014). Agriculture is the backbone of Bangladesh's economy, accounting for 11.63% of the country's overall Gross Domestic Product (GDP) (Bangladesh Economic Review, 2021). Bangladesh's economy is built on agriculture, which is transitioning from a traditional to a modern system (Bangladesh Economic Review, 2014).

Bangladesh imports a large volume of edible oils each year to suit its need. The country produces approximately 0.36 million tons of edible oil per year, with a total demand of 1.4 million tons. (Mallik MSA, 2013). To meet the growing demand of its population, the government must spend a significant amount of foreign cash on the importation of edible oils and oilseeds. In 2014-2015, Bangladesh imported 2,539 metric tons of mustard for Tk. 33 crore. In 2014-2015, imports of edible oils and oilseeds totaled USD1574 million and USD354 million, respectively (Bangladesh Bank, 2016). To limit the amount of foreign currency spent on edible oil imports, domestic production should be expanded to the greatest extent practicable. Mustard occupies 80% of the total area under oilseed crops in Bangladesh, and is the most widely grown of the oilseed crops (Miah et al, 2015).

In the period 1999-2010, Bangladesh agriculture experienced an all-time high growth rate of 7.62 percent (MoF, 2012). The crop sector's high growth rate boosted the agricultural

sector's overall growth rate. Although agricultural contributions as a percentage of GDP are decreasing, the total value of Bangladesh's economy is expanding. The agriculture industry employs roughly 47.5 percent of the entire national labor force (Bangladesh Economic Review, 2021), and it employs about 70 percent of the country's population directly or indirectly. The oil seed sub-sector accounts for 1.37 percent of total GDP (BBS, 2010). This country produces a wide variety of crops. Minor crops such as oil seed crops are treated as such. Because of the increased area under grain crops to fulfill the rising need for food, acreage under oil seed crops has decreased, and the price of oil has increased (Anwar, 2004).

1.2 IMPORTANCE OF MUSTARD AS AN OIL CROP

Mustard is a major oil crop that is now rated third in terms of area and output in the globe. After soya bean and peanuts, mustard is one of the most significant oilseed crops in the world (FAO, 2019). Mustard's total annual production was 654.11 metric tons (FAO, 2019). However, it is the most widely grown oil crop in many nations, both in terms of area and production. Mustard oil has been used as a cooking oil from the beginning of time. Mustard yields 1500 kg per hectare on average. Using high yielding varieties (HYV) and enhanced production practices, total production and per hectare seed yield of this crop can be boosted (Gonzales et al., 1993). Oil cake is a nutrient-dense feed for livestock and fish. It's also an excellent organic fertilizer for plants. Mustard plants that are dry can be used to make mustard oil.

Soybeans, rapeseed, and sunflower are three fast-growing oil seed crops that have contributed significantly to the extension of farmed area under all crops in developing nations and around the world (Gujrati, 1998). The expansion of land under the four major oil crops (soybeans, sunflower, mustard, and oil palm) was 63 million ha, accounting for all of the rise in world harvested area and more than compensating for the dramatic decreases in the area under cereals in industrial and transition economies (Jabbar and Islam, 1981). The rapid rise of the oil crops sector in the historical period was mostly fueled by rising food demand in developing countries (Islam, 2006). The majority of countries had a significant impact on these changes. In Table 1.1 we can see the increased production of oil crops since 2000.

Table 1.1: Major oil crops world production over two decades (Million Tones)

Oil Crops	Year	
	2000	2020
Soybeans	28.8	50
Mustard	15.2	26.2
Sunflower seed	12	19.5
Groundnuts	11	21.4
Coconuts	6.0	13.0
Cottonseed	6.3	11.0
Sesame seed	1.5	2.9
Other oil crops	9.2	13.6

Source: World Agriculture (2020)

1.3 IMPORTANCE AND PRESENT STATUS OF OIL SEED IN BANGLADESH

Because of the increased area under cereal crops to fulfill rising food demand, land under oil seed crops has shrunk, and oil prices have risen. In 1022 acres of area, 928 (M.tones) oil seed is produced. And per acre yield of oil seed in Bangladesh is 2858 kg (BBS, 2020). Mustard is Bangladesh's main oil-producing crop, accounting for 67 percent of total oilseed production in the country (Anwarul and Arshad, 2018). The seeds have a fat content of 40-44 percent, a protein content of 25 percent, and a nitrogen content of 6.4 percent (FAO, 2012). It is one of the most important oilseed crops in Bangladesh, out of all the oilseed crops.

As a result, the government of Bangladesh has given importance to the agriculture sector in order to improve oil seed output by providing farmers with subsidies on various inputs such as fertilizer and irrigation (BBS,2012). Mustard's by-product, oil cake, is a nutrient-dense feed for cattle and fish (Esmaeili, 2008). It's also an excellent organic fertilizer. It is a key source of cooking oil in Bangladesh, providing one-third of the country's edible oil

needs (Ahmed, 2008). In Bangladesh, oilseed production accounts for one-third of total oil seed production. The majority of oil supply in the market is maintained by importing it from other countries at a significant expense in foreign exchange (Hossain et al., 2006). Table 1.2 shows the expenditure of oil seed and edible oil import.

Table 1.2: Oil Seed and Edible Oil Expenditure by Import (Million US Dollar)

Year	Oil seed	Edible Oil
2010-11	130	1050
2011-12	103	1067
2012-13	177	1644
2013-14	242	1402
2014-15	264	1568
2015-16	294	1634
2016-17	311	1854
2017-18	519	2043

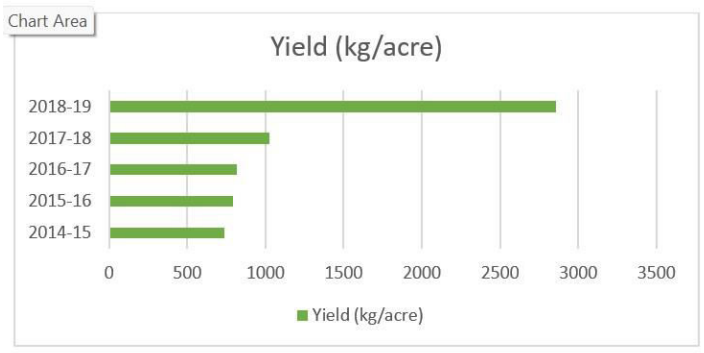
Source: Bangladesh Economic Review, 2021

Table 1.3: Production of oil seeds in Bangladesh over the years

Year	Area (Acres)	Production (M. tons)	Per acre Yield (kg)
2018-19	1022	928	2858
2017-18	1122	915	1027
2016-17	1196	975	815
2015-16	1213	987	790
2014-15	1245	830	737

Source: BBS, 2020

Figure 1.1: Production of oil seeds in Bangladesh over the years



Source: BBS, 2020

In Table 1.3 and Figure 1.1 we see the changes in production of oil seeds in Bangladesh throughout the years.

1.4 HISTORY OF MUSTARD

For centuries, mustard has been one of the most frequently farmed and used spices on the world. It's thought to have started in Ancient Egypt. Mustard was utilized as a medicinal and a spice by the Greeks. The Romans followed in the footsteps of the Greeks, utilizing it as both food and medicine, prescribing it for everything from hysteria to snakebite to bubonic plague. Mustard was brought to Northern France by the Romans, where it was eventually farmed by monks. Mustard sales were bringing in a lot of money for monasteries by the ninth century.

The name mustard is thought to have originated from the word Mosto, which refers to a young, unfermented wine that was blended with powdered mustard seeds by French monks. In the 13th century, the Mustard-loving Pope John XXll of Avignon supported the development of prepared mustard by creating the position of "Grand Moustardier du Pape" or Grand Mustard-Maker to the Pope for his idle Nephew who lived near Dijon. The British became the world's first mustard millers in the early nineteenth century, grinding the heart of the mustard seed to a fine powder and establishing mustard as a food ingredient. In 1904, the yellow mustard that we know today was first introduced in Rochester, New York, where its popularity increased due to its combination with the American hotdog. This ancient seed is now employed as a vital ingredient in thousands of goods due to its many unique qualities.

1.5 CLIMATE AND SOIL FOR MUSTARD CULTIVATION

Soil and Land

Mustard can be grown on terrain that is medium to moderately high in elevation, however loamy soil is preferable. Clay loam and sandy loam soils are also suitable for growing it.

Treatment of Seeds

Seed treatment with Captan or Vitavex-200 (2 g/kg of seeds) before sowing could assist to reduce Alternaria blight incidence (Begum and Manos, 2005).

Sowing Season

Mustard crop seeding is best done between mid-October and mid-November.

Land Preperation

4-5 ploughings followed by laddering should be used to prepare the land. The land should be well crushed and devoid of weeds and large clods.

Sowing Method

Seeding can be done in a line or through broadcasting. In the case of line sowing, the row to row distance should be 30 cm, and seeds should be sown constantly in rows.

Dosage of Fertilizers

The following are the fertilizer doses for various fertilizers (kg/ha) for various varieties:

TSP 170-180

Urea 250-300

Gypsum 150-180

Cow manure (ton) 8-10 (Begum and Manos, 2005).

Depending on the AEZ and the fertility of the soil, the above fertilizer rate may be adjusted (Begum and Manos, 2005).

1.6 MUSTARD CULTIVATION AREAS IN BANGLADESH

Table 1.4 illustrates area, production and yield of mustard in highest producing districts of respective divisions including the study area and also across Bangladesh. In this table we can see the difference of production of mustard throughout the country.

Table 1.4: Area, production and yield of Mustard in highest producing districts of respective divisions including the study area and also in entire Bangladesh

Zila/Division		2016-17		2017-18		2018-19	
		Area (acres)	Production (M. Ton)	Area (acres)	Production (M. Ton)	Area (acres)	Production (M. Ton)
i	Bhola	1783	862	2117	1035	2114	1100
1	**Barishal**	4604	1952	**4810**	**2133**	**4795**	**2175**
ii	Brahmanbaria	26864	18276	19525	15208	24003	15929
2	**Chattogram**	44382	26534	**34013**	**21753**	**37926**	**22018**
iii	Manikganj	48243	20123	46183	19782	37126	15216
3	**Dhaka**	255917	101967	**203091**	**83883**	**142386**	**59694**
iv	Meherpur	15332	8633	13130	7483	12211	7304
4	**Khulna**	94547	43482	**87184**	**41934**	**61121**	**30401**
v	Jamalpur	18718	7728	23034	9512	23396	9620
5	**Mymensing**	29642	12664	**36524**	**14370**	**34174**	**14573**
vi	Pabna	40296	14986	38815	14141	40157	14747
vii	Sirajganj	122525	54164	120576	52726	122920	53793
6	**Rajshahi**	325597	137574	**321112**	**148089**	**320410**	**147417**
viii	Dinajpur	27033	14622	30499	16379	29668	16222
7	**Rangpur**	69990	33439	**66656**	**34070**	**62114**	**31504**
ix	Maulvibazar	736	2241	736	2243	736	2245
8	**Sylhet**	6581	5248	**6484**	**5305**	**4316**	**3958**
	BANGLADESH	831260	362860	**759874**	**351537**	**667242**	**311740**

Source: BBS, 2019

1.7 JUSTIFICATION OF THE STUDY

Mustard is farmed commercially in Bangladesh on a small scale. Mustard, on the other hand, is in high demand across the country. Farmers allocate land and other resources to various crops based on their respective financial viability and resource efficiency. The demand for oil has been rising in tandem with the rapid increase in population and urbanization. Mustard cultivable area should be extended to supply the growing demand for oil without having to import it. Oil's enormous demand can only be supplied by increasing vertical output. Farmers weigh the costs of production against the crop yield while making production decisions. As a result, a mustard profitability research is likely to yield useful information for farms and farmers that grow this crop.

Given the importance of mustard farming in Bangladesh, it is vital to determine the maximum amount of mustard that can be produced per unit of land utilizing current resources. The problem is particularly in Bangladesh, where the recommended amount per hectare is rarely employed in production. However, a few systematic financial investigations on oilseed crops were conducted by private or government organizations, but they were insufficient to meet the needs of extension workers, policymakers, researchers and farmers.

In this regard, this research will aid in the diagnosis of problems and the demonstration of our understanding of the linked problems of farmer decision-making in mustard production. The study's conclusions will generate basic financial statistics on mustard production practices. The current study will provide useful information to individual farmers and researchers who will perform similar studies in the future, encouraging them to conduct more complete and deep investigations in this subject. With this in mind, the research was carried out with the following precise goals in mind.

1.8 OBJECTIVES

This study has the following objectives:

i. To understand the socio-economic profile of the mustard growers in some selected areas of Pabna district.
ii. To estimate the profitability of mustard in some selected areas of Pabna district.
iii. To identify the factors affecting the yield of mustard and

iv. To assess the constraints of mustard cultivation in some selected areas of Pabna district.

1.9 ORGANIZATION OF THE STUDY

There are eight chapters in this thesis. The first chapter covers the introduction, which includes the study's background, justification, and goals. In Chapter II, a survey of related literature is offered. The study's research technique is discussed in Chapter III. The study's findings and discussion are reported in Chapters IV, V, VI, and VII. Finally, Chapter VIII contains the study's summary, conclusions, and recommendations.

1.10 LIMITATION OF THE STUDY

Given the researcher's limited time, money, and other resources, it was necessary to apply several limits. As listed below, in order to make the study useful and feasible from a research standpoint:

1. The investigation was based on the information provided by the farmers during their interviews.

2. In some circumstances, when collecting data from the intended respondents, the researcher encountered unanticipated interference from overly interested side talkers.

3. Due to a lack of time, the study was unable to cover a broad range of topics in order to collect the necessary data to avoid an inverse profit relationship.

4. A lack of funds and time prevented the collection of a significant number of samples to demonstrate the true significance of all types of farmers.

5. Farmers were constantly occupied with field activities, making it impossible to obtain information from their wives and children without consulting their husband.

CHAPTER II

REVIEW OF LITERATURE

A number of studies in Bangladesh have looked at the financial profitability of various agricultural crops. This section contains a survey of the research on resource usage efficiency and profitability analysis for cereals and non-cereals using various financial analyses. The major goal of this chapter is to discuss several related studies that are relevant to the current research.

Despite the fact that a lot of research have been undertaken on mustard production in Bangladesh, only a few studies have been fruitfully completed the financial profitability of mustard production in Bangladesh. Again, some of these studies may not be completely related to the current study, but their findings, analysis methods, and recommendations have a significant impact on it.

Esmat et al. (2020) did a comparative study on BARI mustard-14. The focus of this study was to assess socioeconomic factors determining farmers' decisions to adopt BARI mustard-14. Primary data were collected through multistage random sampling technique from 76 BARI mustard adopters and 74 non adopters from selected areas. Mean, percentage, standard deviation and Probit model was used. It was found that the rate of adoption of BARI mustard-14 was 38.95% at farm level but adoption rate was higher in Tangail compared to Comilla and Rajshahi districts.

Parvin and Sarker (2021) investigated the profitability and resource efficiency of Tomato production in Bangladesh's Cumilla and Rangpur district. To meet the study's goals, descriptive statistics and functional analysis were used. Undiscounted benefit cost ratio of tomato production per acre was found to be 1.51 and 1.40 on the basis of total cost for Cumilla and Rangpur districts respectively. The high price of input, lack of storage

facilities, price fluctuation, insect and disease damage were the most salient constraints in producing tomato.

Miah et al. (2019) conducted a study with 540 mustard growing farmers under Manikgonj, Rajshahi and Dinajpur districts. Probit regression model along with other descriptive statistics were used to analyze the collected data. Analysis revealed that the farm level adoption of different production practices were not encouraging as most farmers did not follow the recommendations made by Bangladesh Agricultural Research Institute (BARI) for mustard cultivation. The variety adoption scenario was also discouraging since only 40% of the farmers cultivated improved mustard varieties. However, farmers showed positive attitude towards adoption of improved mustard varieties since about 53% of the adopters wanted to increase area under improve mustard cultivation in next growing season considering the high yielding ability, low cultivation cost, high profit, and less labour requirements

Hossain (2015) conducted a study between aman and boro rice, on farmers' perceptions of the profitability of mustard farming. According to the findings, the majority of the farmers (59 percent) had a positive impression of Mustard planting as a profitable alternative to Aman and Boro rice. Even so, some (41% of respondents) had a moderate perception. As a result, it appears that there is room to take the required actions to get 41% of farmers to a high level of perception.

Rabbani et al. (2013) discovered that farmers require managerial and technological training to boost farm production and profitability from mustard farming. The author demonstrated that when there is a lack of suitable technology innovation and information availability, mustard output levels fall, and improper resource allocation raises production costs.

Rayhan et al. (2013) investigated the profitability and resource efficiency of mustard production in Bangladesh's Sirajganj district. To meet the study's goals, descriptive statistics and functional analysis were used. The author demonstrated that the productivity

and profitability of Sirajganj Mustard producers were satisfactory. The author also indicated that if the farmers of Sirajganj district made better use of their resources, mustard growers in the research area could produce more.

Haque et al. (2012) conducted a study during the Rabi season of 2007-08, with three types of seed producers, namely BADC farms at Dattanagar, Jhenaidah, and Tabunia, Pabna as a public agency, LAL TEER Seed Company in Lalmonirhat district as a private company, and BRAC farm in Bogra district as a non-governmental organization, to determine the current status and profitability of hybrid maize seed According to the study, the cost of manufacturing and yield of hybrid seed were higher for non-governmental organizations (NGOs) than for public agencies and commercial companies. The benefit-cost ratio (BCR) of public-sector contract growers was higher. Hybrid maize seed production yielded a 50 percent higher net return than non-seed output. Hybrid maize seed production in the study areas was hampered by high seed prices and a lack of technical competence.

Baree (2012) did a study on determining the technical efficiency of onion (Allium cepa L.) farms. The production elasticity with regard to land, labor, and capital cost was calculated to be positive and significant at 0.3026, 0.0718, and 0.0442, respectively. It was determined to be insignificant in terms of seed and irrigation, with negative values of 0.0045 and 0.0007. The age, experience, and farm size coefficients were all significant with expected negative signals, indicating that the inefficiency impacts in onion production diminish as age, experience, and farm size rise. Onion farms' technical efficiency ranged from 58 percent to 99 percent, with an average of 83 percent. It means that by utilizing effective production technologies, it is possible to enhance output per hectare of onion farm by 17% without incurring any additional costs.

Navadkar et al. (2012) aimed to investigate the resource use structure, estimate agricultural costs, and investigate maize commercialization. Human labor, manures, and nitrogen are the major resource variables responsible for improving output, according to the study's estimates of the production functions. Maize growers must carefully extend the use of these variables in order to boost yield.

Begum et al. (2011) conducted research to determine the costs and returns of cultivating specific crops in various regions. He discovered that the benefit cost ratios over total expenses for maize, groundnut, mungbean, sweet potato, cabbage, cauliflower, tomato, cucumber, and okra production were 1.61, 1.72, 1.62, 3.55, 1.90, 2.17, 3.72, 1.94, and 2.64, respectively. According to the sample farmers, high fertilizer and insecticide prices were the biggest stumbling blocks to increased output for most of the crops.

Ogunniyi (2011) had done a study to measure profit efficiency among maize producers in Oyo State, Nigeria. He showed that profit efficiencies of the farmers varied widely between 1% and 99.9% with a mean of 41.4% suggesting that an estimated 58.6% of the profit is lost due to a combination of both technical and allocative inefficiencies in maize production. From the inefficiency model, it was found that education, experience, extension and non-farm employment were significant factors influencing profit efficiency. This implies that profit inefficiency in maize production can be reduced significantly with improvement in the level of education of sampled farmers.

Rahman and Hasan (2011) looked on the profitability of wheat in Bangladesh,. They came to the conclusion that the output price, which is the major policy variable of interest, has an almost elastic supply response. A 1% increase in wheat price will result in a 0.95 percent increase in supply. Since the 1970s, Asia has seen a favorable response of output (rice or wheat) to its price.

Alam et al. (2010) undertook a study to analyze land utilization in the haor areas of Bangladesh, delineate the productivity and profitability of cultivating contemporary rice, evaluate existing cropping patterns, and assess the prospect of possible cropping patterns. According to the report, there are approximately 1.26 million hectares of cultivated lands in seven haor districts, with 66 percent falling inside the haor area. According to the farmers, the lack of a flood control dam, as well as a shortage of short-duration varieties, are the biggest obstacles to adopting prospective cropping patterns. Construction of communal harvest and threshing facilities, as well as flood control devices, could be crucial public interventions in the haor areas for increased agricultural production.According to

Barkat et al. (2010), smaller farmers have less options and chances due to a lack of assets, and their financial profits from crop production activities are not moderate. The correct subsidy program may be a selective, targeted fertilizer subsidy system for only the smaller farms. Farmers have frequently complained in recent years about not receiving the proper amount of fertilizers, and in some cases, no fertilizer at all, from dealer's stores. Small farmers had a big fertilizer deficiency, according to the study, although larger farmers were less likely to be fertilizer-deficient than small farmers. The reasons for the massive fertilizer shortage could include expensive fertilizer prices, a lack of timely supply, transportation issues, and so forth.

Karim et al. (2010) conducted a study to evaluate current hybrid maize agronomic methods, profitability, restrictions, and factors impacting hybrid maize production. The coefficients of human labor, land preparation, irrigation, urea, and borax have been found to have a considerable impact on gross return. Hybrid maize production was hampered by a lack of timely seed availability, a high fertilizer price, and a low yield price. Hybrid maize was grown by farmers because of its increased yield, higher income, and ease of cultivation.

Onuk et al. (2010) examined the economics of maize production among farmers in Plateau State, Nigeria's Mangu Local Government Area. The poll also found that men had greater access to land than women, implying that men were more involved in maize production. Men and women, on the other hand, have both worked in maize production and got planting supplies primarily from past harvests. Finally, the study recommended an appropriate market for maize farmers' products with good, consistent prices in order to increase maize output in the study area and throughout the country.

In 2006-07, Moniruzzaman et al. (2009) conducted a study in four main maize-growing areas in Bangladesh, namely Chuadanga, Dinajpur, Bogra, and Lalmomirhat, to determine the profitability level of maize production. On a total cost, variable cost, and cash cost basis, benefit cost ratios were computed as 1.58, 2.10, and 2.58, respectively. Maize farming became more profitable as a result. TSP's increased output was hampered by a lack

of finance and a high price. Farmers in the study area have the opportunity to boost maize yield by achieving full efficiency through resource reallocation.

Rashid et al. (2009) explores the impact of Bangladesh's trade policies and comparative advantages of selected agricultural commodities such as rice, wheat, maize, potato, and lentil by determining the financial profitability of selected crops in various areas across the country. At the examined years, the border price of wheat, maize, potato, and lentil at the producer level, evaluated at the official exchange rate, was typically higher than the domestic producer price. Bangladesh must prepare appropriately and implement proper policies to actualize the likely grains in trade by increasing its trade capacity in order to successfully implement trade liberalization policies.

Anupama (2005) conducted research in the Madhya Pradesh state. According to the study, raising the adoption level of the enhanced package of practices can improve maize growers' economic efficiency in Madhya Pradesh. This can be accomplished by giving high-quality seeds of improved maize cultivars, as well as accessible and affordable loans for the purchase of important inputs such as fertilizers and pesticides. Furthermore, by securing a market for their output through forward linkages with agro-processing companies, farmers will be able to reduce price volatility in maize and improve their socio-economic status.

Khan et al. (2004) investigated the productivity and resource efficiency of Boro rice growing in some Kishoreganj district haor locations. Boro rice production is profitable in the Haor area, according to the authors. The research area's common land use pattern is Boro-Fallow-Fallow. The author also discovered that the research area's technical efficiency was 87.27 percent. Boro rice yield in the haor area is considerably increased by fertilizer and irrigation.

Alam (2003) conducted research to see if there were any ways to improve Bangladesh's diversified agriculture's long-term viability. During the recent decade, maize and potato production has increased at a respectable rate. A field research of maize, millets, potato,

sweet potato, lentil, and mungbean production in 12 districts found that the financial and economic returns on those secondary crops are favorable. In rural Bangladesh, maize, millets, pulses, potato, and sweet potato (CGPRT or secondary crops) appear to have sufficient potential for crop diversification, job creation, income production, malnutrition reduction, and poverty alleviation.

Reza (2003) investigated the input-output connection and resource utilization efficiency of snake gourd farming in a specific location of Gazipur District. The author demonstrated that while snake gourd farming is beneficial for farmers, resources are not being used effectively in the research region.

Shahabuddin et al. (2002b), except for the highland aus and deepwater aman rice, he looked at the cost and return of rice using two indicators: net financial profitability and domestic resource cost ratio, and concluded that Bangladesh had achieved rice production efficiency. Both highland and extreme lowland diversification into non-rice economic activity proved financially justified.

According to Zahir (2001), reducing subsidies will diminish farmers' profit (net income) and have a negative impact on crop sector growth. Farmers require support and subsidies on inputs in their cultivation process, according to the author, in order to boost profit and productivity. The author demonstrated that with less adequate technology improvement and knowledge provision, Mustard output levels drop, and improper resource allocation raises production costs.

In India, Bagchi and Hossain (2000) calculated the cost and return on rice production. The cost was calculated using an estimation of social productivity and a domestic resource cost ratio that took into account the value of rice and the resources used in its cultivation. The introduction of high-yielding cultivars, farm mechanization, and increased fertilizer and chemical use all resulted in higher production and profitability, according to the findings.

The most effective use of fertilizer inputs also improved resource efficiency. All of these variables had an impact on rice yield and efficiency.

In the Kalihati Upazila of Tangail District, Das (2000) conducted a comparison study of HYV BR-29 and hybrid Alok paddy. He calculated the HYV BR-29 and Alok paddy's expenses, returns, and relative profitability. 66 farmers from six communities were chosen as a sample in order to achieve the goals. The entire cost of BR-29 was Tk. 13206.75, whereas the cost of Alok varity was Tk. 13894.45, according to cost and return analysis. The BR-29 variety yielded a better return above full cost than the Alok variety, which yielded Tk. 6350.61 per acre. As a result, when compared to the Alok type, the BR-29 variety proved to be more profitable.

Rahman (2000) conducted research in Melandah Upazilla, Jamalpur district, to investigate the economics of Boro paddy cultivation. The study's main conclusions were that BR-29 was a lucrative venture from the perspective of small, medium, and big farms. For small, medium, and big farmers, per hectare expenses for BR-29 were computed at Tk. 3295.54, Tk. 32485.63, and Tk. 33617.40, respectively. BR29 yielded 6290 kg, 6600 kg, and 6100 kg per hectare, respectively. In general, human labor, power tiller, seedling, fertilizers, irrigation, and insecticides identified as major contributions to enhanced BR- 29 Boro output revenue.

In Zimbabwe, Sukume et al. (2000) calculated the cost and return of crop production. In the small scale commercial sector, the author demonstrated that a greater number of crops are economically viable in each zone. In all zones, peanuts and mustard were the most productive crops in the community sector, followed by sunflower, finger miller, and cotton. The author further claimed that the long-standing financial system had caused substantial distortions by net subsidizing farmers in areas far from major consumer centers.

Nantu (1998) conducted a research in Bangladesh to determine the costs, returns, and resource use efficiency of Boro paddy production in a few areas. For small, medium, and

large farmers, the expenses of Boro paddy production per hectare were Tk. 25547, Tk. 25857.73, and Tk. 27548.07. Boro paddy yields per hectare were 2875.85 kg, 3230.95 kg, and 3152.50 kg, respectively, across different farm classifications. Tk. 2075.09, Tk. 4986.09, and Tk. 2232.48 were the respective net returns per hectare.

Zabunnesa (1998) investigated the effectiveness of a number of BRAC-sponsored rural development programs in a specific area of Mymensingh. She looked at the poultry, dairy, and sericulture programs from the BRAC program. She stated that the average annual household income was Tk. 23388.40, with poultry rearing accounting for 36.47 percent of total income. Total annual feed costs per household were projected to be Tk. 30399.29, with total annual labor costs per household estimated to be Tk. 1178.57 for male labor and Tk. 1204.76 for female labor. Tk. 8529.93 was estimated to be the gross margin of the poultry business.

Hasan (1997) investigated small-scale poultry production in a Kushtia district location under the supervision of BRAC. According to the study, the total annual cost per poultry farm for key rearer, model rearer, and chick rearer was Tk. 1367.17, Tk. 24558.76, and Tk. 46707.75, respectively. For key rearer, model rearer, and chick rearer, the net returns per poultry farm were Tk. 6533.25, 5165.60, and 17158.40, respectively. According to the findings, the chick rearer had the highest annual net return, but the key rearer had the highest net return per Taka invested. The BCR for key rearer, model rearer, and chick rearer, respectively, was 4.78, 2.74, and 1.75.

In the years 1994–96, Yao (1997) evaluated the cost and value of Thailand's agricultural diversification policy. He said Mustard was also more profitable than soybeans and mug beans, showing that government involvement could result in efficiency losses. Potential price fluctuations, increased water scarcity, and the environmental effects of agricultural production were identified as major problems that justified government intervention, according to sensitivity studies.

Wheat cultivation, according to Morris et al. (1996), is the most efficient use of domestic resources in most non-irrigated zones and one irrigated zone in Bangladesh when inputs and products are assigned economic prices.

Ali (1993) conducted research in Dhaka to determine the profitability of small-scale layer farms. 30 egg-producing farms were chosen for this study, 16 of which were small and 14 of which were middle. In small farms, the average number of birds was 61, compared to 178 in large farms. Farms in the middle. 268 and 266 eggs were produced on a yearly basis per hen, respectively on small and medium farms. He mentioned that chicken is a good source of protein. Owners received Tk. 21301.00 in net profits over cash cost. In small farms, Tk. 67316.00 is required, whereas in medium farms, Tk. 67316.00 is required. In small farms, net returns were Tk. 21135.00, while in medium farms, net returns were Tk. 51556.00. Small farms yielded Tk. 0.45 every taka invested, whereas medium farms yielded Tk. 0.84. Small and medium farms were expected to have gross margins of Tk. 16171.00 and Tk. 60822.00, respectively.

According to Bayes et al. (1985), rice efficiency in Bangladesh can be achieved by a combination of price support and the application of correct fertilizer dosages. The authors demonstrated that Bangladeshi farmers require institutional assistance in order to reduce operational costs and boost output efficiency.

Barker and Hayami (1976) discovered that a subsidy paid to contemporary inputs that were being used inefficiently, such as fertilizer, can be more profitable than maintaining product pricing. Farmers must use current inputs while maintaining correct doses, according to the authors, in order to achieve efficiency.

The majority of the research above concentrated on cereal crop cost, return, and economic analysis, with only a few focusing on oil seed crops. There is also relatively little effort put into measuring efficiency in the development of oil seed crops. Despite this, no empirical research has been done specifically on the financial viability of Mustard production in

Pabna district. As a result, the current study represents a modest attempt in this direction and should be regarded as a pioneering work in this sector in terms of systematic inquiry into the cost, returns in some selected locations of Pabna district.

CHAPTER III
METHODOLOGY

The methodology for the study is discussed in this chapter. The suitable approach utilized in the research has a big impact on the dependability of a scientific study. Farm management research typically entails gathering primary data from working farmers. The technique of data collecting, on the other hand, is determined by the study's goals and objectives. Methodology primarily addresses concerns such as study area selection, sample selection, questionnaire preparation, data collecting, tabulation, analysis, and interpretation. The following is a step-by-step description of the methods utilized in this study:

3.1 METHOD OF INVESTIGATION

The collection of data from individual respondents is the focus of survey-based research. Farm survey data can be collected using three different approaches. Direct observation, interviewing respondents, and keeping a record are the three methods.

The nature of the study topic, the availability of research funds, time restrictions, and other factors all influence the approach chosen.

The survey approach was used to obtain information from the respondents in order to meet the study's objectives. The survey approach has two primary advantages: fast analysis of a large number of cases and broader applicability. The survey method's flaw is that it relies completely on respondents' memories. Typically, Bangladeshi farmers do not retain any written records or account for their farm operations. Furthermore, the majority of Bangladesh's rural population remains illiterate. So conducting a survey for any scientific farm management study is a demanding endeavor.

3.2 SELECTION OF THE STUDY AREA

The choice of a research area is crucial. A preliminary survey was carried out in the Pakshi and Sahapur Union of Ishwardi upazilla, of Pabna district in order to meet the study's objectives. In these region farmers cultivate the Bari 9,11 and 14 varieties of mustard. The districts of Bangladesh are divided into sub-districts called Upazilas (Sarker 2010).

The following factors influenced the study area choice:

i. Mustard farming is practiced by the farmers of these communities.
ii. This area is suitable for the investigation from the standpoint of time and resources available.
iii. The area is accessible due to a well-developed communication infrastructure and
iv. The respondents are expected to cooperate well in order to get trustworthy data.

3.3 SAMPLING TECHNIQUE

In most cases, it is impossible to conduct a survey that covers all farmers, and it is not worthwhile to include too many farmers in a survey because it will take more time and money to complete. A total of 75 mustard growers were chosen by simple random sampling for this study. The size of the farm is categorized in this study based on the amount of cultivated land available during the survey period.

3.4 PREPARATION OF QUESTIONNAIRE

A preliminary questionnaire was created to collect data in order to achieve the study's objectives. The researcher himself pre-tested the proposed questionnaire in the research field. As a result of the actual and practical experiences gained from pre-testing, various portions of the questionnaire were enhanced, changed, and updated. The following factors were considered when creating the questionnaire:

i. The respondent's name and family composition, as well as information on their education and work.
ii. The pattern of land use.
iii. The total amount of assets and their current value.

iv. Input costs, which include the cost of human labor, housing, all fertilizer charges, and other extraneous costs.
v. Mustard cultivation returns.
vi. Problems faced by the farmers.

3.5 PERIOD OF DATA COLLECTION

During the months of January and February of 2021, the researcher conducted face to face interviews with the respondents to obtain the relevant information.

3.6 COLLECTION OF DATA

The researcher interviewed each of the selected farmers individually. Before beginning the interview, the respondents were given a brief explanation of the study's nature and purpose to assure that the information they provided would be kept private and utilized solely for the study. The questions were then asked in a straightforward manner, with explanations provided where needed. Respondents' responses were directly recorded. Following the interview, each questionnaire was double-checked to ensure that the information for each item had been properly recorded. Items that were determined to be contradictory and ignored were fixed.

3.7 PROCESSING OF DATA

Before being transferred to the computer, all of the acquired data was double-checked. As a result, these were categorized, tabulated, and evaluated in order to meet the study's specific objectives. Because it was a straightforward computation, extensively used, and easy to understand, data were generally given in tabular form.

In addition, functional analysis was used on a small scale to arrive at the desired results. MS Excel was used to enter raw data into the computer. Then SPSS was used for further analysis.

3.7.1 ANALYTICAL TECHNIQUE

The information was examined in order to meet the study's goals. The following methods were employed in this study:

i. Tabular technique
ii. Analytical technique

Tabular technique

Using simple statistical metrics such as means, percentages, and ratios, a tabular technique was used to classify data in order to get meaningful results.

Analytical technique

This part of the financial analysis was created to look into the elements that influence mustard production. A production function analysis was used to investigate the contribution and productivity of the various inputs in order to achieve that goal. This study's data was organized by hectare.

3.7.2 FINANCIAL PROFITABILITY OF CROP

The most frequent approach of determining and comparing the profitability of different farm companies is cost and return analysis. The following formula was used to calculate the amount of profitability in crop production:

$$\Pi = P_M Q_M + P_B Q_B - \Sigma W X_i - TFC$$

Where,

Π = Profit per hectare for producing the crop;

P_M = Per unit price of the output;

Q_M = Quantity of output obtained (per hectare);

P_B = Per unit price of by-product;

Q_B = Quantity of by–product obtained (per hectare);

W = per unit price of the i^{th} input used for producing the crop

X_i = Quantity of the i^{th} input used for producing the crop

TFC = Total fixed cost

3.7.3 CALCULATION OF BCR

The gross return to total cost ratio is known as the BCR. It denotes the cost benefit per unit of benefit. The BCR was determined using the formula below.

$$\text{BCR} = \frac{Gross\ return}{Total\ cost}$$

3.7.4 COST ITEMS

The cost of inputs is a critical consideration in making financial decisions for performing and income-generating activities. In the research area, respondents used purchased and self-supplied inputs. The costs of purchased and self-supplied inputs were not separately calculated. Mustard cultivation costs can be broken down into two categories:

a) Fixed cost and
b) Variable cost

a) Fixed price

This mostly consists of:

The cost of land use

b) Variable cost

This mostly consists of the following headings:

i. Seed costs;
ii. Labor costs;
iii. Fertilizer costs;
iv. Insecticide costs
v. Machinery costs;
vi. Interest on operating capital costs and others.

Seed costs

Mustard farms' primary expense was seed. The overall cost of Mustard seed purchased or saved by farmers during Mustard growing is referred to as the cost of seed.

Labor costs

Another crucial element in the manufacture of Mustard was the expense of human labor. Because hired labor was used extensively in this cultivation, the labor cost comprises both family and hired labors. The opportunity cost concept was employed to assess the wage rate of work, and eight adult male hours were equivalent to one man-day.

Fertilizer costs

Fertilizer was one of the most expensive and time-consuming aspects of Mustard farming. Fertilizer costs were factored in (Urea, TSP, MP etc.). The cost of fertilizer was computed using current market rates in the area. It was calculated based on the farmers' per-kilogram cash price.

Insecticide costs

Another expensive and time-consuming components of Mustard farming was insecticide. Insecticide costs were calculated using actual market pricing in the area. It was computed using the farmers' cash price per liter.

Machinery costs

The costs of Machinery services were determined using the Mustard farmers' real expenses. For land preparation and threshing, nearly all of the sample farmers in the research area used power tillers and other machinery. They primarily utilized a motorized tiller that they had rented. For land preparation and threshing, a power tiller owner provided fuel as well as a driver.

Land use cost

The cost of land utilization varied depending on location, topography, and soil fertility. From land preparation until harvesting, land was used for four months to cultivate Mustard. The cost of land use was computed in this study by calculating the cash rental value of land, which would have been another option for accounting for the cost of land use.

Interest on operating capital costs

In this study, operational capital was defined as the amount of money required to cover the costs of hired or purchased inputs. The rate of interest on working capital was computed at 9% per year. The following formula was used to calculate interest on operating capital (Mia et al., 2013)

IOC= AIit

Where,

IOC= Interest on operating capital

i= Rate of interest

AI= Total investment

t = Total time period of a cycle

3.7.5 RETURN ITEMS

Return items were as follows:

(i) Return from selling Mustard.

(ii) Return from selling by product

3.7.6 PROCEDURE FOR EVALUATION OF RETURN

The total volume of produce was multiplied by their respective average market price to obtain the gross return per hectare. The value of the main product and the value of the by-product were included in the gross return per hectare calculation. All direct cash and non-cash expenses were subtracted from the gross return to get the net return.

3.7.7 COBB-DOUGLAS PRODUCTION FUNCTION

To determine the contribution of the most important variables in the production process, the following type of Cobb-Douglas production function was used in the study.

$$Y = a\ X_1^{b^1}\ X_2^{b^2}\ X_3^{b^3}\ X_4^{b^4}\ X_5^{b^5}\ X_6^{b^6}\ X_7^{b^7}\ e^{ui}$$

By taking log in both sides the Cobb-Douglas production function will be transformed into the following double logarithmic form so that it can be solved as a linear relationship;

$$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + u_i$$

Where,

Y = Yield of Mustard (Kg /ha),

a = Constant or Intercept of the function,

X_1 = Human labor (Man days /ha),

X_2 = Seed (Kg /ha)

X_3 = Urea (Kg /ha)

X_4 = TSP (Kg /ha),

X_5 = MoP (Kg /ha),

X_6 = Insecticide (kg/ha)

X_7 = Irrigation (tk/ha)

b_i = Coefficient of respective variables

ln= Natural logarithm,

u_i = Error term and

i = l, 2 ...n

CHAPTER IV

DEMOGRAPHIC PROFILE OF RESPONDENTS

The findings of the study, as well as their logical interpretations, have been organized in this chapter into separate sections based on the study's aims. Wherever possible, the findings have been compared to those of other similar studies. The study's first portion examines some of the sample farmers' demographic features. Farmers' demographic features frequently impact their production decisions. Individual decision-making behavior is heavily influenced by his demographic traits. However, precise information on the demographic characteristics of the sample farmers was not possible to acquire. In this study, essential criteria such as family size and composition, educational status, occupation, and ownership pattern were taken into account. Regarding the demographic features of the sample farmers, the following sections provide a brief summary of these factors.

4.1 AGE DISTRIBUTION OF THE SAMPLE MUSTARD FARMERS

The age of the sample farmer plays an important role in describing the demographic makeup of the area. Mustard cultivation is also influenced by the age of the farmer. The age of a farmer was measured from his birth to the moment of the interview. It was calculated using actual years. Farmers in the research area were divided into three categories based on their age.

1. Young farmers (20-35) years,

2. Middle age farmers (36-50) years and

3. Old farmers (51-above) years.

(Source: Authors own estimation)

Table 4.1 showed the age distribution of the Mustard Farmers in the study area. The data showed that the largest group of Mustard Farmers (34.7 percent) is between the ages of 51 and above, followed by middle age (33.3 percent) and young age (32 percent).

Table 4.1: Age Distribution of Sample Farmers

Age Group	No	Percent
Young farmers (20-35)	24	32.0
Middle age farmers (36-50) years	25	33.3
Old farmers (51-above) years.	26	34.7
Total	75	100

Source: Field survey, 2021

4.2 AGE DISTRIBUTION OF THE FAMILY MEMBERS

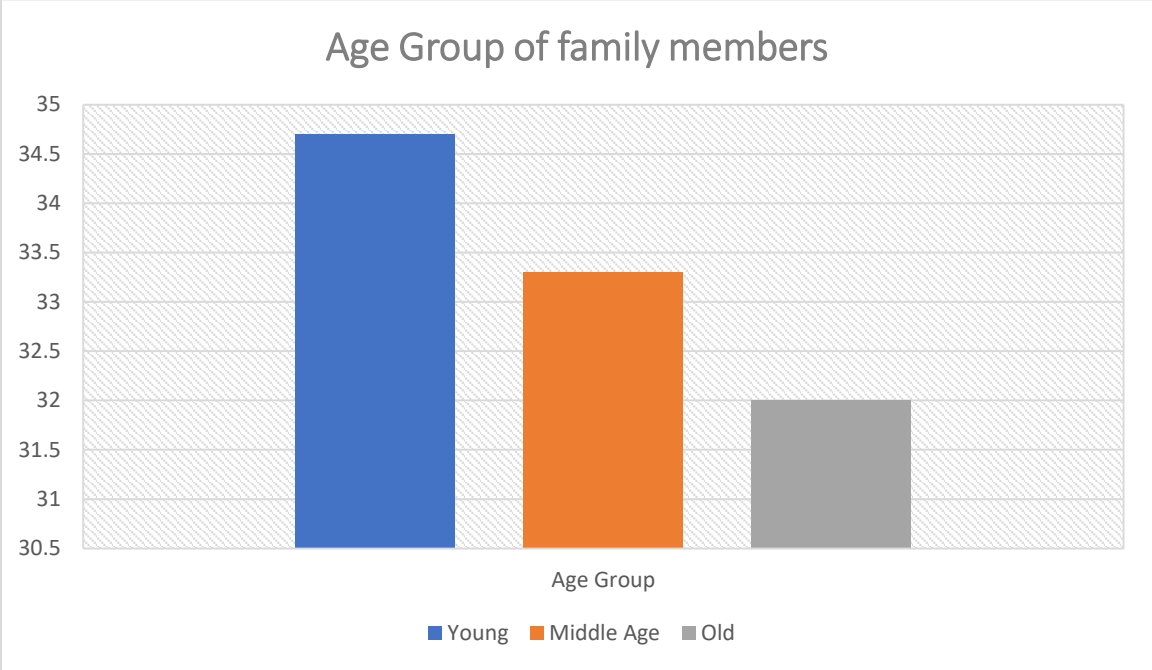
The age of family members can assist determine the family's commitment to the project, process of cultivation. From Table 4.2, it showed that the largest percentage (41.6%) of family members range in age from 0 to 20 years old. And the age group of over 51 years had the lowest percentage (27.9%). These data's were also illustrated in Figure 4.1.

Table 4.2: Age Distribution of Farmers Family Members

Age Group	No	Percent
Young (up to 20) years	158	41.6
Middle age (21-50) years	116	30.5
Old (51-above) years.	106	27.9
Total	380	100

Source: Field survey, 2021

Fig 4.1: Chart of age group of family members



Source: Field survey, 2021

4.3 EDUCATION LEVEL OF MUSTARD FARMERS

Education is a nation's backbone and the underlying qualitative causes of all kinds of prosperity. Education is valuable in and of itself, and it aids in economic and social progress. Education is also essential for agricultural development. Education allows a person to stay up to date on new procedures as well as technological advancements in various industrial processes. It improves a person's ability to manage finite resources and so maximize profit. It also assists a person in making the best decision possible. The Mustard growers' educational standing was divided into three categories:

(i) Illiterate

(ii) Sign only

(iii) Primary

(iv) Secondary and above

Table 4.3: Education Level of Mustard Growers

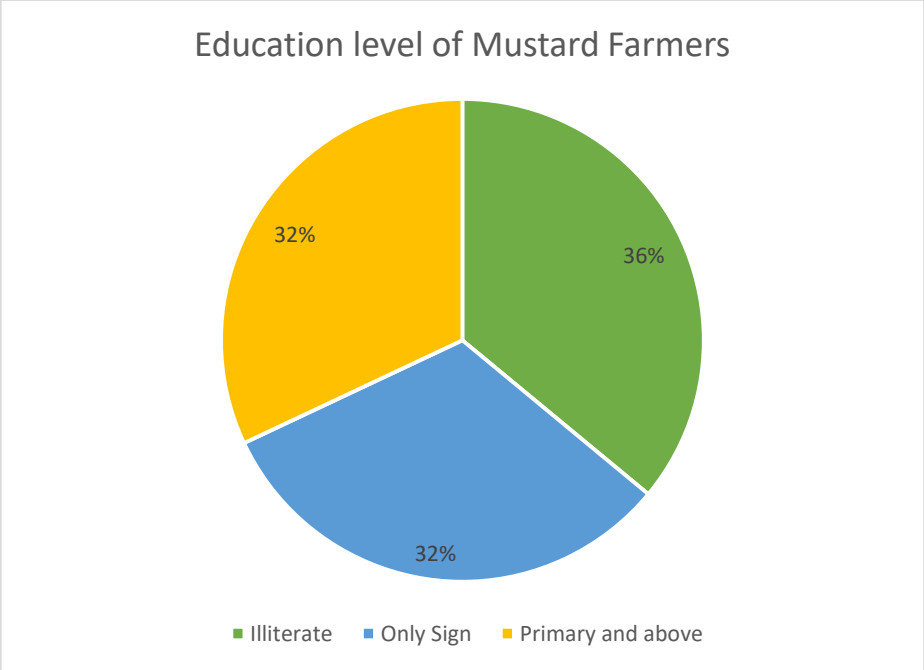
Literacy level	Number	Percent
Illiterate	27	36
Only Sign	24	32
Primary and above	15	20
Secondary and above	9	12
Total	75	100

Source: Field survey, 2021

Table 4.3 shows the educational status of the mustard growers who were chosen. According to the table, the majority of the farmers are illiterate in term of education (36%) while the percentage of only sign and primary and above educated farmers are same (32%).

This can be visualized better with the following pie chart, Figure 4.2.

Fig 4.2 : Education Level of Mustard Farmers



4.4 EDUCATIONAL LEVEL OF THE FAMILY MEMBERS

The level of education of family members is also a significant aspect in any revenue creation process. Because it focuses on the number of active educators who contribute to the cultivation process.

Table 4.4: Education status of the family members

Literacy level	Number	Percent
Illiterate	45	11.8
Only Sign	95	25
Primary	123	32.3
Secondary and above	117	30.7
Total	380	100

Source: Field survey, 2021

Table 4.4 shows that the majority of family members (32.3 percent) had completed primary school. In the study areas, roughly 11.8% of the family members were illiterate, and about 25% of the family members can only give signature, according to the table. Others (30.7%) have studied till secondary and above.

CHAPTER V

FINANCIAL PROFITABILITY OF MUSTARD PRODUCTION

This chapter tries to figure out how much it costs to grow Mustard, how much it pays back, and how profitable it is. Fertilizer, seed, labor costs, land costs, and cost of operating capital @9% in 4 months are among the charges. On the other hand, the gross return on Mustard cultivation included both product and by-product sales. Benefit cost ratios for particular category farmers and all farmers were calculated after all costs and returns were assessed. All calculations were done by hectare.

5.1 COST OF HUMAN LABOR

The most essential expense in every manufacturing process is the cost of human labor. Because the most significant aspect in utilizing both fixed and variable costs is human labor. Different procedures, including as land preparation, sowing, weeding, fertilizer application, harvesting, and other functions, all require human work.

According to table 5.1 during harvesting (17 man-days/ha), they utilized the most hired labor, while applying fertilizer required the least amount of work (5 man-days/ha). On an average it takes 50 man-days/ha labor. If the wage rate is same (350 tk), the cost is 17500 tk/ha for human labor.

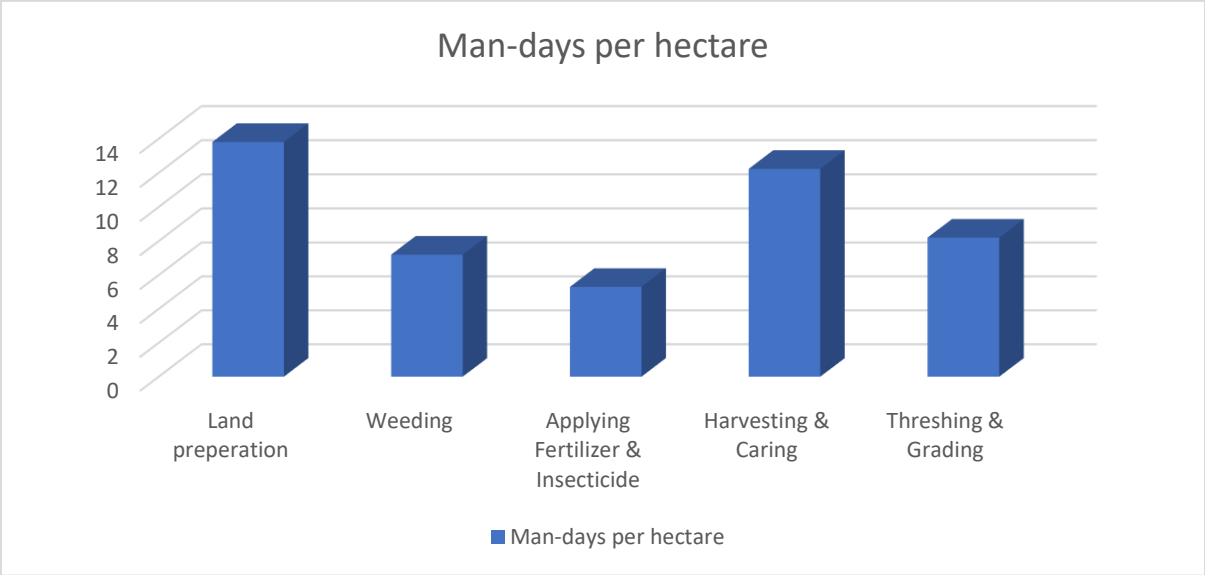
Table 5.1: Human labor cost (Man-days per hectare)

Operation	No of labor per ha	Wage(tk)	Cost (tk/ha)
Land Preparation	13	350	4550
Weeding	7	350	2450
Applying fertilizer and Insecticide	5	350	1750

Harvesting & Carrying	17	350	5950
Threshing & Grading	8	350	2800
Total	50	350	17500

Source: Field survey, 2021

Fig 5.1: Man-days per hectare



Source: Field survey, 2021

Figure 5.1 illustrates the labor per hectare needed for each operation separately. Harvesting and caring needed highest labor and applying fertilizer and insecticide needed the least labor per hectare.

5.2 MACHINERY COST

Machinery costs are important factors in determining financial viability. Machinery was used for land preparation and primarily for laddering, threshing, and carrying.

According to table 5.2 the cost of machinery is 2515 tk.

Table 5.2: Machinery Cost/ha

Operation	Owned(tk)	Hired(tk)	Total(tk)
Land preparation	160	2355	2515

Source: Field survey, 2021

5.3 COST OF MATERIAL INPUTS

The cost of material inputs is another critical component in determining financial profitability in any type of manufacturing process. Farmers used many types of material inputs for Mustard cultivation in the study, including:

1. Seed
2. Fertilizers, such as;
    a. Urea
    b. TSP and
    c. MoP
3. Insecticide.
4. Irrigation

Table 5.3: Cost of Material Inputs (Tk/Ha)

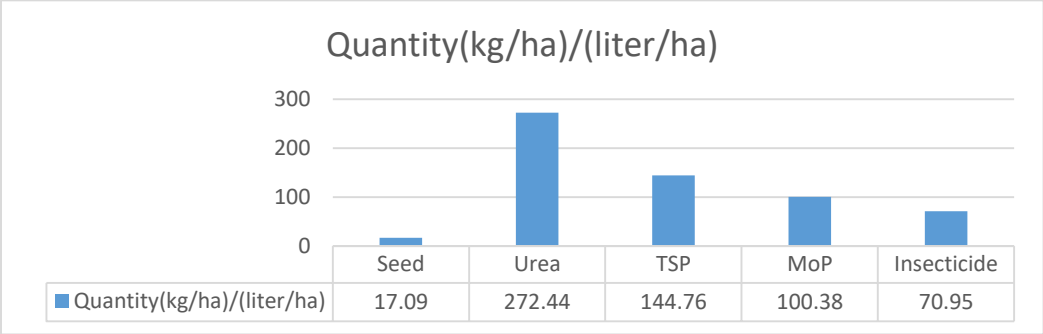
Inputs	Quantity (kg/ha)/(liter/ha)	Price(tk/kg)	Cost(tk/ha)
Seed	17	70	1190
Urea	252	16	4032
TSP	145	22	3190
MOP	100	15	1500
Insecticide	67	50	3350

Irrigation			10016
Total			23278

Source: Field survey, 2021

Here in Table 5.3 the cost of all the inputs used in mustard production is given. This table also illustrates that irrigation is most expensive among all the inputs. And MOP is least costly in terms of material inputs for mustard cultivation in the study area. Urea is used in a huge quantity here.

Fig 5. 2: Quantity (kg)/(litre) of various inputs per hectare



Source: Field survey, 2021

5.4 GROSS RETURN

Here, Table 5.4 illustrates the yield per hectare is 1711.62 kg for which the farmers get a return of 89004.24 tk per hectare from mustard cultivation. The value of by-product is tk 3309.02 tk per hectare. Thus total return is 92313.26 tk/ha.

Table 5.4: Per Hectare Return From Mustard Cultivation

Items	Yield(kg/ha)	Price(tk/kg)	Return(tk/ha)
Product	1711.62	52	89004.24
By-product			3309.02
Gross Return			92313.26

Source: Field survey, 2021

5.5 NET RETURN FROM MUSTARD PRODUCTION

5.5.1 Variable Cost

Variable costs are generally thought of as physical items, such as raw materials. Variable costs include all expenses which increase incrementally with each additional unit produced. Table 5.5 shows that among the variable cost elements, the highest expense is spent by the farmers for materials input which is 23278 tk/ha. The lowest expense is machinery inputs which is 2515 tk/ha.

Table 5.5: Net return (Tk. /ha)

Particulars	Cost(Tk)
A. Variable Cost	
Material inputs	23278
Machinery inputs	2515
Human labor	17826.35
Interest on operating capital	1308.58
Total variable cost	44927.93
B. Fixed Cost	
Land use cost	24589.3
C. Total Cost (A+B)	69517.23
Return	
D. Gross Return	92313.26
E. Gross Margin (D-A)	47385.33
F. Net Return (D – C)	22796.03
BCR (D/C)	1.33

Source: Author's own estimation

5.5.2 Fixed Cost

Fixed cost per unit is the amount of money required to do one unit of a particular business activity. It is the fixed amount of money required to execute a unit of business activity. Fixed cost per unit enables a business to understand its performance. Here the fixed cost is land use cost.

Table 5.5 shows that the cost of land use is 24589.3 (tk/ha).

5.5.3 Total Cost

Total cost is the summation of the variable cost and fixed cost. Here the total cost of mustard in the study area is 69517.23 (tk/ha)

5.5.4 Gross Return

The entire amount of product and by product were multiplied by their respective prices to get per hectare gross return. Here the gross return is 92313.26 (tk/ha).

5.5.5 Gross Margin

Gross margin is net sales less the cost of goods sold (COGS). In other words, it's the amount of money a company retains after incurring the direct costs associated with producing the goods it sells and the services it provides. The gross margin per hectare was calculated by deducting variable costs from gross return. Gross margin per hectare was found to be Tk. 47385.33.

5.5.6 Net Return

The Total cost was subtracted from gross return to achieve net return which is 22796.03 (tk/ha).

5.6.7 Undiscounted Benefit Cost Ratio (BCR)

Total cost and total return were used to determine the undiscounted Benefit Cost Ratio (BCR). The undiscounted BCR is 1.33. Mustard producers have BCR greater than one, showing that mustard farming is profitable in the study area.

CHAPTER VI

FACTORS AFFECTING THE YIELD OF MUSTARD PRODUCTION

In the context of functional analysis, this chapter was created to demonstrate a quantitative link between several essential inputs and outputs of mustard production. To find out how various inputs affect Mustard output, on the basis of the best match, the Cobb-Douglas production function was selected.

6.1 Interpretation of the Estimated Values

Table 6.1 shows the estimated values of the Cobb-Douglas production function's co-efficient and related data for Mustard cultivation. The following are the primary features and interpretations of the values, as well as the major findings:

1. Total output changes were calculated using the coefficient of multiple determinations, which was recorded as modified "R^2."

2. One percent and five percent probability were employed to test the significance level of an individual coefficient with sufficient degree of freedom.

3. From the computed parameters of the regression equation for farms, the relative contributions of stated factors impacting Mustard productivity can be observed.

6.1.1 Human labor (X_1)

The regression co-efficient of human labor (X_1) was positive (0.049) and significant at the 1% level, indicating that increasing human labor use by 1% while maintaining other factors unchanged will enhance Mustard production by 0.049 percent.

6.1.2 Seed (X_2)

The Seed (X_2) coefficient was positive (0.073) and significant at the 5% level, indicating that increasing seed use by 1% while maintaining other factors unchanged will enhance Mustard production by 0.073 percent (Table 6.1)

6.1.3 Urea (X_3)

The Urea (X_3) coefficient was found positive and value is 0.072 but it is insignificant (Table 6.1).

6.1.4 TSP (X_4)

The TSP (X_4) coefficient was positive (0.114) and significant at the 1% level, indicating that increasing TSP use by 1% while maintaining other factors unchanged will enhance Mustard production by 0.114 percent (Table 6.1).

6.1.5 MoP (X_5)

The coefficient of MoP (X_5) indicates that MoP had no significant effect on Mustard yield in the studied area.

6.1.6 Insecticide (X_6)

The Insecticide (X_6) coefficient was positive (0.218) and significant at the 1% level, indicating that increasing insecticide use by 1% while maintaining other factors unchanged will enhance Mustard production by 0.218 percent (Table 6.1).

6.1.7 Irrigation (X_7)

The Irrigation (X_7) coefficient was found positive and value is 1.011 but insignificant (Table 6.1).

6.2 Overall performance of the model

The "R^2" co-efficient of determination is a summary metric that indicates how well a sample regression line fits the data (Gujarati, 1998). The coefficient of determination "R^2" was determined 0.52, indicating that the independent variables included in the model explained roughly 52 percent of the variation in yield (Table 6.1). At a 1% level of significance, the F-value of the equation was significant. (Table 6.1).

Table 6.1: Cobb-Douglas regression estimates for Mustard production

Variables	Co-efficients	Standard error	t value
Constant	6.995***	0.774	9.04
Human labour	0.049***	0.017	2.88
Seed	0.073**	0.037	1.98

Urea	0.082	0.072	1.14
TSP	0.114***	0.049	2.32
Mop	0.252	0.200	1.27
Insecticide	0.218***	0.098	2.22
Irrigation	1.011	0.855	1.18
R^2	0.52		
F value	6.825***		
Return to scale	1.79		
Observations (n)	75		

Note: *** and ** indicates Significant at 1% and 5% level of significance

Source: Author's own estimation

6.3 Returns to Scale

The degree to which a proportionate change in all inputs generated a change in the output is represented by returns to scale. It has three different value types.

1. Return to scale (=1) at a constant rate

2. Increasing the Return to Scale (>1) and

3. Decreasing the Return to Scale (1).

Mustard production return to scale was calculated by multiplying regression coefficients, which also reflects production elasticity (Table 6.1). The sum of the coefficients of various inputs was found to be 1.79 in the study. This means that if all of the inputs provided in the function are increased by 1%, the yield will increase by 1.79 percent.

CHAPTER VII

CONSTRAINTS OF MUSTARD CULTIVATION

Agriculture is an integral aspect of Bangladesh's economy. Farmers in Bangladesh are currently dealing with a variety of economic and technical issues throughout their harvesting season. The purpose of this study was to identify some of the primary obstacles to Mustard cultivation. Mustard cultivation constraints can be divided into four categories:

1. Financial Problems
2. Technical Problems
3. Natural Problems and
4. Marketing problems

7.1 FINANCIAL PROBLEMS

Capital, inputs, financial condition, pricing, wage, and other economic issues confronted Mustard producers. The following section goes over these constraints.

7.1.1 Higher Input Price

Table 7.1 reveals that increasing input prices were a problem for 29.3% of farmers. This is one of the most serious financial problem mentioned by most of the farmers that ranks it in 1st place.

7.1.2 High Wage Rate

Another most serious issue for sample farmers in the study area was the high pay rate. During harvest season, the wage rate was very high. According to Table 7.1, approximately 29.3 percent of farmers were affected by this issue. Among the financial issues, a higher wage rate was identified as the most serious issue.

7.1.3 Lack of Capital

Farmers were overwhelmingly poor in the study area. Around 28% (Table 7.1) of farmers in the study area said they lacked sufficient operating cash. Among all the financial issues, a lack of capital is the 3rd ranked problem.

7.1.4 Low Price of Output

To keep their households afloat, the majority of farmers were obliged to sell their produce shortly after harvest. According to Table 7.1, this problem affected 13.3 percent of farmers. Last serious issue among the economic issues was low production prices.

Table 7.1: Financial problems of Mustard cultivation

Problems	Number	Percent	Rank
Higher input price	22	29.3	1st
High Wage Rate	22	29.3	1st
Lack of Capital	21	28.0	2nd
Low price of output	10	13.3	3rd
Total	75	100	

Source: Field survey, 2021

7.2 TECHNICAL PROBLEMS

Technical problems are related to production techniques and technologies which are discussed below:

7.2.1 Harvesting and Drying Problems

Most of the farmers in the research had difficulties with harvesting and drying. Harvesting at the accurate moisture level of the crop is a difficult task. Also drying in the perfect temperature is also an issue. Harvesting and drying problems were mentioned by 26.7 % farmers. Harvesting and drying issues came in first place out of all the technical issues (Table 7.2).

7.2.2 Fertilizers Crisis

Some farmers in the study area were experiencing a fertilizer shortage. This was a problem for about 18.7 percent of all farmers (Table 7.2).

7.2.3 Lack of Quality Seed

According to Table 7.2, farmers cited a difficulty with a lack of quality seed. Approximately 16 percent of all farmers in the research area faced this issue.

7.2.4 Machinery Shortage

For Mustard farming, farmers have a limited amount of time to seed and harvest. It's critical to have the right machinery on hand during the land preparation process. During land preparation and threshing, farmers in the research area did not receive adequate mechanized support. Approximately 16 percent of farmers said they did not receive timely machinery support (Table 7.2).

7.2.5 Labor Shortage at Harvesting Time

Mustard production is heavily reliant on the availability of sufficient personnel and experience. During the harvest season in the research area, there was a severe labor shortage. According to Table 7.2, approximately 14.6 percent of all farmers claimed that they did not receive appropriate labor during the land preparation, weeding, and harvesting of Mustard.

7.2.6 Lack of Technological Knowledge

Agriculture is a branch of science concerned with the ongoing production of food and fibre. As a result, suitable knowledge and technology are required to obtain the desired output from both the soil and the natural environment. Table 7.2 reveals that in the study region, the problem of lack of understanding of improved technology was an issue. This problem affected approximately 8 percent of all farmers.

Table 7.2: Technical Problems for Mustard farmers

Problems	Number	Percent	Rank
Harvesting and Drying Problems	20	26.7	1st
Fertilizer Crisis	14	18.7	2nd
Lack of Quality Seed	12	16	3rd
Machinery Shortage	12	16	3rd
Labor Shortage at Harvesting Time	11	14.6	4th
Lack of Technological Knowledge	6	8	5th
Total	75	100	

Source: Field survey, 2021

7.3 NATURAL PROBLEMS

Farmers in the study area experienced a number of serious environmental issues. Natural problems are ones that cannot be protected, but for which precautions can be taken to mitigate damages. These difficulties are listed below:

7.3.1 Rising Temperature

Temperatures have been rising steadily in recent months. As a result, it causes issues for farmers during the harvesting process. Table 7.3 demonstrates that this issue was reported by almost 34.7% of all farmers. Among all natural challenges, the issue of insufficient warmth rated first.

7.3.2 Seasonal change

Seasonal change that is not predictable is a major issue in the agricultural sector. It causes problems for farmers in the research area during agricultural production. Table 7.3 reveals that the problem was noted by 34.7 percent of all farmers. It came in first place with rising temperature of all the ecological issues.

7.3.3 Insect and disease attack

Table 7.3 reveals that the farmers reported pest and disease concerns. This issue was reported by around 30.6% of all farmers. Among all the natural difficulties, the problem of attack and pathogens into the field placed third.

Table 7.3: Natural Problems for Mustard farmers

Problems	Number	Percent	Rank
Rising Temperature	26	34.7	1st
Seasonal Change	26	34.7	1st
Insect and disease attack	23	30.6	2nd
Total	75	100	

Source: Field survey, 2021

7.4 Marketing Problems

Farmers encounter marketing issues mostly following crop cultivation, when it is necessary to get profit during the post-harvest period. Farmers in the study area encounter certain marketing challenges. In the following section, we'll go through these:

7.4.1 Transportation Problem

During the post-harvest period in the research area, transportation is the most serious issue. According to Table 7.4, farmers do not have access to adequate transportation. This issue was reported by almost 33.3% of the farmers. The transportation issue came in 1st place among all marketing issues.

7.4.2 Lack of Storage

Among all the Marketing issues, the storage difficulty ranked fourth most serious. After harvesting season farms in particular experienced this issue. Table 7.4 reveals farmers in the research area claimed that they did not have enough storage facilities. This difficulty was mentioned by 29.3 percent of the farmers.

7.4.3 Unavailability of market

One of the most pressing issues for large farms is the lack of a proper marketing channel to reach the accessible market. Because, in the study area, farmers did not earn a fair price for their vast amount of output. According to Table 7.4, this issue was reported by almost 24.1% of all farmers.

7.4.4 Selling problems

Among all of the Marketing issues, the selling problem was last in place. According to research area table 7.4, around 13.3 percent of farmers reported not selling their goods flexibly. Because the market is complicated by the owner and other intermediate men.

Table 7.4: Marketing Problems for Mustard farmers

Problems	Number	Percent	Rank
Transportation problem	25	33.3	1st
Lack of storage	22	29.3	2nd
Unavailability of market	18	24.1	3rd
Selling Problems	10	13.3	4th
Total	75	100	

Source: Field survey, 2021

7.5 SUGGESTIONS TO OVERCOME THE PROBLEMS

Mustard producers who highlighted their own issues also proposed ways to enhance the current production and pricing structure. Farmers proposed the following steps to address the issues raised above.

1. Supply of credit on easy terms

Farmers require funds at the time of planting. As a result, institutional finance facilities should be made available to Mustard growers in order to increase crop volume. Through

Bangladesh Krishi Bank (BKB) and other commercial banks, the government should provide such services.

2. Increase the Price of Output

The government officials should increase the price of mustard at farm level. So that the farmers get fair price for their output and do not get exploited by the intermediaries.

3. Supply of inputs and machinery

The government, responsible authority, agriculture extension officer (AEO), and block supervisors (BS) should provide Mustard farmers with an adequate number of inputs and machinery, including HYV mustard seeds, on a timely basis at discounted prices. Efforts should also be made to guarantee that fertilizer and herbicides are delivered on time and at a reasonable price to Mustard growers.

4. Improvement of transportation facilities

In the study areas, transportation needs should be addressed. Village roads should be created first and foremost, with at least brick bedded roadways, to allow rickshaws and motor vehicles to operate freely. It would also aid in transportation cost reduction. Such facilities could be developed by local government administration.

5. Fertilizer Crisis should be Solved

The fertilizers should be available enough for the farmers to use. So that it does not affect the productivity of mustard in the selected area.

6. Quality Seed should be Provided

Seed quality and availability of quality seed should be ensured. Quality full seeds gives best production of crop. It is a necessity to have enough quality seed.

7. Supply of Credit on Easy Terms

Farmers require funds at the time of planting. As a result, institutional finance facilities should be made available to Mustard growers in order to increase crop volume. Through Bangladesh Krishi Bank (BKB) and other commercial banks, the government should provide such services.

8. Increase of Technological Knowledge

To educate the farmers with better technological knowledge the government officials should arrange seminars and workshops regularly. This will increase the technological knowhow of the farmers and lead them to produce more outputs.

9. Improved Storage Facilities

It is a must to store the mustard in a good condition. As high temperature can spoil the mustard it should be stored in a good storage. But there is a shortage of storage which needs to be addressed properly.

10. Reducing Selling Problems

The government officials should check on the pricing of mustard in farm level. The market owners and intermediaries should be checked regularly that they do not exploit the farmers with providing them lowers price of their output.

11. Formation of farmers' organization

Farmers' organizations must be established in order to strengthen farmers' bargaining power. It would assist farmers in dealing with middlemen and assuring a higher return on Mustard production.

12. Improvement of market facilities

The necessary government officials should arrange for market infrastructure such as a concrete floor, a tin shed, drainage, water supply, and electricity supply, among others, to facilitate proper mustard marketplaces in the research region.

CHAPTER VIII

SUMMARY AND CONCLUSION

This chapter summarizes the thesis, draws conclusions based on the study's major findings, and offers some Mustard production recommendations.

8.1 SUMMARY

Mustard is one of the world's most important oilseed crops, second only to soya bean and peanut, and Bangladesh's most important oil crop. Mustard production's future is highly dependent on its profitability and marketing outlet. The current study will provide useful information to individual farmers and researchers who will perform similar studies in the future, encouraging them to conduct more complete and deep investigations in this subject. It will aid planners and policymakers in developing micro-level policies for the development of oilseeds, particularly mustard production, throughout the country.

With this in mind, the research was carried out with the following precise goals in mind.

i. To compile a demographic profile of Mustard growers in the study area.
ii. To determine Mustard's financial viability in the research area.
iii. To determine the factors affecting the yield of Mustard.
iv. Determine the primary constraints to Mustard Cultivation at the farm level and make policy recommendations.

75 Mustard producers were chosen at random from the study area to achieve the study's goals. During the months of January and February of 2021, the researcher conducted personal interviews with the respondents to acquire the relevant data. A preliminary survey was undertaken in Pakshi and Sahapur union of Ishwardi upazilla in Pabna district to accomplish the study's goals. After the data gathering was completed, the raw data was entered into the computer using the MS Excel. Using simple statistical metrics like means, percentages, and ratios, a tabular technique was used to classify data in order to extract relevant findings. To investigate the contribution and productivity of the individual inputs, a Cobb-Dauglas production function analysis was also performed.

According to the study area's demographic profile, young farmers (20-35 years), middle age farmers (36-50 years), and old farmers (51 years and up) account for 32.0 percent, 33.3 percent, and 34.7 percent, respectively, of all farmers. The age range up to 20 years old had the highest percentage of family members. The age group of farmers over 55 years old had the lowest percentage of all farmers.

The Mustard farmers' educational status was divided into four categories: illiterate, sign only, primary and secondary and above. According to the findings, almost 36% of the respondents lacked a formal education. The level of education of family members is also a significant aspect in any revenue creation process. Around total 36.8% of family members are illiterate and can only sign, the majority of family members (32.3 percent) had completed primary school.

Fertilizer, seed, labor, land, and cost on operational capital @9% in 4 months are all expenditures that must be included in determining the financial profitability of Mustard in the research region. Mustard cultivation's gross return, on the other hand, included the product's and by-sales product's values. The most essential cost in any manufacturing process is human labor. Farmers used 50 man-days per hectare. Tk 17500 per hectare was reported to be the total labor cost for the farmers. Farmers have spent 2515tk for machinery costs in the research area. The cost of material inputs is another crucial component in determining financial profitability in any type of manufacturing process. Farmers employed a variety of material inputs to cultivate Mustard in the study. The total cost of material input was found to be Tk 23278 per hectare. Farmers obtained yield of 1711.62 kg/ha. However, the total return from Mustard was pretty good, 92313.26. The value of the by-product was found to be Tk. 3309.92 per hectare. Total variable cost for the mustard production was tk 44927.93 per hectare. Total costs are higher due to higher variable costs, which is 69517.23 (Tk/ha). Net return from the mustard production was found to be 22796.03 (Tk/ha). Mustard cultivation proved profitable for the farmers in the research area. Farmers per hectare had undiscounted BCR of 1.33.

The Human Labor, TSP and insecticide coefficients were found to be positive and significant, at 1% level of significance and Seed at 5% level of significance. Urea, MoP and Irrigation Regression coefficient was positive but insignificant. Similarly the coefficient of determination "R^2" was determined to be 0.52, indicating that the independent variables included in the model explained roughly 52 percent of the variation

in yield. At a 1% level of significance, the F-value of the equation was significant. The sum of the coefficients of various inputs was 1.79, indicating an increasing return to scale in the production function. Farmers in the study area had numerous issues with Mustard production.

The goal of this study was to identify some of the most serious issues that mustard growers face. Finacial challenges, technical problems, natural problems and marketing problems have been widely classified as constraints faced by mustard farmers. Among all the financial issues, high wage rate and higher input price is the most serious one. Approximately 26.7 percent of farmers said they had harvesting and drying problems. Among the technical issues, it came in first place. Temperature fluctuation and seasonal change were cited as a serious natural problem by the highest number of farmers. Among the marketing issues, transportation problem came out on top.

Mustard farmers who identified their own issues also proposed measures to improve the existing Mustard production and pricing system, such as providing credit on favorable terms, providing inputs and machinery, improving transportation facilities, forming farmers' organizations, and improving market facilities.

8.2 CONCLUSIONS

The following conclusion can be drawn based on the study's findings in a few select areas of Pabna district:

I. The majority of the farmers in the sample are between the ages of 51 and above, with the average age of their family members being up to 20 years.
II. The cost of human labor is the highest among the cost components. Thus the farms have greater production costs.
III. In the research area, mustard manufacturing is profitable and it has increasing returns to scale.
IV. Mustard yield was positively influenced by seed, TSP and insecticide.
V. The most serious challenges of Mustard cultivation in the research area include a lack of capital, labor shortages during peak seasons, machinery shortages, higher wage rates, and temperature fluctuations.

8.3 RECOMMENDATIONS

Mustard farming in the selected area is profitable, according to the current study. Several recommendations were made based on the study's findings.

I. Availability of all necessary inputs at a reasonable price should be guaranteed in order to increase Mustard productivity.

II. In their plots, most farmers employed an unbalanced amount of fertilizer and insecticides. Short-term instruction on effective input application should be provided to farmers. It will assist farmers in Mustard growing in improving their efficiency.

III. By assuring government regulation, the output price should be increased in a reasonable way. A government procurement center might be set up to purchase Mustard from farmers at a set price.

IV. To improve farmers' understanding, initiatives should be done to boost the availability of information sources, and a mass literacy program might be developed.

V. Profitability is a criterion for farmers when deciding whether or not to use a new technology. As a result, for complete adoption of the Mustard cropping pattern, focus may be given to economic motivation through demonstrations, field days, participatory technology development (PTD), formal training days, farmer's field school (FFS), and other appropriate extension methods.

VI. DAE should improve the field level service provided by field workers (SAAOs) in order to provide farmers with accurate information, suggestions, and advise on Mustard growing.

VII. The current research was conducted in a small area in Pabna district. Similar studies might be carried out in other sections of the country to acquire a comprehensive image of the country, which will aid in policy formulation.

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