FINANCIAL ANALYSIS AND FACTORS DETERMINING THE PROFITABILITY OF CHILLI FARMING IN BOGURA DISTRICT

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FINANCIAL ANALYSIS AND FACTORS DETERMINING THE PROFITABILITY OF CHILLI FARMING IN BOGURA DISTRICT

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CERTIFICATE

This is to certify that the thesis entitled '**FINANCIAL ANALYSIS AND FACTORS DETERMINING THE PROFITABILITY OF CHILLI FARMING IN BOGURA DISTRICT'** submitted to the Faculty of Agribusiness Management, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science in Agribusiness and Marketing,** embodies the result of a piece of bona fide research work carried out by **TAWHIDA UMMEY GULSHAN**, Registration Number: 14-06301, 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 duly been acknowledged.

Dated:

Dhaka, Bangladesh

.....

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Dedicated
to My
Beloved
Parents

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June 2021 *The Author*

ABSTRACT

The purpose of this research is to ascertain the profitability of chilli production and to identify the variables impacting it in Bihar and Namuja villages of Shibpur Upazila in Bogura district. Primary data were collected from 100 farmers from the study area. The sample farmers were selected through purposive sampling technique. The major findings of this study revealed that production of chilli were profitable. The logarithmic cobb-douglas production function was used to measure the factors determining the profitability of chilli production. Variable cost, fixed cost and gross return of production of chilli were BDT 103372, BDT 23668.6 and BDT 252347 respectively. The benefit-cost ratio (BCR) was determined to be 1.98, implying that a taka investment in chilli production generates BDT 1.98. The inputs like cost of irrigation, manure, DAP and MoP played a significant role in determining the level of profit earned from chilli cultivation among the ten explanatory factors in the study area. The coefficient of cost of irrigation was 1.393 which indicates that if the farmer increases the cost of irrigation by BDT 1, net return may be increased by BDT 1.393 while each of the other inputs remains unchanged. On the other hand, if the farmer increase the cost of manure, DAP and MoP by BDT 1 net return may be decreased by BDT 0.292, 0.458, and 1.386 respectively while each of the other inputs remains unchanged. The study also identified inadequate extension service, lack of technical knowledge and credit facility as major production problem and lack of source of information and finance as major marketing constraints. Finally, the study gave necessary recommendations to improve the overall economic condition of the farmers through chilli production.

CONTENTS

SL. No. Title Page

LIST OF TABLES

SL. No.	Title	Page

LIST OF FIGURES

SL. No.	Title	Page

ABBREVIATION

Agril.	=	Agricultural
BRRI	=	Bangladesh Rice Research Institute
BDT	=	Bangladeshi Taka
BADC	=	Bangladesh Agricultural Development Corporation
BARI	=	Bangladesh Agricultural Research Institute
BBS	=	Bangladesh Bureau of Statistics
BER		Bangladesh Economic Review
BCR	=	Benefit Cost Ratio
DAE	=	Department of Agriculture Extension
DAM	=	Department of Agricultural Marketing
GDP	=	Gross Domestic Product
FAO	=	Food and Agriculture Organization
FY	=	Fiscal Year
Ha	=	Hectare
HYV	=	High Yielding Variety
Kg	=	Kilogram
M	=	million
MoA	=	Ministry of Agriculture
MS	=	Master of Science
Mt	=	Metric tons
NGO	=	Non-Government Organization
No.	=	Number
ILO	=	International Labor Organization
SAARC	=	South Asian Association of Regional Co-Operation
SAU	=	Sher-e-Bangla Agricultural University
SD	=	Standard Deviation
%	=	Percentage
UAO	=	Upazila Agricultural Officer

CHAPTER I

INTRODUCTION

1.1 General background

Agriculture has traditionally been Bangladesh's primary industry, as it has been in a large number of other developing nations. Around 40.6% of the population is employed in this industry, while nearly 70% of people depend on agriculture for their living (BER, 2020). Agriculture provides the majority of the impoverished with their principal source of income and employment. Agriculture's indirect dependence is reflected in employment in agricultural-related services and rural companies. Agriculture's total contribution to GDP in 2019-20 was 13.47% (BBS, 2021). Apart from core crops, a number of minor crops are cultivated in Bangladesh to feed the country's enormous population. Apart from rice, the nation grows wheat, maize, potato, legumes, oilseeds, spices, and a wide array of summer and winter vegetables.

Chilli is a significant vegetable spice that is cultivated around the globe, except in colder areas. It is sometimes referred to as red pepper or hot pepper and is a common commercial crop used as a spice, culinary supplement, or vegetable. Chilli peppers are mostly used in cuisine to provide taste, color, vitamin content, and pungency. Chipotle is a near-essential item in the kitchen. Different sorts of vegetables, spices, condiments, sauces, and pickles are farmed. Chilli is one of the nation's most valued crops, and it is farmed across the country. Due to their unique color, taste, and flavor, chilies are often used in Bangladeshi curries, including those cooked with meat, fish, vegetables, and pulses. Red chilies are rich in vitamin C and include a little amount of beta-carotene (Vitamin-A). Green chilies (unripe fruit) have a lower concentration of both chemicals. Additionally, peppers have a high concentration of the B vitamins, notably vitamin B6. They are rich in potassium, magnesium, and iron.

The production of chilli largely depends on the use of fertilizers, irrigation, pesticide etc. The Government of Bangladesh has, therefore, provided priority to the agriculture sector to increase the production of chilli by giving subsidy to the farmers on different inputs such as seeds, fertilizer, irrigation etc. to achieve self-sufficiency in chilli production. (Hossain, 2016)

1.2 Chilli cultivation overview in Bangladesh

Chilli is a tropical and subtropical plant endemic to the world's tropics and subtropics. It thrives in warm, humid climates. For best development, the crop likes deep, loamy, fertile soils that are high in organic matter. Crop development also requires well-drained soils with enough soil moisture. Chilli thrives in the arid and semi-arid regions of the nation. Chilli plants should be put in a well-lit environment. Chillies should not be stored in areas where the nighttime temperature falls below 12°C. Growth will be hindered if the temperature falls below 15°C. Chilli pepper plants are annual crops that survive for just one season. If nurtured, this plant will continue to grow and yield for many months after planting until dying.

Chillies should be watered often to prevent 'flooding' at irregular intervals. Overwatering on a regular basis will lead the roots to root. Leave the blossoms on the plants when they begin to bloom; they will wither and chillies will emerge in a few weeks. Once the plants begin to bear fruit, use the recommended quantity of organic liquid fertilizer every few weeks to ensure that the plants continue to produce abundant fruit.

Chilli peppers are harvested when their hue is green or red. Red peppers are hotter than green peppers. Allow green chilli peppers to grow as large as possible if you want to harvest them. Chillies should be harvested when they begin to turn red. Clip the peppers from the plant by cutting the stems where they connect to the main branch. Bangladeshi chilli growers cultivate local cultivars which produces very low yields. The lack of high yielding varieties and limited irrigation facilities are the main causes of low yield. Though the area and production have increased, the chilli yield per unit is still quite low.

Although chilli is a major spice crop of Bangladesh, but its production technologies has not been standardized from the scientific and economic point of view. Therefore, research needs to bring improvement in production technologies as well as considering economic return. If nature favors, farmers get moderately good harvest.

1.3 Present status of chilli production in Bangladesh

Chilies are grown in all of Bangladesh's districts, however Bogura, Rangpur, Kurigram, Jamalpur, Natore, and Jashore produce the most. Bangladeshi farmers cultivate chilies using archaic ways, resulting in a poor yield. The low yield is a result of a scarcity of high-yielding cultivars and the production practices used by indigenous farmers. Improved production procedures, such as proper plant spacing, may result in an increase in chilli yield. Chilli is mostly grown in two seasons in Bangladesh.

According to the Bangladesh Bureau of Statistics (BBS), 475 kilograms of winter chilli were produced per acre in 2015-16, and 99056 metric tons of chilli were produced on 208699 acres of land. Winter chilli production area was decreased to 191076 acres in 2019-20, while overall output grew to 111963 metric tons at a rate of around 586 kg per acre (Table 1.1).

Table 1.1 Production of winter chilli

Year	Area (acres)	Kg/acre	Production(MT)
2015-16	208,699	475	99,056
2016-17	211,824	499	105,764
2017-18	204,022	526	105,236
2018-19	195,256	543	106,021
2019-20	191,076	585.96	111,963

Source: BBS, 2021

Summer chillies were grown in 43,173 acres of land, produced 31,204 metric tons of chillies in the year of 2015-16. The production increased to 45,644 metric tons in the year of 2019-20, where the rate of production was 944 kg/acre (Table 2).

Table 1.2 Production of summer chilli

Year	Area (acres)	Per acre yield	Production (MT)
2015-16	43,173	723	31,204
2016-17	43,637	713	31,108
2017-18	45,726	786	35,941
2018-19	43,947	989	43,452
2019-20	48,367	944	45,644

Source: BBS, 2021

Adding winter and summer chillies together, total production of chillies were 130,260 metric tons and the area used to grown chilli was 251,872 acres in the year of 2015-16.

In the last year 2019-20, total production of chilli was 157,607 metric tons and area used to cultivate chilli was 239,443 acres.

Table 1.3 Total chilli production (winter & summer)

Year	Area (acres)	Per acre yield	Production (MT)
2015-16	251,872	517	130,260
2016-17	255,461	536	136,872
2017-18	249,748	-	141,177
2018-19	239,203	625	149,473
2019-20	239,443	658.22	157,607

Source: BBS, 2021

1.4 Objectives of the Study

The overall objective of this study is to estimate the profitability of chili with analyzing the most impacting factors at the Bagura district of Bangladesh. The specific objectives are as follows:

- To assess the socio-economic characteristics of chilli growing farmers
- To estimate the profitability of chilli cultivation
- To identify the factors determining profitability of chilli production
- To identify the production and marketing constrains associated with chilli

1.5 Assumptions of the study

While conducting the study, the researcher prioritized these assumptions:

a. The respondents included in the sample were really representative of the targeted demographic.
b. The respondents included in the study's sample were adequately competent of responding to the questions and expressing their thoughts.
c. The respondents' responses were substantial and trustworthy.
d. The researcher, the interviewer, was socially and culturally acclimated to the study location. The responses were objective.

1.6 Organization of the thesis

The study was organized based on eight chapters. The first chapter described the background, overview, present status, objectives, assumptions and limitations of the

study. The second chapter represented a review of previous studies. Chapter three explained the research methodology. The socio-economic characteristics of the chilli growers were demonstrated in chapter four. Chapter five demonstrated the financial analysis of chilli production and chapter six identified the factors influencing the profitability of chilli growers. In chapter seven chilli production and marketing problems was discussed. Finally, chapter eight presented summary, conclusion and recommendation.

1.7 Limitations of the study

Several limitations were noted throughout the research period, including the following:

- ✓ To begin, this investigation was geographically confined.
- ✓ Second, due to time constraints and other resource constraints, the researcher was forced to work with tiny sample numbers.
- ✓ Thirdly, due to time and cost constraints, all data and other relevant information were gathered as quickly as feasible.
- ✓ Fourthly, a significant weakness of the study was that the researcher had to rely entirely on the producers' recollection for the essential information since they did not retain written records of their on-farm operations throughout production and selling. As a result, growers were probed within the confines of their memory in order to recall the right responses to the queries posed.
- ✓ Additionally, certain challenges were encountered during data collecting in getting responses from a number of chilli producers. At first, individuals are hesitant to provide accurate facts. They were eventually persuaded to report the facts.

To minimize all vocal errors, various limitations were handled paying conscious attention during the study period.

CHAPTER II

REVIEW OF LITERATURE

In this chapter, an attempt has been made to review of pertinent literature keeping in view the problem entitled, **"Financial analysis and factors determining the profiability of chilli production in Bogura District."**Again, although not all of these research are directly relevant to the present one, their results, analytical approaches, and suggestions have a substantial influence on it. A review of several recent research papers related to the current investigations is provided below.

Channa *et. al*. (2020) measured profitability of chilli pepper in Pakistan which opined that the yield of chillies obtained was 1785.53 (kg) per acre and price per (kg) was Rs. 102.81. Total cost of production of chilli with opportunity cost was Rs. 102543.44 and Rs. 85334.45 without opportunity cost per acre. The study also revealed, per acre revenue was Rs. 183506.74, similarly net return of chilli with opportunity cost was Rs. 80963.30 and without opportunity cost was Rs. 98172.29 per acre respectively.

Ila *et. al.* (2019) found that total cost was Tk. 128011.13, gross return was Tk. 240864 and gross margin was Tk. 137698 for per hectre production of chilli. The study revealed net return was Tk. 112852.87 and benefit cost ratio (BCR) showed 1.88. Lack of agricultural credit, lack of farmer's association and lack of crop insurance were the major problems in the study area.

Prity (2018) conducted a study on Comparative Profitability Analysis of Spices Production in Bangladesh which revealed BCR 3.12 for ginger, 2.19 for chilli and 2.13 for onion.

Daundkar and Bairagi (2015) explored the economics of capsicum in India. The study estimated total cost was Rs. 125,260 with net returns (Rs. 273,388) and input-output ratio (3.11).

Velayutham & Damodaran (2015) demonstrated the economic performance of chilli production in India. Regression coefficients of Cobb-Douglas model were positive for labour man-days (0.406), manure (0.0778), fertilizer (0.368) and chemicals (0.251).

Olayiwola (2014) performed the economic analysis of chilli production in Nigeria. On per acre basis, total cost was estimated for small (34,225.05 Naira), medium (38,612.48 Naira) and large (42,086.84 Naira) farmers. The gross income was higher for large

farmers (73,883.49 Naira) and less for small (49,104.38 Naira) farmer. Similarly, large farmers had higher benefit cost ratio (1.91) as compared with medium (1.87) and small (1.56) farmers.

Sanusi and Ayinde (2013) conducted research on the profitability of pepper production in Nigeria. The mean of several socioeconomic factors such as age (43 years), pepper farming experience (12 years), family size (8 people), and farm size were calculated (1.23 ha). On average, variable and fixed costs were N 228,293.06 (US$ 1,521.95) and N 9,765.49 (US$ 65.10), respectively, to generate N 622,847.56 (US$ 4,152.32) in revenue. The rate of return on investment was 2.62.

Biradar and Chandrgi (2013) studied, Socio economic profile of chilli farmers and their constraints in chilli cultivation in North Eastern districts of Karnataka, focused on technological gap in adoption of chilli cultivation practices in Raichur and Yadgir districts of North Eastern Karnataka during 2011-12 based on highest area under chilli cultivation. The exposit factor research design was used for the study. The findings revealed that Majority (78.33%) of the farmers expressed problem of price fluctuation followed by inadequate irrigation (62.50%) and same per cent of them expressed the non-availability of laborers at critical stages and high wages, non-availability of good quality inputs at proper price at right time (59.17%) and the major suggestions made by the respondents were minimum support price should be fixed for chilli (86.67%), followed by market should be nearer, (65.83%), should provide good quality.

Jagtap *et. al*. (2012) stated that chilli (Capscicumannuam L.) is India's most frequently used and ubiquitous spice. The research was done in the Achalpurtahsil of Maharashtra's Amravati district. Four villages and twenty farmers from each village were randomly chosen as sample size, totaling 80 farmers. The data utilized were from 2009-10. Economic analysis of the data revealed that Cost 'C' for small, medium, and big farmers was Rs. 40541.72, Rs. 42811.07, and Rs. 53421.29 per acre, respectively. The net returns on cost 'C' were Rs. 19329.52, Rs. 24114.79, and Rs. 21400.51 per acre, respectively, and the input-output ratio at cost 'C' was 1.

Islam *et. al*. (2011) determined the productivity, profitability and resource use efficiency of four promising spices crops such as garlic, chilli, ginger and turmeric. The average estimated technical efficiencies for garlic, chillies, ginger and turmeric were respectively 88, 80, 69 and 79% which indicated that garlic production could be

increased by 12%, Chilli by 20%, ginger by 31% and turmeric by 21% with the same level of inputs without incurring any additional cost. They which revealed that total cost was Tk. 155009, net return was Tk. 243002 for per hectare chilli production and the study found benefit-cost ratio (BCR) for chilli was 2.09.

Balraj and Arockiasamy (2018) revealed that The vast majority of responders (95.83 percent) reported water shortages for irrigation, while 82.50 percent suffered limits due to high pest and disease prevalence. Whereas 68.33 percent and 48.53 percent of respondents cited price fluctuations and a lack of technical guidance as significant constraints in chilli cultivation, respectively.

Rajput *et. al*. (2007) revealed that the following factors were responsible for the declining of chilli area. These constraints were technical aspects (85.14 percent), economic aspect (85.33 percent), lack of information sources (70.00 percent), non-availability of labor (67.32 percent), and erratic climatic condition (94.66 percent), were the important constraints.

Hanumanaikar *et. al*. (2006) revealed that One hundred percent (100%) of respondents expressed concern about increased pest and disease infestations in the Chilli crop, forcing them to use excessive pesticide doses. Ninety percent of respondents said that they were unable to comprehend the manufacturer's instructions on the label of pesticide containers about proper pesticide usage owing to illiteracy and language barriers.

Shrivastava (2003) revealed that the significant restraints were the high cost of fertilizers (98.33 percent), insect and disease attack (96.67 percent), absence of irrigation facility (67.00 percent), lack of sufficient instruction about optimal chilli production method (56.67 percent), and climatic influence (55.00 percent).

Prajapati *et. al*. (2002) reported that the major constraints faced by chilli growers in adopting recommended chilli cultivation practices were a lack of knowledge about recommended varieties (85.00 percent), an inability to obtain fertilizers on time and in sufficient quantity (84.83 percent), and erratic and insufficient power supplies in rural areas (83.16 percent).

Shrivastava *et. al*. (2002) reported that the constraints that chilli growers faced in adopting chilli cultivation technology included the high cost of chemical fertilizers,

insecticides, and pesticides, pest and disease incidents, a lack of technical guidance from village level workers, adverse climate effects and a lack of knowledge about technology, the farmers' poor economic situation, a lack of plant protection chemicals, insufficient and timely credit, and a lack of seed of the S-49 variety.

Mutkule *et. al*. (2001) reported that the significant restrictions faced chilli farmers were a lack of acceptance of chilli farming technologies and the high cost of insecticides and herbicides. non-awareness of pesticide concentrations, fluctuating chilli prices, non-availability of fertilizers on time, high cost of fertilizers, lack of disease resistant varieties, lack of transport facilities to city areas, lack of cold storage, and non-availability of sprayers on a hire basis during spraying.

The review of the literature revealed that there is little research on chilli production in the study region. Further research on chilli production in the study area may assist in identifying specific problems and determining the steps that should be taken to increase the farmers' production and profitability. Thus, the research may benefit policy makers, planners, extension employees, and field workers in terms of effective planning to boost profitability and variables impacting chilli production profitability.

CHAPTER III

METHODOLOGY

3.1 Introduction

This chapter discusses in detail the processes followed throughout the study's various phases. Methodology is an integral part of every research undertaking. This chapter discussed the study's area of focus, the study's context, the sampling procedure and sample size, data collecting, data processing, and analytical tools. The following techniques and methodologies were utilized and followed throughout the research, taking into account the study's unique objectives:

3.2 Selection of the study area

The study area selection is a critical element in any farm management research. The region chosen suited both the study's specific objective and the possibility of cooperating with the farmer. Although chilli is cultivated across Bangladesh, Rangpur, Nilphamari, Dinajpur, Nagoan, as well as Bogura and the majority of the country's northern region, are significant areas where it is grown widely.

Thus, two villages, Bihar and Namuja, in Shibganj Upazila in Bogura district were purposefully chosen for the research because to their high concentration of chilli production. The following were the primary reasons for choosing the research area:

a) The researched localities were densely populated with chilli growers.

b) These villages had several physical features, such as topography, soil composition, and meteorological conditions conducive to chilli production.

c) These communities are easily accessible and have adequate communication facilities; and

d) A high degree of participation from respondents was anticipated in order to get trustworthy data.

3.3 Background of the study area

Bogra is a northern district of the Rajshahi Division of Bangladesh. It is called the gateway to the north Bengal. Bogra district was a part of the ancient Pundra vardhana territory and was the capital of 'Pundra vardhana'. Bogra is famous for its historical values with Pundra vardhana as former capital, which is now known as 'Mahasthangarh'. Bogura is bounded on the north south by Gaibandha and Jaypurhat districts, on the east by Jamalpur and Sirajganj districts, on the south by Sirajganj and Natore districts and on the west by Naogaon and Jaipurhat districts. The total area of the district is 2898.68 sq km.

The annual average temperature of the district varies from maximum 34.6°C to minimum 11.9°C and the average annual rainfall of the district is recorded 1610 mm. According to the Population Census 2011, total population of this district is 34, 00,874. Out of total population male is 17, 08,806 and female is 16, 92,068. Total household of this district 8, 67,137. Density of population is 1173(per sq.km). Literacy rate for both sex is 49.4%, male is 52.9% and female is 45.9%.

Main crops: Aush, Aman, Chili Paddy, Jute, Wheat, Chili, Mustard, Pepper, Vegetables, Banana, Sugarcane and Betel leaf are the main crops of this district. All these demographic indicators are presented in Table 3.1.

Table 3.1 General profile of Bogura District (According to Census 2011)

Sl. No.	Particulars	Number
1	Total population	34,00,874.
	a. Male	17,08,806
	b. Female	16,92,068
	c. Urban	8,67,137
	d. Rural	2533737
2	Percentage of Rural population to Total Population (%)	74.50
3	Percentage of Urban population to Total Population (%)	25.50
4	Population density per sq. Km.	1173
6	No. Of Literates (2011)	
	a. Male	888137
	b. Female	791895
	c. Total	1680032
8	Literacy rate (%)	
	a. Male	52.9%
	b. Female	45.9%
	Total	49.4
9	Rural literacy rate (%)	
	a. Male	71.5
	b. Female	52.7
	Total	62.1
10	Urban literacy rate (%)	
	a. Male	80.88
	b. Female	69.04
	Total	75.12
11	Sex ratio (Female/1000male)	
	a. Rural	1002
	b. Urban	948

3.4 Sampling technique and sample size

In selecting samples for a study two factors need to be taken into consideration. The sample size should be as large as to allow for adequate degrees of freedom in the statistical analysis. On the other hand, administration of field research, processing and analysis of data should be manageable within the limitation imposed by physical, human and financial resources (Mannan, 2001). However, because of diversity in the technical and human environment, it is necessary to sample several numbers of the population before any conclusion can be drawn. Therefore, the purpose of sampling is to select a sub-set of the population that is representative of the population (Rahman, 2000).

It was not possible to include all the farmers of the study area due to limitation of time, money and personnel. In total 100 farmers were purposively selected. A purposive random sampling technique was followed in the present study for minimizing cost, time and to achieve the ultimate objectives of the study.

Table 3.2 Sample size

Villages	Sample size
Bihar	50
Namuja	50
Total	100

3.5 Data collection

Data collecting is identified as an important aspect of a survey since it has a significant impact on the quality of the results. Given its significance, the following precautions were taken throughout the development of the questionnaire as a data collection tool:

3.5.1 Design of the interview schedule

An interview schedule is a strong data collection instrument that uses multi-dimensional questions to acquire information. An interview schedule without a defined goal and purpose would inevitably overlook crucial topics and waste the time of enumerators and respondents by asking and responding to irrelevant questions. All these matters were addressed to the extent possible for developing the interview schedule of survey.

3.5.2 Pre-testing the interview schedule

The interview schedule was pre-tested to determine the amount of time required to complete the interview, test its reliability (i.e., whether it captured the information desired), and its consistency (i.e., whether the information acquired was relevant to the survey's overall goal). The test also aimed to check the logistics required for the survey's successful operation. In order to ensure the best performance of the interview schedule in respect of data collection, processing and analyzing, the pre-testing was carried out during the month of December 2019 to December 2020 prior to the survey at Bihar and Namuja villages of Shibganj upazila under Bogura District.

3.5.3 Finalization of the interview schedule & method of data collection

The interview schedule was sent to my supervisor after I addressed all of the improvements based on the pre-test recommendations. My supervisor also made a significant contribution to the survey. With the permission, the interview schedule was finally completed. Following the interview schedule, a face-to-face interview was conducted.

3.5.4 Data editing and coding

In case of this survey, coding was done along with interview schedule development so that the enumerator could mark the correct responses quickly and precisely. The process of checking and cleaning data that had already been obtained from the field was referred to as data editing.

3.6 Data processing

Data processing involved many steps that were very important because it affected survey results according to the involved steps. During data processing following steps had been taken.

i. Data entry
ii. Appending and merging files
iii. Data validation (further computer checking, editing, and imputation)
iv. Final decision on errors

v. Completion of data processing and generation of data files

vi. Final documentations

vii. Conversion of data files to another software.

viii. Storage of all files.

3.7 Processing, tabulation and analysis of data

Manual editing and coding of the gathered data occurred. The acquired data was then meticulously compiled and analyzed. Additionally, data entry and analysis were performed on a computer using Microsoft Excel and the Statistical Package for the Social Sciences (SPSS). It should be remembered that information was first gathered in local units. After required checks, it was converted to international standard units.

3.8 Analytical techniques

The data were examined to ensure that the study's goals were met. This study included a range of analytical techniques. The tabular approach was employed for the majority of the data analysis. This approach is commonly used because to its inherent capacity to provide the most basic image of the agricultural economy. To evaluate data and define socio economic features of chilli producers, input consumption, expenses and returns on chilli production, and to determine the undiscounted benefit cost ratio, relatively basic statistical methods such as percentage and arithmetic mean or average were used (BCR).

The research used the cob-douglas production function to ascertain the inputs that impacted productivity.

3.8.1 Profitability analysis

Chilli's net returns were calculated using a set of financial pricing. The financial prices were the market prices obtained by farmers for products and inputs acquired during the r esearch period. The following cost items were identified for the study:

i. Land preparation

ii. Human labor

iii. Seedlings

iv. Urea
v. TSP
vi. MoP
vii. Insecticide
viii. Irrigation
ix. Interest on operating capital
x. Land use

Crop returns were evaluated using the market value of the major goods. Variable cost, fixed cost, and total cost were all discussed in this research. TVC includes land preparation, human labor, seedlings, organic manure, urea, TSP, MoP, pesticides, and irrigation. The fixed cost (FC) component includes the land rental value and interest on operating capital. The total cost (TC) factored in both variable and fixed costs.

3.8.1.1 Cost of land preparation

Land preparation is regarded as a critical component of the industrial process. Preparation of the land for chilli production includes plowing, laddering, and other actions necessary to prepare the soil for seedling planting. The number of ploughings varied according to the study from farm to farm and location to place.

3.8.1.2 Cost of human labor

Human labor was once seen as a significant cost component of the manufacturing process. It is often needed for a variety of tasks including land preparation, seeding and transplanting, weeding, fertilizer and pesticide treatment, irrigation, harvesting and hauling, threshing, cleaning, drying, and storage. To calculate the cost of human labor, the recorded man-days per hectare were multiplied by the pay per man-day for a given application.

3.8.1.3 Cost of seed

Seed prices varied significantly based on its quality and availability. The cost of seed was calculated by market pricing of respected chilli seeds. To calculate the cost of seeds for the study locations, the total quantity of seed required per hectare was multiplied by the market price of seed.

3.8.1.4 Cost of urea

Urea was a critical fertilizer in the development of chillies. The price of urea was determined using market pricing. The cost of urea was determined by multiplying the unit of urea reported per acre by the current market price of urea.

3.8.1.5 Cost of TSP

Additionally, the cost of TSP was determined using market pricing. The cost of TSP was determined by multiplying the unit of TSP recorded per acre by the market price of TSP.

3.8.1.6 Cost of MoP

MoP was one of the three primary fertilizers used in the production of chillies. To determine the cost of MoP per hectare, the market price of MoP was multiplied by the unit cost of that input per hectare for a given activity.

3.8.1.7 Cost of insecticides

Farmers applied a range of pesticides 5-7 times to protect their crops from pests and illnesses. The cost of pesticides was evaluated by comparing the market price per hectare of the insecticides used in the study sites to the market price per hectare of the insecticides used in the study locations.

3.8.1.8 Cost of irrigation

Improved water management may boost chilli output. Irrigation expenses vary by farmer. It was calculated based on the number of times irrigation was required per hectare and the associated cost.

3.8.1.9 Interest on operating capital

Interest on operating capital was determined on the basis of opportunity cost principle. The operating capital actually represented the average operating cost over the period because all costs were not incurred at the beginning or at any single point of time. The cost was incurred throughout the whole production period;

Hence, at the rate of 9% per annum interest on operating capital for four months was computed for Chilli. Interest on operating capital was calculated by using the following formula:

IoC= AIit

Where,

IOC= Interest on operating capital

i= Rate of interest

AI= Total investment / 2

t = Total time period of a cycle

3.8.1.10 Land use costs

Land usage costs were calculated using the potential cost of land use per hectare during a four-month cropping cycle. As a result, the cash rental value of land was utilized to calculate the cost of land usage.

3.8.2 Calculation of returns

Gross return

The total amount of product and by-product was multiplied by their respective per unit pricing to compute per hectare gross return.

Gross return= Quantity of the product * Average price of the product + Value of by-product.

Gross margin

The difference between gross return and variable costs is known as gross margin. Generally, farmers want maximum return over variable cost of production. Th e argument for using the gross margin analysis is that the farmers are interested to get ret urns over variable cost. On a TVC basis, gross margin was computed.

Per hectare gross margin was obtained by subtracting variable costs from gross return.

That is,

Gross margin = Gross return – Variable cost

Net return

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

Net return = Total return – Total cost.

3.8.3 Undiscounted benefit cost ratio (BCR)

The average return on each taka invested in manufacturing is a critical metric for determining profitability. The ratio of total return to total cost per hectare was used to calculate the undiscounted BCR.

BCR= Total return (Gross return)/ Total cost

3.8.4 Cobb-douglas production function

Due to its mathematical properties, ease of comprehension, and computational simplicity, the Cobb-Douglas production function is arguably the most extensively used form for fitting agricultural output data (Heady and Dillion, 1969; Fuss and Mcfadden, 1978).The cobb-douglas approximation may be adequate for manufacturing processes in which factors are imperfect replacements across a large range of input values. Additionally, the cobb-douglas is a straightforward estimator because its parameters are linear in logarithmic form and its parameters are sparse (Beattie and Taylor, 1985).

Considering two variable inputs for example one is labor and another is capital, then the function can be expressed as

$$Y = AL^{\beta_1}K^{\beta_2}e^{v_i-u_i}$$

Where Y = level of output, L and K = Labor and Capital are variable inputs, A = multiplicative constant, β_1 and β_2 are the coefficient of L and K and they represent elasticity of the respective factors of production, and e = error term.

3.8.5 Specification of production model

The Cobb-Douglas production function was transformed into following logarithmic form so that it could be solved by ordinary least squares (OLS) method.

$$\text{Ln } Yi = \beta_0 + \beta_1 \ln X_{1i} + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + \beta_4 \ln X_{4i} + \beta_5 \ln X_{5i} + \beta_6 \ln X_{6i} + \beta_7 \ln X_{7i} + \beta_8 \ln X_{8i} + \beta_9 \ln X_{9i} + \beta_{10} \ln X_{10i} + \beta_{11} \ln X_{11} + v_i - u_i$$

Where,

Y = Net return (BDT/ha)

X_1 = Cost of land preparation (BDT/ha)

X_2 = Cost of seed (BDT/ha),

X_3= Cost of manure (BDT/ha)

X_4= Cost of urea (BDT/ha)

X_5 = Cost of TSP (BDT/ha)

X_6 = Cost of Gypsum (BDT/ha)

X_7 = Cost of MoP (BDT/ha)

X_8 = Cost of irrigation (BDT/ha)

X_9 = Cost of pesticides (BDT/ha)

X_{10} = Cost of hired labor (BDT/ha)

X_{11} = Cost of family labor (BDT/ha)

$v_i - u_i$ = error term.

CHAPTER IV

SOCIO-ECONOMIC CHARACTERSTICS OF THE CHILLI GROWERS

This chapter provides an overview of the chilli farmers' socio-economic characteristics. The socio-economic data are an important part of the research and should be examined carefully. The socio-economic profile helps to understand the marital status, educational qualification, family type, family size, occupation, income and savings related information and farming information of the respondents at a glance. The socio-economic profile also helps to understand the behavior or characteristics of the respondents.

4.1 Marital status

The figure 4.1 shows the marital status of the respondents in the study area. Among 100 chilli growers majority of the respondents were married (70%) followed by single (30%).

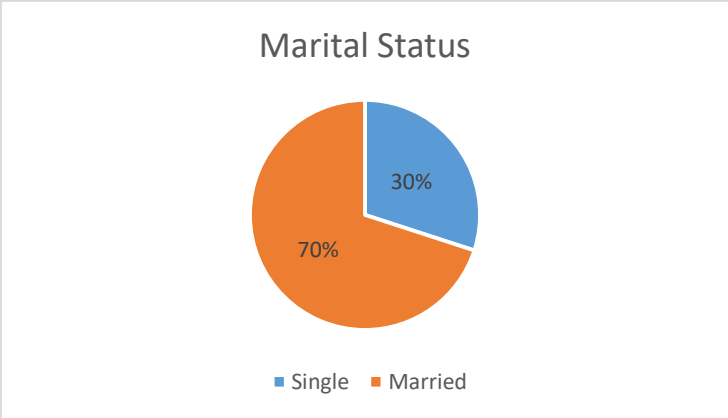

Figure 4.1 Marital status of the respondents

Source: Field survey, 2020

4.2 Age of the respondents

Figure 4.2 shows age of the respondents which were plotted in a Bar-diagram for better representation. Age of the respondent were categorized into 3 categories such as below 35 years, 35 to 50 years and above 50 years. It can be seen from the figure that, the majority of the respondents (67%) belong to the age group of below 35 years. Besides, 11% of the respondents belong to the 35-50 years age category and remaining 22% of the respondents belong to above 50 years age.

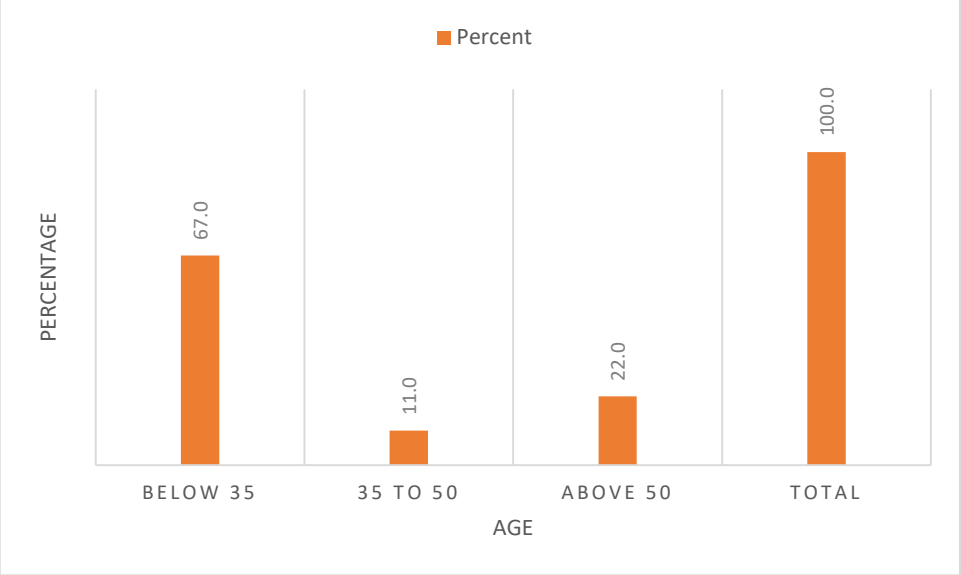

Figure 4.2Age of the respondents

Source: Field survey, 2020

4.3 Educational qualification

The figure 4.3 shows the educational qualification of the respondents. Education levels ranged from no institutional education to secondary level of education. It is inferred from the below figure that, the majority of the respondents (49%) have completed primary level education followed by no institutional education (36%) and secondary level of education (15%).

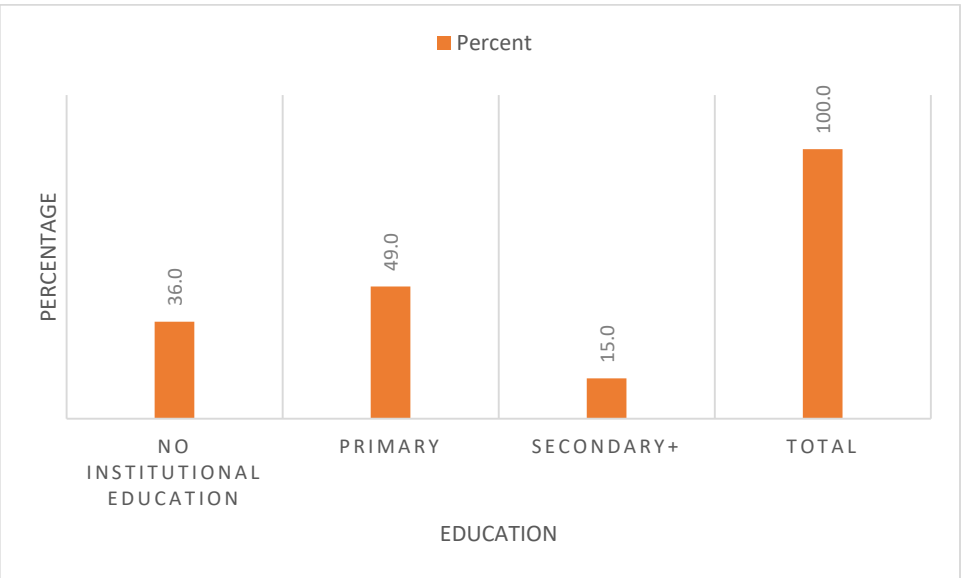

Figure 4.3 Education level of the respondents

Source: Field survey, 2020

4.4 Family size

According to figure 4.4, the family size of chilli growers in the research region varied from one to more than seven people. Chilli farmers were divided into three categories according to the size of their families. Chilli farmers with a family size of 1 to 4 people accounted for 39%, those with a family size of 4 to 7 members accounted for 38%, and those with a family size of more than 7 members accounted for 23%.

Figure 4.4 Family size of the respondents

Source: Field survey, 2020

4.5 Female heads' occupation

The figure 4.5 shows the female heads' occupation. It is seen from the figure below that, the majority of females were housewives (80%) and only 20% of females were involved with other profession.

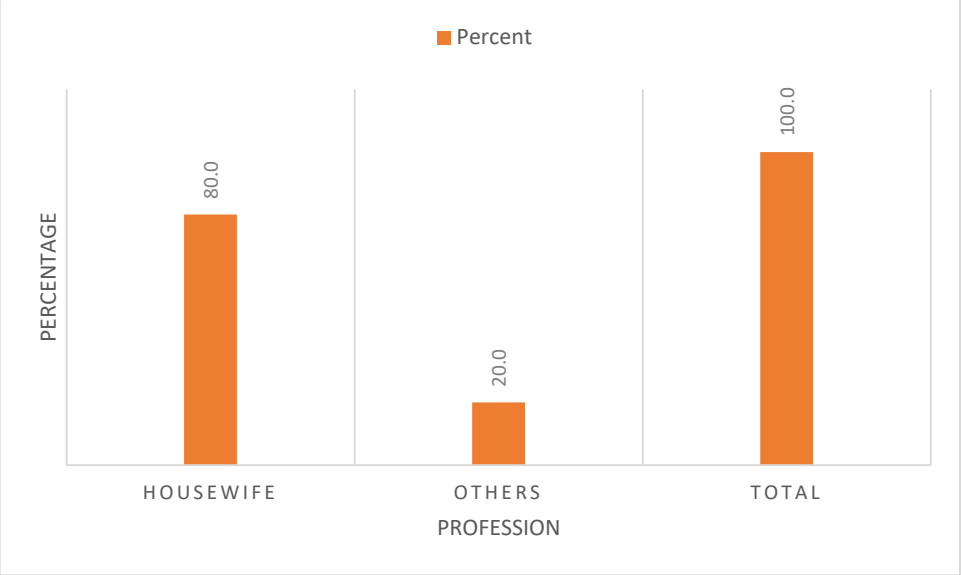

Figure 4.5 Female heads occupation

Source: Field survey, 2020

4.6 Major income source

The figure 4.6 shows the respondent's major sources of income. It is seen from the below figure that, 54% of farmers are dependent on only agriculture for their income whereas, 21% of farmers rely on agriculture and allied activities as their earning source. Besides, a significant number of respondents (25%) were dependent on other activities as their revenue source.

Figure 4.6 Major income source of the respondents

Source: Field survey, 2020

4.7 Annual savings of the respondents

The figure 4.7 shows that, a substantial number of respondents (55%) annual savings were between 1000 to 5000 taka, while only 7% of respondents save more than 5000 taka in a year. Besides, 38% of respondents earned less than 1000 taka in a year.

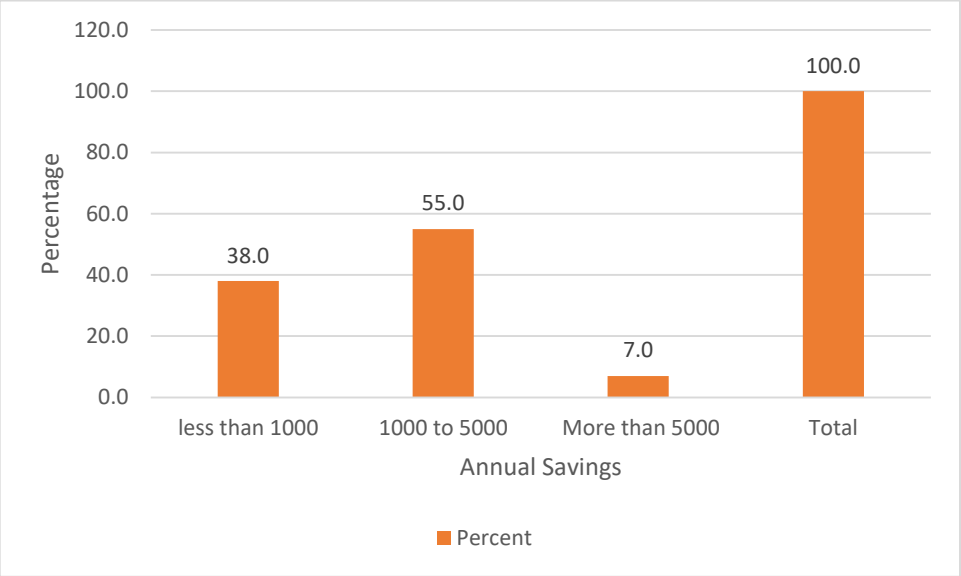

Figure 4.7 Annual savings of the respondents

Source: Field survey, 2020

4.8 Average monthly income

From the figure 4.8, it is seen that in the case of average monthly income, 39% of respondents earned 20000 to 30000 taka per month and 24% respondents earned 30000 to 40000 taka per month. Besides, 29% of respondents earned less than 20000 taka per month whereas, 8% of respondents earned more than 40000 taka in a month.

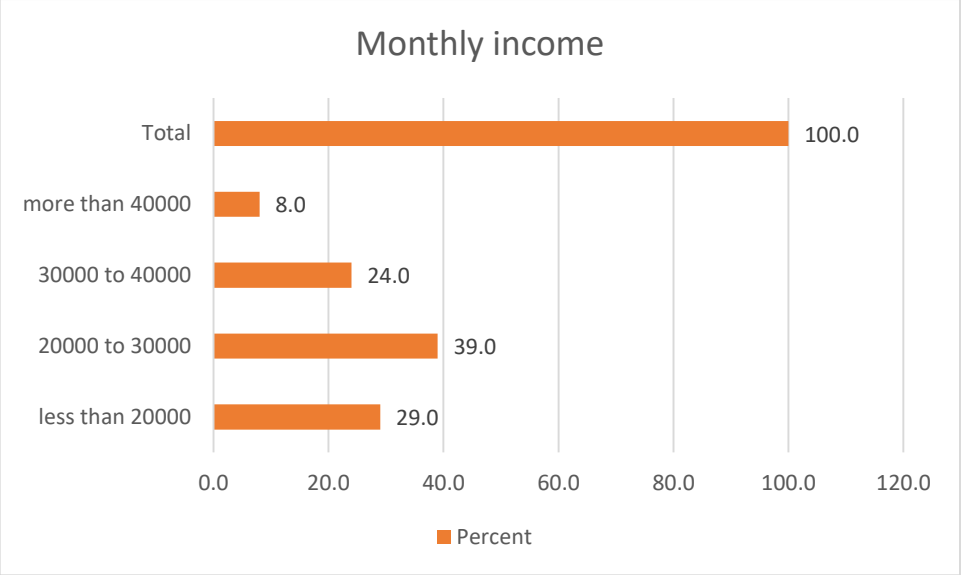

Figure 4.8 Average monthly income of the respondents

Source: Field survey, 2020

4.9 Land used for chilli cultivation

It can be seen from the below figure 4.9, based on their land size chilli farmers were divided into three groups. The number of respondents with a land size of 'below 25 decimal', '25 to 50 decimal' and 'above 50 decimal' was 66%, 29%, and 5%, respectively.

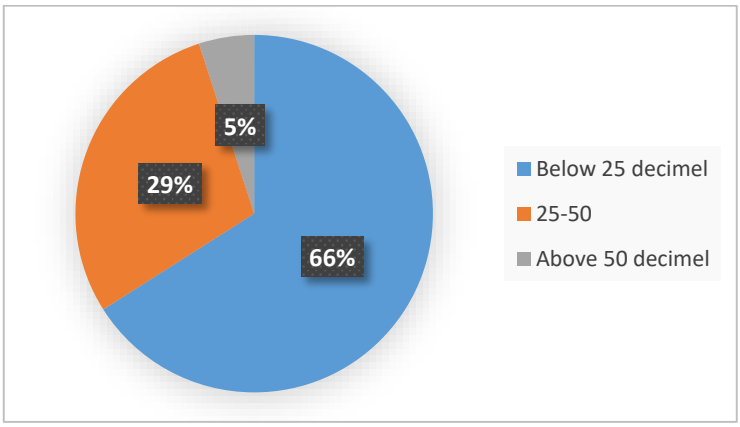

Figure 4.9 Land used for chilli cultivation

Source: Field survey, 2020

4.10 Having bank account

It can be seen from figure 4.10 that, 43% of the respondents have bank account whereas 57% of the respondents do not have any bank account.

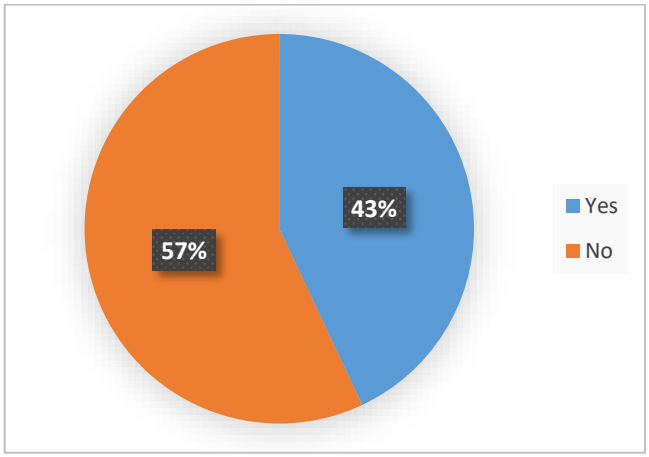

Figure 4.10 Having bank account of the respondents,

Source: Field survey, 2020

4.11 Training status of the respondents

Figure 4.11 shows that, 49% of chilli farmers had access to training or technical knowledge where 51% of farmers had not any kind of training.

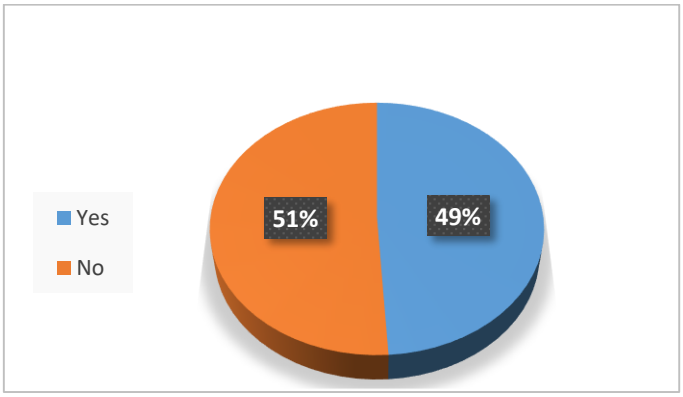

Figure 4.11 Training status of the respondents

Source: Field survey, 2020

4.12 Training center of the respondents

Figure 4.12 shows the places from where the chilli farmers took training. As mentioned in figure 4.11, only 49 respondents had access to training or technical knowledge.It can be seen from the below figure that, majority of the respondents (23 out of 49 farmers) took training from Agricultural Extension Officer. Besides, 19 respondents took training from NGO and remaining 7 farmers got knowledge's of cultivation from different person or local farms.

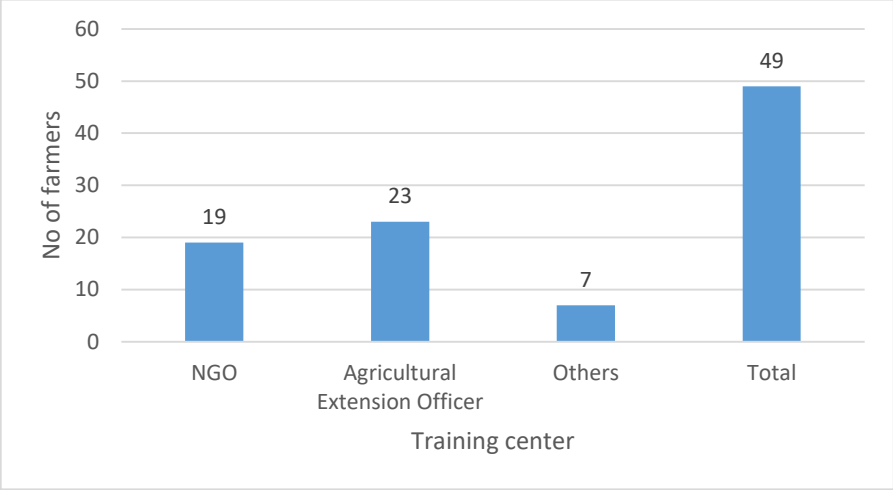

Figure 4.12 Training center of the respondents

Source: Field survey, 2020

4.13 Access to credit

Figure 4.13 shows that, 59% of respondent had access to credit facilities to run their chilli cultivation whereas, 41% did not get any loans or credits in the study area due to complex credit facility procedure.

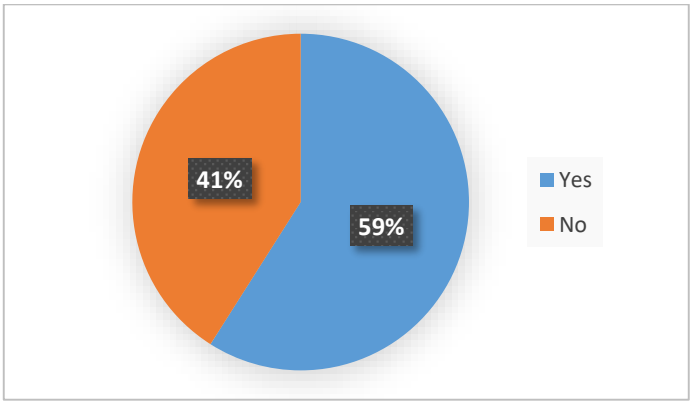

Figure 4.13 Access to credit

Source: Field survey, 2020

4.14 Sources of credit

As mentioned in figure 4.13, only 59 respondents had access to credit facilities to run their chilli cultivation.It is seen from figure 4.14 that, 22 among 59 respondents took loan from bank to run the farm whereas 29 among 59 respondents took credits from different NGO's and remaining 8 respondents borrow from others such as relatives or neighbors in the study area.

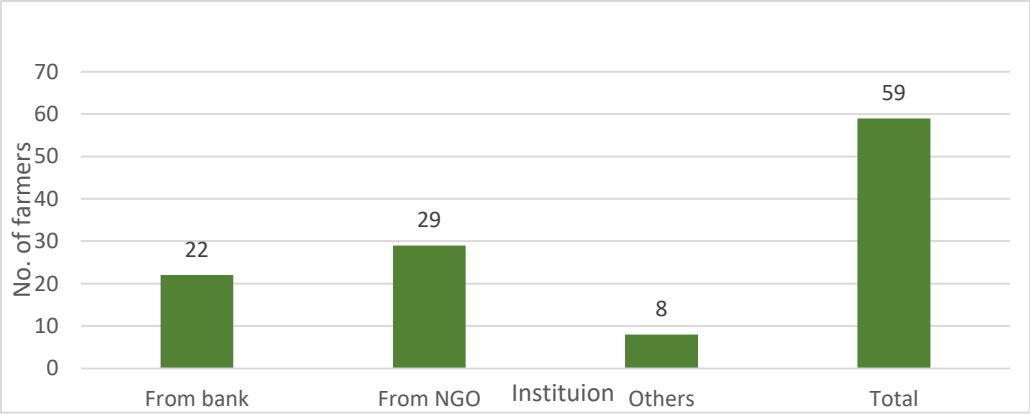

Figure 4.14 Sources of credit

Source: Field survey, 2020

4.15 Having storage place for crops

It is seen from the figure 4.15 that, the majority of the respondents (61%) had not any storage place for their crops and only 39% of respondents had those storage facilities.

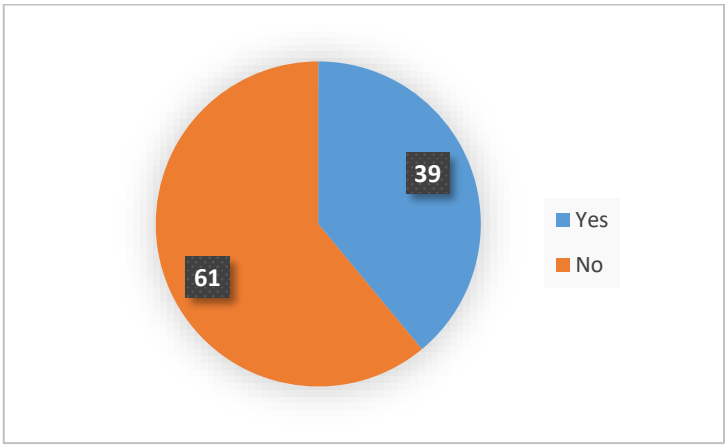

Figure 4.15 Storage facility

Source: Field survey, 2020

CHAPTER V

FINANCIAL ANALYSIS OF CHILLI PRODUCTION

One of the study's objectives was to conduct a financial analysis of chilli growing in the Bogura area. This chapter examined the variable and fixed costs of production in order to determine the profitability of the chilli farmer.

5.1 Variable cost

5.1.1 Cost of land preparation

Two times tillering was required to prepare the land for chilli cultivation. As a result, the average cost of land preparation for chilli production was estimated to be BDT 4000 per hectare, representing 3.86% of total variable costs.

5.1.2 Cost of seed

Seed costs vary considerably according on their quality and availability. Total seed costs were projected to be BDT 4088.33 per hectare for chilli production, accounting for 3.95% of total variable costs.

5.1.3 Cost of manure

Farmers were observed in the present study areas using cow dung to produce their enterprises. The total cost of manure per hectare was estimated to be BDT 7168.07.

5.1.4 Cost of urea

Farmers in the study region used a number of different types of fertilizers. Urea cost BDT 4200.39 per hectare, accounting for 4.06% of total variable costs.

5.1.5 Cost of TSP

The average cost of TSP was BDT 3589.76 which representing 3.47% of the total variable cost.

5.1.6 Cost of DAP

The average cost of DAP was found BDT 645.37 which representing 0.62% of the total variable cost.

5.1.7 Cost of MoP

Per hectare cost of MoP was found BDT 2055.12, which represents 1.98% of the total variable cost.

5.1.8 Cost of irrigation

The average cost of irrigation about 9-13 times and the average irrigation was found 11 times in survey area was found BDT 10561.30 per heater that represents 10.21% of the total variable cost.

5.1.9 Cost of insecticides/pesticides

The average cost of insecticides for chilli production was found to be BDT 13191.86 which was 12.76% of the total variable cost.

5.1.10 Cost of hired labor

One of the most important and widely used inputs in the production of chillies is human labor. The total cost of hired labor was found to be BDT 14005.50 representing 13.54% of total variable cost.

5.1.11 Cost of family labor

The farmer or the family members also works in their land while producing chilli. It is also included as variable cost. The total cost of family labor was found to be BDT 39866.30 representing 38.56% of total variable cost.

5.1.12 Total labor cost

Total labor cost of chilli production was found to be BDT 53871.80 representing 52.11% of total variable cost.

5.2 Total variable cost

As a result of the various cost factors listed above, it was determined that the overall variable cost of chilli production was BDT 103372 per hectare.

Table 5.1 Calculation of variable cost

Items		BDT/ha	Percentage of total variable cost
Land preparation cost		4000.00	3.86
Seed cost		4088.33	3.95
Fertilizer cost	Manure	7168.07	6.93
	Urea	4200.39	4.06
	TSP	3589.76	3.47
	DAP	645.37	0.62
	MoP	2055.12	1.98
Irrigation cost		10561.30	10.21
Insecticides cost		13191.86	12.76
Labour cost	Hired labour	14005.50	13.54
	Family labour	39866.30	38.56
	Total labour cost	53871.80	52.11
A. Total variable cost		**103372**	**100**

Source: Field survey, 2020

5.3 Fixed cost

5.3.1 Rental value of land/land use cost

Land usage cost was determined to be BDT 18500 per hectare using data acquired from chilli growers, accounting for 78.16% of the total fixed cost.

5.3.2 Interest on operating capital

Interest on operating capital for chilli production was estimated @ 9% as bank rate and calculated BDT 5168.6 per hectare, which represents 21.83% of the total fixed cost.

5.4 Total Fixed cost

From the above different cost items it was clear that the total fixed cost of chilli production was BDT 23668.6 per hectare.

Table 5.2 Calculation of fixed cost

Item	BDT/ha	Percentage of total
Land use cost	18500	78.16
Interest on operating capital @ 9%	5168.6	21.83
B. Total Fixed cost	**23668.6**	100

Source: Field survey, 2020

5.5 Gross return

Per hectare gross return was calculated by multiplying the total amount of main product and by-product by their respective per unit prices. Gross return of chilli cultivation per hectare was BDT 252347.

Table 5.3 Calculation of gross return

Cost Items	Quantity(Kg/ha)	Price per unit (BDT)	Returns (BDT/ha)
Main product(Chilli)	8911.53	28.22	252347
By-product	-	-	0.00
C. Gross return	-	-	**252347**

Source: Field survey, 2020

5.6 Gross margin

Gross margin was calculated by deducting the total variable cost from the gross return. On the basis of the data, gross margin was found to be BDT 148975 per hectare.

5.7 Net return

The net return or profit was determined by subtracting the whole cost of production from the gross return. On the basis of the data, a net return of BDT 125307 per hectare was calculated.

5.8 Benefit cost ratio (undiscounted)

The Benefit Cost Ratio (BCR) is a ratio used to compare benefit to cost per unit. The Benefit Cost Ratio (BCR) was determined to be 1.98, indicating that a BDT investment in chilli production generated a BDT return of 1.98. According to the aforementioned figure, chilli growing is lucrative in Bangladesh.

Table 5.4 Gross margin, net return and BCR

Item	Cost/Returns (BDT/ha)
A. Total variable cost	103372
B. Total fixed cost	23668
C. Gross return	252347
D. Total cost(A+B)	127040
E. Gross margin (C-A)	148975
F. Net return (C-D)	125307
G. Undiscounted BCR (C/D)	**1.98**

Source: Field survey, 2020

CHAPTER VI

FACTORS DETERMINING CHILLI PROFITABILITY

One of the objectives of the present study was to identify the factors influencing the profitability of chilli growers in Bogura district. Cobb-Douglas Production function is used in the present study which shows a functional relationship between inputs and outputs.

6.1 Coefficient of multiple determinations (R^2)

The coefficient of multiple determinations for chilli production was determined to be 0.797, indicating that the model's independent variables explained roughly 80% of the overall variance in returns. As a result, we can assert that this regression model has a higher goodness of fit, as R2 indicates the regression model's goodness of fit (Table 6.1).

6.2 Adjusted R^2

The word "adjusted" refers to the number of degrees of freedom considered. The modified R2 value for chilli production was 0.772, suggesting that the model's independent variables explained about 77% of the variance in output. The model fitting information for chilli production's input costs and net returns is shown in Table 6.1.

Table 6.1Model fitting information of chilli production

Model	R	R Square	Adjusted R Square
1	0.893	0.797	0.772

Source: Field survey, 2020

6.3 Factors affecting the profitability of chilli

The findings of the estimated Cobb-Douglas production function for chilli is presented in table 6.2. In this function, the net return of chilli has been used as the dependent variable. The functional analysis reveals that out of ten explanatory variables, cost of irrigation, manure, DAP and MoP played a significant role in determining the level of profit earned from chilli cultivation in the study area. The positive coefficient signs of the significant variables are implies that an additional unit increase in these costs may

increase the profit from chilli farming by the coefficient values associated with these variables (table 6.2). The negative coefficient signs of the significant variables are implies that an additional unit increase in these costs will decrease the profit from chilli farming by the coefficient values associated with these variables (table 6.2).

From the table 6.2 it is seen that, p value of cost of irrigation (β = 1.393) and manure (β =-0.292) were 0.085 and 0.065 respectively which were lower than 0.1. P value of lower than 0.1 indicates that cost of irrigation and manure were significant at 10% level of significance.

Besides p value of cost of DAP (β =-0.458) and MoP (β = -1.386) were 0.000<0.001 indicates the factor is highly significant and the level of significance is 1%. On the other hand, cost of land preparation, seed, urea, TSP, pesticides, hired labor and family labor were not statistically significant.

Table 6.2 Factors affecting the profitability of chilli production

Factors	Coefficient	p-value	Std. Error
Hired labor cost	-.261	0.713	0.709
Family labor cost	-.014	0.770	0.048
Cost of land preparation	1.447	0.196	1.110
Seed cost	-0.155	0.369	0.172
Irrigation cost	1.393	0.085*	0.799
Cost of manure	-.292	0.065*	0.156
Cost of urea	-.197	0.804	0.792
Cost of TSP	.917	0.126	0.594
Cost of DAP	-.458	0.000***	0.066
Cost of MoP	-1.386	0.000***	0.372
Cost of insecticides	-.175	0.621	0.352

**** denotes significant at 1% and * denotes significant at 10% level of significance*

Source: Field survey, 2020

The coefficient of cost of irrigation was 1.393 which indicates that if the farmer increases the cost of irrigation by BDT 1, net return may be increased by BDT 1.393 while each of the other inputs remains unchanged. On the other hand, if the farmer increase the cost of manure, DAP and MoP by BDT 1 net return may be decreased by BDT 0.292, 0.458, and 1.386 respectively while each of the other inputs remains unchanged. (Table 6.2)

The best possible explanation of these findings could be that if the farmers are able to afford these input costs in an efficient manner, they may also be able to generate a larger volume of production as well as sales. As a result, the net value of return might be higher as well.

CHAPTER VII

PROBLEMS OF CHILLI PRODUCTION

Farmers had several difficulties while growing chillies. The issues arose on social, cultural, financial, and technical levels. This chapter will discuss several aspects of chilli production. According to the farmers' perspectives, the issues confronting them have been identified. The following sections discuss the major issues associated with chilli cultivation:

7.1 Constraints associated with chilli production

Table 7.1 Problems of chilli production

SI. No	Particulars	Percentage
1.	Inadequate extension service	91.00
2.	High cost of irrigation water	54.00
3.	High price of fertilizer	80.00
4.	High price of quality seed	44.00
5.	Space shortage in the cold storages	70.00
6.	Lack of credit facility	83.00
7.	Insects, pests and disease problem	38.00

Source: Field survey, 2020

7.1.1 Inadequate extension service

Despite the fact that new agricultural technologies have been implemented in the studied regions, many farmers lack appropriate information about the right dosages and procedures for incorporating current inputs and technology into their companies. Several farmers said that they had not received any extension services from the Department of Agricultural Extension (DAE) about better chilli growing methods over the course of the study. 91% of farmers in the research area identified this as a serious problem.

7.1.2 High cost of irrigation water

Irrigation is the primary factor affecting crop production. Chilli yields are dependent on the amount of irrigation water used. The majority of farmers in the studied regions lacked their own shallow tube well or deep tube well, and as a consequence, they were forced to pay a premium to the water supply. According to Table 7.1, around 54% of chilli producers identified this as a limitation on chilli growth.

7.1.3 High price of fertilizers

Farmers argued that sometimes the inability to get fertilizers at a reasonable price was impeding their production enterprises. The study revealed that some of the local sellers charges higher prices from the growers. 80% of respondents cited this issue as a barrier on chilli output.

7.1.4 High price of quality seed

The high cost of good-quality seed was one of the most important constraints for chilli production in the study region. According to Table 7.1, nearly 44% of chilli growers identified this as a negative.

7.1.5 Space shortage in the cold storages

For 70% of farmers in the study region, inadequate storage facilities were a concern. Historically, the bulk of chilli growers kept their chillies in their homes. As a result, they had various setbacks, including weight loss and rotting chilies.

7.1.6 Lack of credit facility

Farmers in the study region were constrained by capital restrictions. Chilli farming requires a significant financial investment to acquire various inputs such as human labor, seed, fertilizers, and insecticides. Around 83% of chilli growers in the study region said that they were unable to get sufficient finance when they needed it. (Figure 7.1).

7.1.7 Insects, pests and disease problem

Pests and diseases harm crops, reducing productivity and increasing production costs. Around 38% of chilli producers in the research region identified pests and insects as a cultivation concern.

7.2 Marketing constraints of chilli

In general, the numbers of marketing constraints faced by chilli growers in the study area as a whole indicated that, lack of market information was the major constraints as expressed by 95% respondents. Due to lack of market information such as price of produce at the markets, quality and quantity of produces required at the markets, chilli growers in the research area negotiate on prices of their produce based on the information provided by traders. As a result, the bargaining power of the chilli growers reduced and thus promote development of uncompetitive market places. 85% farmers reported that they did not have enough finance to hold their produce for better price or to evaluate markets. Most of the chilli growers did not get payment regularly for their produce from the intermediaries. 55% of the growers in the study paid high cost for transported. They blamed poor road condition for against the reason of increased transportation cost. Half of the respondents provided higher commission to the intermediaries in the research area.

Table 7.2 Marketing constraints of chilli

SI. No	Particulars	Percentage
1.	High commission charges	50.00
2.	Lack of finance	85.00
3.	Lack of market information	95.00
4.	High cost of transport	55.00
5.	Irregular payment by intermediaries	61.00

Source: Field survey, 2020

CHAPTER VIII

SUMMARY, CONCLUSION AND RECOMMENDATION

8.1 Summary

Chilli output in Bangladesh is rising daily. Our country's soil and climate are ideal for chili growing. According to the study, the majority of chilli growers only completed primary education; therefore, chilli growers must be educated about the importance of using treated seeds, maintaining proper spacing, and irrigating the crop at recommended intervals. They mostly lack finance and storage facilities.

Additionally, this data demonstrates that chilli cultivation was lucrative in the Bogura area. Chilli production's total variable cost, fixed cost, and net return were BDT 103372, BDT 23668.6, and BDT 125307 per hectare, respectively. Additionally, the Benefit Cost Ratio (BCR) was determined to be 1.98, indicating that a BDT investment in chilli production generates BDT 1.98. Multiple determinations coefficient and modified R2 values for chilli production were determined to be 0.797 and 0.772, respectively.

The functional analysis reveals that, of the ten explanatory variables, cost of irrigation, manure, DAP, and MoP all contributed significantly to the level of profit earned from chilli cultivation in the study area. The p values for irrigation and manure were determined to be significant at the 10% level of significance. Additionally, the p value for the cost of DAP and MoP is extremely significant, with a level of significance of 1%. On the other hand, there was no statistically significant difference in the cost of land preparation, seed, urea, TSP, pesticides, hired labor, and family labor.

The study identified a variety of chilli production and marketing constraints. Production constraints included an insufficient extension service, a high cost of irrigation water, a high cost of fertilizer, a high cost of high-quality seed, and a lack of credit, while marketing constraints included high commission fees, a lack of finance, a lack of market information, and a high cost of transport.

8.2 Conclusion

The research analyzes the financial profitability of green chilli growing by analyzing the elements that determine its profitability. The research's primary result is that green chilli farming is lucrative in the study region, with a net return of Tk. 125307 per hectare. Costs associated with irrigation, manure, DAP, and MoP all contributed significantly to the level of profit earned from chilli cultivation in the study area. Among them, the cost of irrigation had a significant positive effect. While the farmers prosper, they have encountered certain obstacles. The research highlighted inadequate extension services, high fertilizer prices, and a lack of credit facilities as significant production restrictions, whereas inadequate market intelligence and a lack of funding were recognized as significant marketing constraints. To address these issues, the government should strengthen its extension services, educating farmers about the most efficient use of resources such as fertilizer and water. The government should create farmer field schools to educate farmers about contemporary agricultural methods, and monitoring teams should inspect the quality of agricultural inputs sold in the retail market in order to boost output and profitability for chilli producers in the study region.

8.3 Recommendation

Due to Bangladesh's land scarcity, raising chilli output via increased cultivation area is difficult. However, by enhancing current production technology, providing government incentives, monitoring markets, and using inputs wisely, chilli output may be increased. Following an analysis of the present study's findings, the following suggestions are madeLoan allocation to agriculture should be enhanced, and the government should assist financial institutions in developing agricultural credit programs for the study area's chilli producers to assure credit availability.

- To alleviate many of the respondents' marketing restrictions, technical training in high yielding chilli growing methods, processing, and marketing should be implemented. The government might take measures to create chilli storage facilities in the research area. Additionally, the government might aid in the formation of cooperatives to offer short-term storage and marketing assistance. Roads and communication infrastructure must be modernized to allow for rapid and easy movement of forms of transportation. The market regulator should take

the initiative and take appropriate action against the market's most powerful traders.

- As a consequence of the finding that rising irrigation costs may assist enhance chilli profitability, the government should place a greater emphasis on subsidized irrigation infrastructure to provide enough irrigation to the fields of chilli producers in the research region.

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Appendices

Appendix A.Interview schedule

Village..... **Upazilla**.....

A. Socio-economic characteristics

1. **Name**:
2. **Age**: a) Below 20 years b) Between 20-35 years c) Between 36-50 years d) Above 50 years
3. **Marital status**: a) Single b) Married c) Divorcee
4. **Education**: a) Illiterate b) Illiterate but can sign c) Primary d) Secondary e) Diploma/Technical f) Graduation g) Post graduation h) Others
5. **Type of family**: a) Nuclear b) Joint
6. **Size of land holdings**: a)Below 1 acre b) 1-3 acres c) 3.01-5 acres d) Above 5 acres

7. Annual income: a) Below 1 lakh b) Between 1-3 lakh c) Between 3-5 lakh d) Above 5 lakh

8.Annual savings: a) Below 20000 taka b) Between 20000-35000 taka c) Between 35001-50000 taka d) Above 50000

9.How many years have you been engaged in farming? a) 1-2 years b) 3-4 years c) 5-6 Years d) 7-8 years e) 9-10 f) Above 10 years

10.Off-farm employment: a) Yes b) No

11.Labor use: a) Hired b) Owned c) Both hired and owned

12.How do you control pests and diseases?

a) Biological and organic control method b) Chemical pesticides
b) Integrated Pest Management (IPM) d) Chemical pesticides and IPM

13.Do you belong to any chilli related co-operative/association? a) Yes b) No

14.Have you got any training in the cultivation of chillies? ? a) Yes b) No

15. **If yes, Received training from**: a) Agricultural institution b)NGO c) Agricultural Extension Officer d) Others

16. **Do you have a storage place for your crops**? a) Yes b) No

B. Information on inputs

17.Planting time: Month ……

Week……

18.Variety Name:

19.Soil Type:

20.Source of Seed

Source	Kg	BDT/Kg
a) Home		
b) Purchase		

C. Cost of cultivation

21. Human Labor cost (Per unit area)

Operations	Human labor (Hrs./Days)		Price/wage
	Family	Hired	
a. Land preparation			
b. Planting			
c. Fertilizer application			
d. Intercultural operation			
e. Insecticide application			
f. Harvesting			
g. Others			

22. Material cost (Per unit area)

Particulars	Quantity/Times	Rate
a. Seed		
b. Irrigation		
c. Manure		
d. Urea		
e. TSP		
f. DAP		
g. MoP		
h. Bio-fertilizers		
i. Insecticide & Pesticides		
j. Others		

23. Other cost:

D. Production in survey area

Items		Hectare	Kg	BDT
Area of land used to cultivate				
Total production	Main product			
	By-product			
Sales price /kg				

E. Constraints of chilli production

1.
2.
3.

4. Marketing Constraints of chilli production

1.
2.
3.

I appreciate your assistance tremendously.

Name of the enumerator:

Signature:

Date: