PROFITABILITY ANALYSIS AND DIFFERENT ASPECTS OF JUTE CULTIVATORS IN JAMALPUR DISTRICT

BY

ASHFIA NISHA BRISTY

DEPARTMENT OF AGRICULTURAL STATISTICS

SHER-E-BANGLA AGRICULTURAL UNIVERSITY

DHAKA -1207

June, 2020

PROFITABILITY ANALYSIS AND DIFFERENT ASPECTS OF JUTE CULTIVATORS IN JAMALPUR DISTRICT

BY

ASHFIA NISHA BRISTY

Reg. No. 12-05208

A thesis
Submitted to Department of Agricultural Statistics,
Sher-e-Bangla Agricultural University, Dhaka-1207
In partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE
IN
AGRICULTURAL STATISTICS
SEMESTER: JANUARY-JUNE, 2019

APPROVED BY:

Supervisor
Professor Md. Abdul Latif
Department of Agricultural Statistics
Sher-e-Bangla Agricultural University
Sher-e-Bangla Nagar, Dhaka-1207

Co-Supervisor
Professor Md. Zulfikar Ahmed Reza
Department of Agricultural Statistics
Sher-e-Bangla Agricultural University
Sher-e-Bangla Nagar, Dhaka-1207

Professor Md. Zulfikar Ahmed Reza
Chairman
Examination Committee
Department of Agricultural Statistics
Sher-e-Bangla Agricultural University
Sher-e-Bangla Nagar, Dhaka-1207

Department of Agricultural Statistics

Sher-e-Bangla Agricultural University
Sher-e-Bangla Nagar, Dhaka-1207

CERTIFICATE

*This is to certify that the thesis entitled "**Profitability Analysis And Different Aspects of Jute Cultivators in Jamalpur District**" submitted to the Faculty of Agricultural Statistics, Sher-e-Bangla Agricultural University, Dhaka-1207, in partial fulfillment of the requirements for the degree of **Master of Science** in **Agricultural Statistics**, embodies the result of a piece of bona fide research work carried out by **Ashfia Nisha Bristy**, Registration No. **12-05208** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

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

Dated: June, 2020

Dhaka, Bangladesh

Supervisor

Professor Md. Abdul Latif

Department of Agricultural Statistics

Sher-e-Bangla Agricultural University

Sher-e-Bangla Nagar, Dhaka-1207

Dedicated to

My

Beloved Parents who aid the

foundation of my success

ABSTRACT

Jute Known as the 'Golden Fiber', was one of the major cash crops of Bangladesh. The study aims to assess profitability and technical efficiency of Jute. Hundred cultivars of Jute from three upazila namely Islampur, Jamalpur sadar and Melandaha under Jamalpur district were selected for study purpose. A structured questionnaire was constructed for data collection. The results are as descriptive statistics and interpreted based on farmer feedbacks. Findings include that total cost Tk. 62378.51 per hectare, the gross return, gross margin and net return were found to be Tk. 92625, Tk. 50636.00 and Tk. 30246.50 respectively per hectare. Benefit Cost Ratio (BCR) was found to be 1.48 which implies that one-taka investment in Jute production generated Tk. 1.48 in our study. The regression coefficients of Seed cost (X_2) and Irrigation cost (X_4) and Insecticide (X_5) were negative but the coefficient of Human labor (X_1), Total fertilizer cost (X_3), Insecticide cost (X_4) was found negative. In the technical inefficiency effect model experience, training, jute retting technology and Farm size have expected (negative) coefficients. The coefficients of farmer's age and education is positive meaning that these factors have no impact on the technical inefficiency. That is, these factors do not reduce or increase technical inefficiency of producing Jute. Average estimated technical efficiencies for Jute are 92 percent which indicate that Jute production could be increased by 08 per cent with the same level of inputs without incurring any further cost. Increase of only managerial skills result in a substantial increase of output for Jute. Farmers faced a lot of problems in producing Jute. The problems were social and cultural, financial and technical. Lack of quality seed was one of the most important limitations of producing Jute in the study area. Lack of operating capital, high price of quality seed, high cost of irrigation water, shortage of human labor and lack of quality tillage were the major problems faced by farmers. These are the major constraints for the producers of Jute in the study area. Public and private initiatives should be taken to reduce or eliminate these problems for the sake of better production of Jute.

ACKNOWLEDGEMENT

With a great pleasure, I express my deepest sense of respect, and heartiest gratitude to my honorable teacher and supervisor, ***Professor Md. Abdul Latif****, Department of Agricultural Statistics, Sher-e-Bangla Agricultural University, Dhaka for his efficient and scholastic guidance, constructive criticism, valuable suggestions and immense help to carry out the research work toward successful completion and preparation of the thesis by necessary correction through reviewing the text.*

I am pleased to avail myself of the opportunity to express my profound appreciation and thanks to my honorable Co-supervisor, ***Professor Md. Zulfikar Ahmed Reza****, Chairman, Department of Agricultural Statistics, Sher-e-Bangla Agricultural University, Dhaka for his generous guidance, broad view of discussion and stimulating assistance during the period of research work.*

I express my heartfelt thanks to all the teachers of the Department of Agricultural Statistics, SAU, for their valuable teaching, suggestions and encouragement during the period of the study.

I also express my heartfelt thanks to UAO, especially SAAO of the study area.

I would like to extend cordial thanks to my friends specially Rabiul Islam, Nishat Tasnim, Md. Al Imran, Ruhul Amin and Sharanon Chakma, MS Student for their kind co-operation, valuable advice during my study. Diction is not enough to express my profound gratitude and deepest appreciation to my father and mother who sacrificed their happiness during the entire period of study and brothers, sister for their never-ending prayer, encouragement, sacrifice and dedicated efforts to educate me to this level.

Last but not the least, farmers of the study area of Jamalpur district, deserves special appreciation for their patience and co-operation during the collection of data.

The Author

CONTENTS

CONTENTS

CONTENTS

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

BRRI	: Bangladesh Rice Research Institute
BBS	: Bangladesh Bureau of Statistic
BCR	: Benefit Cost Ratio
BDT	: Bangladeshi Taka
BER	: Bangladesh Economic Review
DAE	: Department of Agricultural Extension
et al.	: and others
GR	: Gross Return
gm	: Gram
ha	: 100 Boro
HIES	: Household Income and Expenditure Survey
HYV	: High Yielding Variety
IOC	: Interest on Operating Capital
kg	: Kilogram
MoP	: Muriate of Potash
mt	: Metric Ton
NGO	: Non-Government Organization
SRC	: Spices Research Center
t	: Ton
TC	: Total Cost
TFC	: Total Fixed Cost
Tk.	: Taka
TSP	: Triple Super Phosphate
TVC	: Total Variable Cost
US	: United States
USDA	: United States Department of Agriculture
$	: Dollar

CHAPTER-I

INTRODUCTION

1.1 General Background

Jute dicotyledonous fiber-yielding plant of the genus *Corchorus*, order Tiliaceae. Jute was once known as the golden fibre of Bangladesh, since it was the most important cash crop for the country. Jute fibre is produced mainly from two commercially important species, namely White Jute (*Corchours capsularis*), and Tossa Jute (*Corchorus olitorius*). The center of origin of white jute is said to be Indo-Burma including South China, and that of tossa Africa. The word jute is probably coined from the word jhuta or jota, an Orrisan word. However, the use of jutta potta cloth was mentioned both in the Bible and Monushanghita-Mahabharat. This indicates the ancient uses of jute materials by the people of these areas. There is evidence of the trade of jute cloth in the 16th century, mentions sackcloth originating from Bengal. Jute grows under wide variation of climatic conditions and stress of tropic and subtropics.

In Bangladesh, the service sector accounts for 52.85% of GDP, the industrial sector 29.65% and agriculture 12.68% Bangladesh is a major agricultural producer, particularly in the global cultivation of rice (4th), fisheries (5th), jute (2nd), tea (10th) and tropical fruits (5th) . That is, Bangladesh is currently the second largest producer of jute fiber, now over taken by India. After the country's independence, more than 80% of total foreign currency in Bangladesh was earned from jute and jute related goods. But after 80's, the earning rate of jute related goods. But after 80's, the earning rate of foreign currency from jute industry has gradually declined. The sector provides about 10% of the total employment in the economy and 12% of GDP. About 90% of jute products produced in Bangladesh is exported (Rahman, 2001). Foreign exchange earnings of Bangladesh come mostly from jute. Beside, jute is a good source of revenue for the governments in the form of taxes, levies, sales tax, octroi and custom duties on jute goods (Sikdar and Banerjee, 1990).

Bangladesh is famous for jute cultivation and earned a big amount of foreign currency by exporting jute and jute products to different countries. At one stage, Jute was only the vital sector in Bangladesh from which major portion of foreign currency is to come and help

Bangladesh's economy and a large number of manpower were employed here. Bangladesh was recognized as one of the best jute producing and exporting countries of the world (Islam *et al*., 2013). Over the last 20-25 years it did slide down to the seventh position. Now it regained to come to the forth position (Abdullah, 2013). Jute is called the Golden Fiber of Bangladesh. The Jute Area, popular for highest quality of jute fiber is located in Bangladesh. Therefore, Bangladesh is able to supply the highest quality of jute fiber in the world. However, Bangladesh falls behind its other competitors in applying recent technological advancements. In terms of world export of jute fiber, Bangladesh's share is more than 70%, which makes Bangladesh the largest exporter of jute fiber in the world (http://en.wikipedia.org/wiki/Jute_cultivation). It is one of the cheapest and the strongest of all natural fibers and considered as fiber of the future. Jute is second only to cotton in world's cultivation of textile fibers. India, Bangladesh, China and Thailand are the leading producers of Jute. It is also produced in southwest Asia and Brazil. India is the largest producer of jute goods in the world, while Bangladesh is the largest cultivator of raw jute.

1.2 Present Status of Jute Cultivation in the World

The jute fiber comes from the stem and ribbon (outer skin) of the jute plant. The fibers are first extracted by retting. The retting process consists of bundling jute stems together and immersing them in slow running water. There are two types of retting: stem and ribbon. After the retting process, stripping begins; women and children usually do this job. In the stripping process, non-fibrous matter is scraped off, then the workers dig in and grab the fibers from within the jute stem. Jute is a rain-fed crop with little need for fertilizer or pesticides, in contrast to cotton's heavy requirements. Cultivation is concentrated mostly in Bangladesh, as well as India's states of Assam, Bihar, and West Bengal. India is the world's largest producer of jute, but imported approximately 162,000 tonnes of raw fiber and 175,000 tonnes of jute products in 2011.

India, Pakistan, and China import significant quantities of jute fiber and products from Bangladesh, as do the United Kingdom, Japan, United States, France, Spain, Ivory Coast, Germany and Brazil.

Table 1.1: Top Jute Producing Countries in the World

Rank	Country	Annual Jute Cultivation (Tons)
1	India	1,968,000
2	Bangladesh	1,349,000
3	People's Republic of China	29,628
4	Uzbekistan	20,000
5	Nepal	14,890
6	South Sudan	3,300
7	Zimbabwe	2,519
8	Egypt	2,508
9	Brazil	1,172
10	Vietnam	970

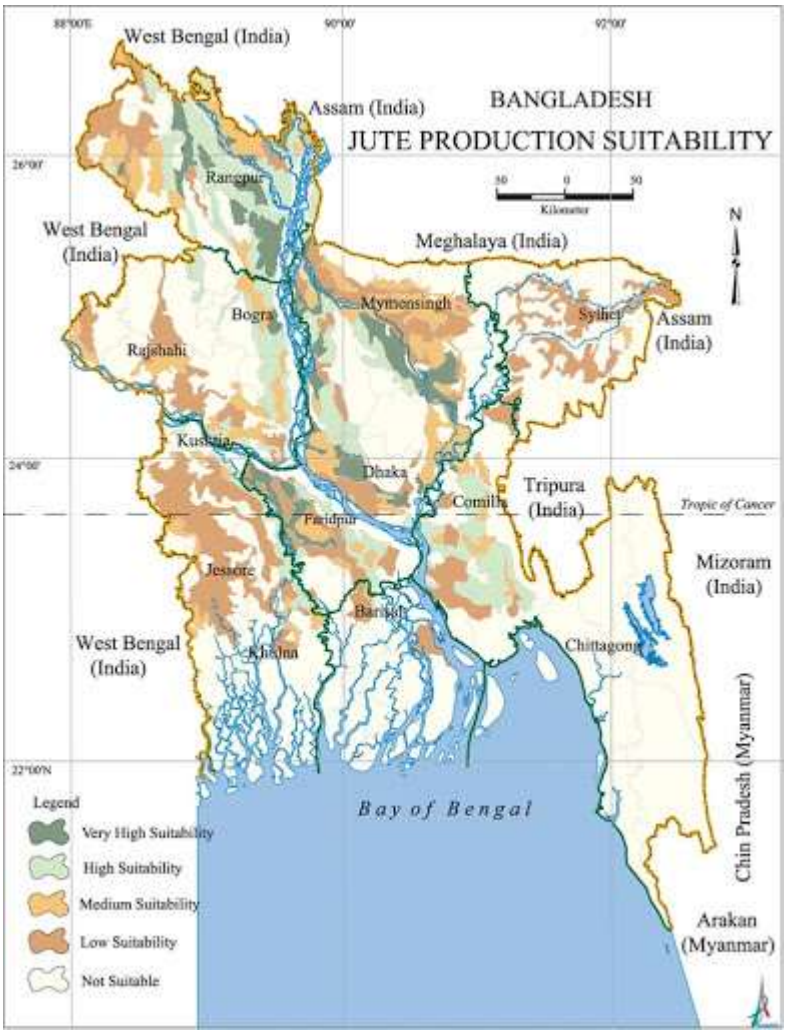
Source: worldatlas.com

Jute is a long natural fiber that is produced from plants of the Corchorus genus and is made of the plant's cellulose and lignin. The fiber has numerous uses including the manufacturing of bio-degradable packing material, such as gunny bags. Jute is recognized as the second most important vegetable fiber in the world, behind only cotton, in terms of global consumption and cultivation. India and Bangladesh produce the greatest amounts of jute in the world, and global cultivation is estimated at more than 3.3 million tonnes each year.

1.3 Jute Cultivation in Bangladesh

Bangladesh is the second largest producer of jute in the world, with annual cultivation estimated at 1.349 million tonnes. The country was formerly the world's top jute producer, but a lack of technological advancements in Bangladesh's jute cultivation

means that cultivation was stagnant, as was later surpassed by India as the global leader in jute cultivation. Nonetheless, Bangladesh remains the world's largest exporter of jute fiber, accounting for as much as 70% of global jute exports. The jute fiber produced in Bangladesh is often considered the best quality in the world.



The yearly generation of jute in Bangladesh is assessed to be 80.20 lakh tons which is comparable to 42% of the worldwide cultivation (BBS, 2017). Jute cultivation has increased on average by 8.87% every year from 2015 to 2017 (DAM, 2017). Owing to reasonable market prices, favorable weather conditions, and availability of water, jute cultivation increased remarkably over the last few years. Jute has been produced in Bangladesh for domestic consumption for many centuries, but it was not until the establishment of the British East India Company that the crop became a key export commodity. Key jute producing regions in Bangladesh include Tangail, Dhaka, Jessore,

Jamalpur, Bogra, and Faridpur. The total area under jute cultivation in Bangladesh is about 559,838 hectares. The Bangladeshi Jute Research Institute is a state-owned institute which provides top-quality seeds to jute farmers across the country.

The livelihood of about 25 million people is dependent on jute - related activities in agriculture, domestic marketing, and manufacturing trade.

Table 1.2. Year wise area, cultivation and yield of jute in Bangladesh

Fiscal Year	Area (lakh hectares)	Cultivation (lakh tons)
2015-16	7.21	77.95
2016-17	7.38	82.47
2017-18	7.89	80.20

(Source: BBS, 2017)

1.4 Economic importance of jute in Bangladesh

Bangladeshi jute is popular around the world due to its excellent fiber quality. Bangladesh is the second largest jute producer in the world. The yearly cultivation of jute in Bangladesh is assessed to be 80.20 lakh tons which is comparable to 42% of the world wide cultivation (BBS, 2017). Bangladesh exports about 70% of their total harvested jute and this makes it one of the leading jute producing countries in the world (Hassan *et al.*, 2018). Dhaka controls over 62% of the global jute market and earns Tk. 2,012.5 crore by exporting jute products (Rahman, 2017). The total demand for jute products in the international market have been estimated at 7.50 lakh tons (Rahman, 2017). Bangladesh earned Tk. 2,939.5 crore by exporting raw jute and jute products in the fiscal year of 2017-18 (BBS, 2017). At present 160,000 people are directly employed in jute mills (Sarkar, 2018). The value addition of export is almost 100% and the farmers are beneficiary of export (Sarkar, 2018). Jute plant also improves soil condition as a result of its huge leaf fall and root multiplication in the field. Per ton jute fiber can bring $3,000-$10,000 to the economy of Bangladesh by enhancing the quality of jute items (Rahman, 2017).

Jute is a noteworthy money crop for more than three million little homestead family units, the biggest business, delivering around 33% of assembling yield, and the biggest agricultural export item in Bangladesh (Bepari, 2018). The livelihood of about 25 million people is dependent on jute related activities in agriculture, domestic marketing, manufacturing and trade (Nahar *et al.*, 2017). Jute is accounted for 4.9% to the gross domestic product (GDP) in FY 2017-18 (BBS, 2017).

It is one of only a handful couple of harvests which can be developed in the monsoon season, and can be pivoted with rice to reestablish the richness and structure. The leaves of jute plants enrich the fertility of the soil for sustained agriculture, and have good nutrition value as vegetables (Rab, 2017). Jute fiber is 100% bio-degradable and recyclable and along these lines naturally well disposed (Siddique, 2011).

1.5 Prospect of jute in Bangladesh

Jute is one of the major cash crops in Bangladesh (DAM, 2017). Bangladesh is under challenge from other producers such as India, China, Uzbekistan, and Nepal (Molla *et al.*, 2015). However, it is still the second largest producer of jute and jute goods with around 42% of the total world cultivation (BBS, 2017). Globally, people are becoming conscious about the consequences of using artificial and synthetic products like polythene, poly-propylene etc. One of the environmental friendly ways to replace these artificial fibers is using jute products. Individuals worldwide are maintaining a strategic distance from hurtful polythene in their day by day lives while business visionaries in the nation are contributing on jute and jute products.

As a result, the demand for jute goods is increasing. Although jute is branded as the 'golden fiber', it was not documented as the agricultural product in the past (Rab, 2017). The present government has at this point announced jute and jute items as agrarian items with the goal that the maker could get government subsidy (Bepari *et al.*, 2018). Bangladesh government has already made jute sacks use mandatory for packing major items like rice, wheat, fertilizer, sugar (Bepari *et al.*, 2018). The world market for jute bags will reach $2.6 billion in 2022 and Bangladesh can use this opportunity (Bepari *et al.*, 2018).

The administration gave out endowment on broadening of jute merchandise. The development of "GENOME SEQUENCE" by Maksudul Alam has opened another gateway for jute cultivation (Hoque *et al.*, 2014). It is helping to invent new varieties of jute with better quality and cultivation. Bangladesh should go for more research on diversified products of jute with collaboration of private sector entrepreneurs. Furthermore, government of Bangladesh may also shut down the non-viable and sick jute mills in both government and private sector and encourage setting up new jute mill with advanced technology for diversified jute products.

1.6 Rationale / justification of the study

Jute plays an important role in the socio-economic and ecological settings in Bangladesh. The specialty of this natural fibre is its contribution to the environment. With the biodegradable nature, it is friend of soil and water. It absorbs atmospheric CO2 that is one major greenhouse gas and exhale O2 more than that which contributes in air purification. Jute helps to reduce deforestation because there are many products made from jute that can substitute the usage of woods. Jute is also used to make paper pulp and contributes in restoring forest and woods. Considering the impacts that it creates to the environment and recycling nature, jute is considered as 'sustainable'. However, along with these lots of environmental benefits, jute is contributing in the economy of Bangladesh since the birth of the country. It was number one export item which is replaced by the readymade garments industry at present.

Jute lost its past glory with the emergence of cheap synthetic fibre during 90s. There are some other administrative and maintenance problems arose along with this. However, still there is potential prospect to revive jute industry. Adaptation of sustainable development goals worldwide creates the responsibility to protect the environment and initiate the development in a sustainable way. There is more consciousness regarding exploitation of the earth, usage of fossil fuels, emitting greenhouse gases, usage of plastic and so on. People are depending more on the renewable resources and natural fibers. By this time, with the help of technology, jute gets new dimension. The application and usage of jute becomes extended with the diversified value-added products and applications.

The invention of bio degradable ‘sonali bag’ made from jute has the prospect to fight with environmentally harmful plastic bags. Blending jute with cotton and wool has a great prospect in the textile sector.

Similarly, these types of new applications have great future in the automobile, geoengineering, building infrastructure sectors. Another important part is its contribution in society. Jute leaves are used as vegetables and the watery field of jute helps to grow fishes. Therefore, jute contributes in dietary sources to the people of society. Also, the increasing employment opportunities make the people more stable, conscious and independent while they can contribute to the society in a large scale. Therefore, considering environmental, economic and social contribution of jute, it can be said jute has a great contribution in achieving sustainable development.

1.7 Objectives of the study

The specific objectives of this study are-

I. To document the socio-economic characteristics of farmers growing jute;

II. To estimate the major factors affecting profitability of jute cultivation;

III. To identify the major problems and constraints faced by the farmers;

1.8 Organization of the Study

The study consists of 9 chapters. Chapter 1 describes introduction of the study. Relevant review of literature, methodology, description of the study area, socioeconomic characteristics of the sample farmers, results and discussion, major factors affecting to the cultivation processes of Jute, problems of Jute growers and summary, conclusion and recommendations are presented in Chapter 2, Chapter 3, Chapter 4, Chapter 5, Chapter 6, Chapter 7, Chapter 8 and Chapter 9, respectively.

CHAPTER-2
REVIEW OF LITERATURE

This chapter aims at represent some review of the past research works that are related to the present study. Only a few studies have so far conducted related to technical efficiency and profitability of Jute in Bangladesh. Again, some of these studies may not entirely relevant to the present study, but their findings, methodology of analysis and suggestions have a great influence on the present study. Review of some research works relevant to the present studies, which have been conducted in the recent past, are discussed below.

Hasan (2015) studied on comparative economic analysis of aus rice and jute cultivation in Narayangonj district with a sample of 60 farmers by considering Cobb-Douglas cultivation function and found that jute had higher return than aus rice.

Sheheli and Roy (2014) studied on profitability, constraints and opportunities of raw jute cultivation in Kishorgonj district with a sample of 100 farmers using Cobb-Douglas cultivation function and found that jute cultivation was profitable and medium farmers had the highest profit than small and large farmers.

Sinha *et al.* (2014) studied on crop diversification for profitability in jute and allied fiber crops in Jessore district by considering Cobb-Douglas cultivation function with a sample of 80 jute farmers and found that high transportation cost, high labor cost, lack of storage facilities, natural disaster, high input cost and attack of pests were the major problems. These above literatures show that the most common problems of jute cultivation were high input cost, high labor cost, high transportation cost and lack of storage facilities.

Khan (2013) studied on a comparative assessment of financial and economic profitability of aus rice and jute in Bangladesh with a sample of 90 farmers using Policy Analysis Matrix and found that jute cultivation was more profitable than aus rice.

Afroz and Islam (2012) studied on economics of aus rice and jute cultivation in Narsingdi district with a sample of 70 farmers by considering Cobb-Douglas cultivation function and found that jute had three times more net return than aus rice and BCR of jute was 30% higher than Aus rice.

Forman (2011) studied on comparative economic analysis of Aus rice and jute cultivation in Mymensingh district with a sample of 80 farmers by using Cobb-Douglas cultivation function and found that jute was more profitable than aus rice as jute had higher net return than Aus rice.

Kundu (2011) studied on profitability of jute cultivation and value addition activities of jute products in Madaripur district with a sample of 73 jute farmers using Cobb-Douglas cultivation function and found that jute cultivation was profitable and medium farmers had the highest profit.

Siddique (2011) studied on profitability analysis of jute growing farmers in Mymensingh district with a sample of 60 farmers considering Cobb-Douglas cultivation function and found that jute cultivation had higher gross return than total cost and medium farmers had the highest profit than small and large farmers.

Islam *et al.* (2009) undertook a study on genetic diversity and relationships of different jute species in Jamalpur with a sample of 130 jute farmers by considering Cobb-Douglas cultivation function and found that human labor, fertilizer, insecticides and power tiller showed significant impact on jute cultivation.

Rahman and Bala (2009) studied on ecological and environmental sustainability of jute cultivation system in Bangladesh by using life cycle assessment method with a sample of 130 jute farmers and found that high input cost, lack of storage facilities, high transportation cost, high labor cost were the major obstacles of jute cultivation.

Yasmin (2009) studied on profitability and value addition activities of jute cultivation in Jessore district with a sample of 60 jute farmers by considering Cobb-Douglas cultivation function and found that cost of seed, fertilizer, human labor and power tiller showed significant effect on profitability of jute.

Dev and Bairagi (2008) studied on profitability and marketing of jute in 12 jute producing districts with a sample of 360 jute farmers by considering Cobb-Douglas cultivation function and found that cost of labor, pesticide, power tiller and fertilizer showed significant impact on profitability of jute cultivation.

CHAPTER 3
METHODOLOGY

3.1. Introduction

Farm management research depends on the proper methodology of the study. Proper methodology is a prerequisite of a good research. The design of any survey is predominantly determined by the nature, aims, and objectives of the study. It is also depends on the availability of necessary resources, materials and time. There are several methods of collecting data for farm management research. A farm business study usually involves collection of information from individual farmers; collection of data for farm business analysis involves judgment of the analyst in the selection of data collection methods within the limits imposed by the resources available for the work (Dillon and Hardaker 1993). In this study, “survey method" was employed mainly due to two reasons:

i. Survey enables quick investigations of large number of cases; and
ii. Its results have wider applicability.

The major disadvantage of the survey method is that the investigator has to rely upon the memory of the farmers. To overcome this problem, repeated visits were made to collect data in the study area and in the case of any omission or contradiction the farmers were revisited to obtain the `missing and/or correct information. The design of the survey for the present study involved the following steps.

3.2. Selection of the Study Area

Selection of the study area is an important step for farm management study. The selection of an area fulfilled the particular purpose which was set for the study and also the possible cooperation from the farmer. Although jute is grown all over Bangladesh, the district Jamalpur is one of the important districts where it is grown quite extensively. So, on the basis of higher concentration of Jute cultivation, 3 Sub-District namely Islampur, Jamalpur sadar and Melandaha under of Jamalpur district were purposively selected for the study.

The main reasons in selecting the study area were as follows:

a) Availability of a large number of Jute growers in the study area;
b) These villages had some identical physical characteristics like topography, soil and climatic conditions for producing jute;
c) No study of this type was conducted previously in these areas;
d) Easy accessibility and good communication facilities in these villages; and
e) Co-operation from the respondents was expected to be high so that the reliable data would be obtained.

3.3. 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 hundred farmers were randomly 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.

3.4. Preparation of the Survey Schedule

A draft questionnaire was prepared for collecting information from the sample farmers. Keeping the objectives of the study in mind, the questionnaire was pre-tested by interviewing some farmers who cultivated Jute and necessary modifications, additions and alternations were made and then draft questionnaire was finalized. The final questionnaire contained three categories of information. The purpose of the first category was to obtain information about the socioeconomic conditions of the selected farmers. The second category contained information related to costs and returns. The third category of information was related to constraints and problems faced by the farmers in producing jute.

3.5. Period of the Study

Data were collected during the period from May to June in 2020. Data relating to inputs and outputs were collected by making time to time visit in the study area during this period.

3.6. Data Collection Methods

For the present study, data were collected from the Jute growing farmers through field survey. The researcher himself collected the relevant data from the selected Jute growers. Before interviewing, the selected farmers were contacted so that they could be interviewed according to their convenience of time. At the time of interview, the researcher asked questions systematically and explained the aims and objectives of the study whenever it was felt necessary. It was explained to the farmers that the study was purely academic. Farmers were also explained the usefulness of the study in their farm business context. Each time, when interview was over, the interview schedule was checked to be sure that information to each of the item was properly recorded. If there were such items which were overlooked or contradictory, they were corrected through a revisit. In addition to survey, observation method was also applied to collect information by the researcher.

3.7. Processing, Tabulation and Analysis of Data

The collected data were manually edited and coded. Then all the collected data were summarized and scrutinized carefully. Moreover, data entry was made in computer and analyses were done using the concerned software Microsoft Excel and STATA. It may be noted here that information was collected initially in local units. After necessary checking it was converted into standard international units.

3.8. Analytical Techniques

Data were analyzed with a view to achieving the objectives of the study. Several analytical methods were employed in the present study. Tabular method was used for a substantial part of data analysis. This technique is intensively used for its inherent quality of purporting the true picture of the farm economy in the simplest form. Relatively simple statistical techniques such as percentage and arithmetic mean or average were employed to analyze data and to describe socioeconomic characteristics

of jute growers, input use, costs and returns of jute cultivation and to calculate undiscounted benefit cost ratio (BCR). In order to estimate the level of technical efficiency in a manner consistent with the theory of cultivation function, Cobb-Douglas type stochastic frontier cultivation function will be used in the present study.

3.8.1. Economic Profitability Analysis

The net economic returns of jute were estimated using the set of financial prices. The financial prices were market prices actually received by farmers for outputs and paid for purchased inputs during the period under consideration in this study. The cost items identified for the study were as follows-

- Land preparation
- Human labour
- Seedlings
- Urea
- TSP
- Mop
- Insecticide
- Irrigation
- Interest on operating capital
- Land use
- Retting

The returns from the crops were estimated based on the value of main products. In this study variable cost, fixed cost and total cost had been described. Total variable cost (TVC) included land preparation, human labour, seedlings, organic manure, urea, TSP, MoP, insecticides, irrigation and interest on operating capital. Fixed cost (FC) included only rental value of land. Total cost (TC) included total variable cost and fixed cost.

3.8.1.1 Cost of Land Preparation

Land preparation considered one of the most important components in the cultivation process. Land preparation for jute cultivation included ploughing, laddering and other activities needed to make the soil suitable for planting seedling. It was revealed that the number of ploughing varied from farm to farm and location to location.

3.8.1.2 Cost of Human Labour

Human labour cost was considered one of the major cost components in the cultivation process. It is generally required for different operations such as land preparation, sowing and transplanting, weeding, fertilizer and insecticides application, irrigation, harvesting and carrying, threshing, cleaning, drying, storing etc. In order to calculate human labour cost, the recorded man-days per hectare were multiplied by the wage per man-day for a particular operation.

3.8.1.3 Cost of Seed

Cost of seed varied widely depending on its quality and availability. Market prices of seeds of respected jute were used to compute cost of seed. The total quantity of seed needed per hectare was multiplied by the market price of seed to calculate the cost of seeds for the study areas.

3.8.1.4 Cost of Urea

Urea was one of the important fertilizers in jute cultivation. The cost of urea was computed on the basis of market price. In order to calculate cost of urea the recorded unit of urea per hectare were multiplied by the market price of urea.

3.8.1.5 Cost of TSP

The cost of TSP was also computed on the basis of market price. In order to calculate cost of TSP the recorded unit of TSP per hectare were multiplied by the market price of TSP.

3.8.1.6 Cost of MoP

Among the three main fertilizers used in jute cultivation, MoP was one of them. To calculate the cost of MoP per hectare, the market price of MoP was multiplied by per unit of that input per hectare for a particular operation.

3.8.1.7 Cost of Insecticides

Farmers used different kinds of insecticides for 5-7 times to keep their crop free from pests and diseases. Cost of insecticides was calculated based on the market price of the insecticides which was used in the study areas per hectare.

3.8.1.8 Cost of Irrigation

Water management helps to increase jute cultivation. Cost of irrigation varies from farmers to farmers. It was calculated based on how many times irrigation needed per hectare and how was its 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 cultivation period; hence, at the rate of 9 percent per annum interest on operating capital for four months was computed for jute. 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 use cost was calculated on the basis of opportunity cost of the use of land per hectare for the cropping period of four months. So, cash rental value of land has been used for cost of land use.

3.8.1.11 Jute retting Costs

Retting is a process in which the tied bundles of jute stalks are taken to the tank by which fibers get loosened and separated from the woody stalk. The bundles are steeped in water at least 60 cm to 100 cm depth. The retting process is completed in 8 to 30 days, when the barks separate out easily from the stick or wood and the fibers are ready for extraction. A development in recent years is adoption of ribbon retting technology in jute growing trade of the country.

3.8.2 Calculation of Returns

Gross Return

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

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

Gross Margin

Gross margin is defined as the difference between gross return and variable costs. Generally, farmers want maximum return over variable cost of cultivation. The argument for using the gross margin analysis is that the farmers are interested to get returns over variable cost. Gross margin was calculated on TVC basis. 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 calculated by deducting the total cultivation cost from the total return or gross return. That is,

Net return = Total return – Total cultivation cost.

Undiscounted Benefit Cost Ratio (BCR)

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

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

3.8.2 Technical Efficiency Analysis

Technical efficiency refers to the ability of a firm to produce the maximum possible output from a given set of inputs and given technology. A technically efficient farm will operate on its frontier cultivation function. Given the stated relationship the firm is technically efficient if it produces on its outer-bound cultivation function to obtain the maximum possible output which is feasible under the current technology. Putting it differently a firm is considered to be technically efficient if it operates at a point on an isoquant rather than interior to the isoquant. The homogeneity of inputs is a vital factor for achieving technically efficient output. No one would dispute that the output produced from given inputs is a genuine measure of efficiency, but there is room for doubt whether, in a particular application, the inputs of a given firm are really the same as those represented by the corresponding point on the efficient isoquant.

But it is important to note that mere heterogeneity of factors will not matter, as long as it is spread evenly over firms, it is when there are differences between firms in the average quality (or more strictly, in the distribution of qualities) of a factor, that a firm's technical efficiency will reflect the quality of its inputs as well as the efficiency of its management.

3.8.2.1 The Stochastic Frontier Models

The most widely discussed, theoretically reasonable and empirically competent method of measuring efficiency is the stochastic frontier model. It is an improvement on the traditional average cultivation function and on all types of deterministic frontiers in the sense that it introduces in addition to one-sided error component a symmetric error term to the model. This permits random variation of the frontier across farms, and captures the effects of measurement error, other statistical noise arid random shocks outside the firm's control. A one-sided component captures the effects of inefficiency relative to the stochastic frontier.

The stochastic frontier model is also called the 'composed error' model introduced by Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977). It was later extended and elaborated by Schmidt and Lovell (1979; 1980) and Jondrow *et al*. (1982). The notion of a deterministic frontier shared by all farms ignores the very real possibility that a farm's performance may be affected by factors entirely outside its control (such as poor machine performance, bad weather, input supply breakdowns, and so on), as well as by factors under its control (inefficiency). But stochastic frontiers consider all the factors while estimating the model and accordingly it separates firm- specific efficiency and random error effect. Thus the efficiency measurements as well as the estimated parameters are unbiased.

3.8.2.2 The Stochastic Frontier with Cobb-Douglas Cultivation Function

The Cobb-Douglas cultivation function is probably the most widely used form for fitting agricultural cultivation data, because of its mathematical properties, ease of interpretation and computational simplicity (Heady and Dillion, 1969; Fuss and Mcfadden, 1978). The Cobb-Douglas function has convex isoquants, but as it has unitary elasticity of substitution; it does not allow for technically independent or competitive factors, nor does it allow for Stages I and III along with Stage II. That is, MPP and APP are monotonically decreasing functions for all X- the entire factor-factor space is Stage II-given $0 < b < 1$, which is the usual case. However, the Cobb-Douglas may be good approximation for the cultivation processes for which factors are imperfect substitutes over the entire range of input values. Also, the Cobb-Douglas is relatively easy to estimate because in logarithmic form it is linear in parameters; it is parsimonious in parameters (Beattie and Taylor, 1985).

A stochastic Cobb-Douglas cultivation frontier model may be written as

$$Y_i = f(X_i,\beta)\exp.(V_i-U_i) \qquad i = 1, 2, 3, \ldots\ldots.., N \qquad (3.1)$$

Where the stochastic cultivation frontier is $f(X_i,\beta)\exp.(V_i)$, V_i having some symmetric distribution to capture the random effects of measurement error and exogenous shocks which cause the placement of the deterministic kernel $f(X_i,\beta)$ to vary across firms. The technical inefficiency relative to the stochastic cultivation frontier is then captured by the one-sided error component $U_i \geq 0$.

The explicit form of the stochastic Cobb-Douglas production frontier is given by

$$Y_i = \alpha X_{1i}^{\beta 1}\, X_{2i}^{\beta 2}\, X_{3i}^{\beta 3}\, X_{4i}^{\beta 4}\, X_{5i}^{\beta 5}\, X_{6i}^{\beta 6}\, X_{7i}^{\beta 7} e^{ui}$$

Where Y is the frontier output, X is physical input, b the elasticity of Y with respect to X, a is intercept and $\mathcal{E} = V-U$ is a composed error term as defined earlier. For simplicity, we have ignored the subscript.

3.8.2.3 Specification of Production Model

We have specified the Cobb-Douglas Stochastic Frontier Production Function in order to estimate the level of technical efficiency. The functional form of stochastic frontier is as follows:

$$Y = \beta 0\ X1\beta 1\ X2\beta 2\ \ldots\ldots\ldots X7\beta 7\ eVi\text{-}Ui$$

The above function is linearized double-log form:

$$\ln Y = \ln \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + + \beta_7 \ln X_7 + + Vi\text{-}Ui$$

Where,

Y = Output (kg/ha)

X_1 = Human labour cost (Tk/ha)

X_2 = Urea (Kg/ha),

X_3= TSP (kg/ha)

X_4 = MOP (kg/ha)

X_5 = Gypsum (kg/ha)

X_6= Irrigation (kg/ha)

X_7 = Seed (kg/ha)

The model of the technical inefficiency effects in the stochastic production frontier equation is defined by

$$U_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 + W_i$$

Where,

Z1…….. Z6 are explanatory variables.

The equation can be written as:

$$Ui = \delta_0 + \delta_1 \text{ Farm Size} + \delta_2 \text{ Age} + \delta_3 \text{ Education} + \delta_4 \text{ Training} + \delta_5 \text{ Experience} + \delta_6 \text{ Retting Technology} + W_i$$

V is two-sided uniform random variable beyond the control of farmer having N (0, σ 2) distribution, U is one-sided technical inefficiency effect under the control of farmer having a positive half normal distribution {Ui~|N (0, σu2)|} and Wi is two-sided uniform random variable. W is unobservable random variable having a positive half normal distribution. The model was estimated simultaneously using STATA and MS excel.

CHAPTER 4
DESCRIPTION OF THE STUDY AREA

4.1 Introduction

This chapter presents a brief description of the study area. Knowledge of the study area is very essential to understand the location, physical features and topography, soil type, temperature, rainfall, agricultural and economic condition, population, education and other socioeconomic infrastructure available in the area. This chapter aims at present the above-mentioned characteristics of the study area.

4.2 Location

Jamalpur is a district in Mymenshing Division.It is situated on the northern part of Bangladesh. Jamalpur district was established in 1978. It is said that during the reign of Emperor Akbar, a Saint named Hazrat Shah Jamal (R.) came from Yemen to preach Islam with 200 followers and set up a hermitage at Singhajanee mauza located on the southern bank of Brahmaputra River. It is believed that the name of the district had been derived from the name of that Saint. Jamalpur is bounded on the north by Kurigram district and Meghalaya State of India, on the east by Sherpur and Mymensingh districts, on the south by Tangail district and on the west by Sirajganj, Bogra and Gaibandha districts. The total area of the district is 2115.16 sq.km. (816.66 sq.miles) of which 18.16 sq.km. is under forest. The district lies between 24°34´ and 25°26´ north latitudes and between 89°40´ and 90°12´ east longitudes.

4.3 Physical Features, Topography and Soil Type

Jute requires a hot and humid climate, the temperature fluctuation between 24^{o} C and 37^{o} C. However, the optimum being around 34^{o} C. There should not be constant rain or water logged conditions which are harmful for jute cultivation. In the seedling stage, water-logging is not advised. Alternate sunshine and rainy days are most helpful to jute growth.

The best soil recommended for the cultivation of jute is new grey alluvial soil of good depth, receiving silt from the annual floods. Jute is largely grown in sandy loams and clay loams. Varying clays are unsuitable for jute cultivation. You can note that the optimum pH range is around 6.4 for the cultivation of jute.

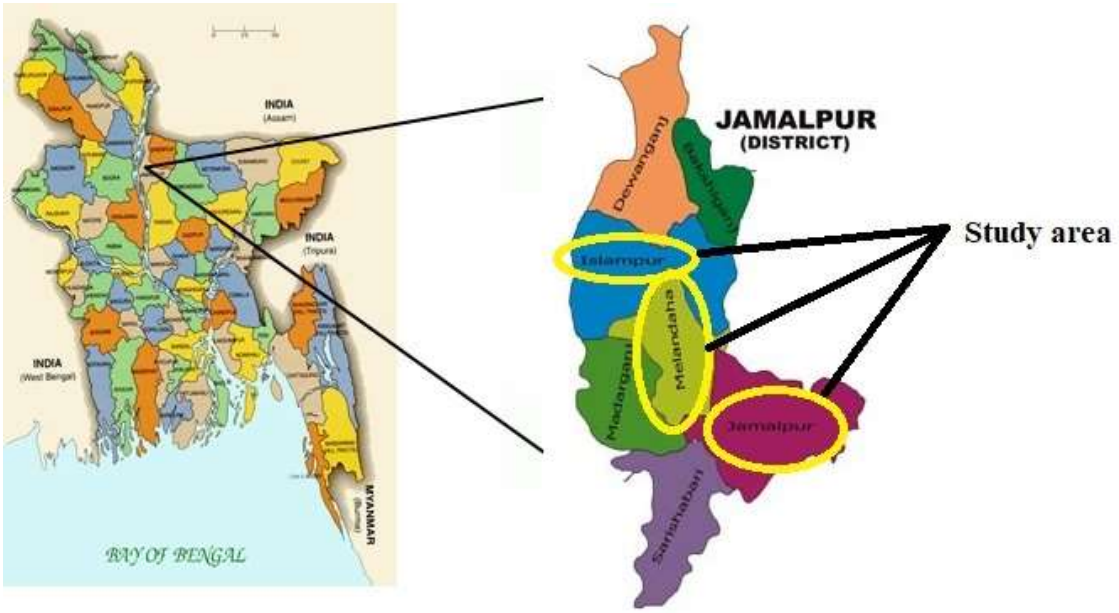


Figure 4.1: Map of Study Area

4.4 General Information of study area

Table 4.1: Broad classification of Study area (In sq. km.)

Upazila	Total area	Land area
Islampur	267.51	198.51
Jamalpur Sadar	353.31	331.09
Melandaha	258.32	255.63

Table 4.2: Number of household, population and density of study area

Upazila	House hold	Population (000)			Sex ratio (M/F)	Average size of household	Density per sq. km
		Male	Female	Total			
Islampur	74963	148	149	297	99	3.98	845
Jamalpur Sadar	152174	301	313	614	96	4.01	1209
Melandaha	79390	154	159	313	97	3.93	1212

Table 4.3: Population and literacy rate of study area

Upazila	Population (000)			Literacy rate (%)		
	2001	2011	2018	2001	2011	2018
Islampur	268	289	298	25.9	53.6	40.1
Jamalpur Sadar	502	569	615	37.6	49.7	57.0
Melandaha	262	292	313	27.4	36.6	45.7

Source: Population census 2011 and Economic census 2019

4.5 Climate

The annual average temperature of this district varies from maximum 33.3°C to minimum 12°C.Annual average rainfall is 2174 mm. Main River: The Jamuna, Brahmaputra, Jhenai, Banar, Jirjira, Chhatal are main rivers of this district.

Table 4.4: Temperature, rainfall, humidity of Jamalpur

Years	Temperature (centigrade		Rainfall (millimeter)	Humidity (%)
	Maximum	Minimum		
2016	34.2	12.5	2235	79.0
2016	33.0	13.2	1653	80.0
2017	32.4	11.7	1811	66.3
2018	22.2	10.8	2153	79.3

Source: Bangladesh Meteorological Department

4.6 Agriculture and Economic Condition

The economy of Jamalpur district is predominantly agricultural. Out of total 546,075 holdings of the district, 336,784 (61.67%) holdings are farms and remaining 38.33% are non-farms. Non-farm holdings largely depend on non-agricultural activities. Despite the growth of agriculture activities, the non-farm holdings play an important role in the economy of this district. Farm-holdings produce varieties of crops, namely local and HYV rice, wheat. Vegetables, spices, cash crops, pulses, oilseeds, maize and others. Various fruits like banana, jackfruits, guava, coconut, etc. are grown. Fishes of various species are abundant in the district. Varieties of fish are caught from local rivers, tributary channels and creeks and from paddy fields during rainy season. Popular fresh water fish species are ruhi, katla, mrigel, kalibous, airh, ghania, shoel, boal, gulsha, koy, shing, magur, etc. Crops, livestock, forestry and fishery are the main sources of household income.

The main agricultural crops of the district are rice, **jute** and sugarcane. Jute and sugarcane remain the main cash crops. Jamalpur is a market center for local rice, sugarcane, jute, tobacco and mustard. The town's main exports are jute, tobacco, mustard seed, peanut, leather, egg, pulse, betel leaf and handicrafts. Making nakshi kantha (embroidered quilts) is a traditional occupation. An economic zone is establishing in Jamalpur by BEZA. The objective of this project is to attract foreign and local investment to industrialize the country for export promotion and to meet the requirements of local areas that leads to employment generation and economic development of the country.

Main Crop: Paddy, jute, sugarcane, mustard seed, peanut, wheat, sweet potato, tobacco, betel leaf, chilly, pulse, vegetables, etc. are main fruits of this district.

Main Fruit: Jackfruit, banana, latkol, tetul, kodbel, bangi, etc. are main fruits of this district.

4.7 Transportation

Palanquin, horse carriage, bullock cart, buffalo cart, soari, dinga made of palm tree and Gaina boat are the traditional transports found in the rural areas of Jamalpur Zila, are either extinct or nearly extinct. Now-a-days, all the upazilas are connected the zila headquarters metalled roads. Bus, minibus, three wheelers ply over the zila.

4.8 NGO Activities

Operationally important NGOs of this district are Setu, Joy, Desha, Pipasha, Jagarani, CDL, BRAC, Mukti, Swanirvar Bangladesh, ASA, Drishti, Bodhodaya and Karmei Mukti.

4.9 Concluding Remarks

From the above discussions it is found that the location of the study area near to the district. Physical features and topography, soil type, temperature and rainfall are favorable for cultivating Jute. This district is well transport system over marketing to others Bangladesh. Therefore, various types of agricultural crops were cultivated in the study area. Communication are good for marketing of agricultural crops.

CHAPTER –5

SOCIO-ECONOMIC PROFILE OF HOUSEHOLD POPULATION

5.1 Introduction

The point of this part is to present a brief description of the socio-economic characteristics of the growers delivering Jute. Socioeconomic l parts of the growers can be viewed from various perspectives relying on various factors identified with their degree of living, the financial condition where they live and the nature and the degree of the growers ' support in national advancement exercises. It was impractical to gather all the data with respect to the financial attributes of the example growers because of confinement of time and assets. Financial state of the example growers is significant in the event of research arranging in light of the fact that there are various interrelated and constituent qualities describes an individual and significantly impacts advancement of his/her conduct and character. Individuals contrast from each other for the variety of financial perspectives. Nonetheless, for the present research, a couple of the financial qualities have been contemplated for exchange.

5.2 Composition of the Family Size

Family size is significant in connection to generation of enough nourishment grain for ranch family. In this study family has been characterized as the all-out number of people living respectively and taking meals from a similar kitchen under the influence of one leader of the family. The relatives considered as spouse, children, unmarried little girl, father, mother, sibling and different relatives who live for all time in the family.

Table 5.1: Average Family Size and Distribution of Members According to Sex of the Sample Farmers

Particulars	Islampur Upazila		Sadar Upazila		Melandaha Upazila		All Farmers		Average Family Size	National Average Family Size
	No.	%	No.	%	No.	%	No.	%		
Male	2.36	49.79	2.73	49.55	2.30	49.46	2.46	49.60	2.49	4.06
Female	2.38	50.21	2.78	50.45	2.35	50.54	2.50	50.40		
Total	4.74	100	5.51	100	4.65	100	4.97	100		

Source: Field Survey, 2020

5.3 Age Distribution of the Farm Families

There are 35, 35, 30 samples are collected from three upazila named respectively Islampur, Sadar and Melandaha represented the total population. In Islampur upazila, 33.33 percent of the sample populations were 20-40 years, 33 percent were 40-60 years and 23 percent were above 60 years old. In Sadar upazila, 51 percent of the sample populations were 20-40 years, 28 percent were 40-60 years and have 20 percent found sample were above 60 years old. In Melandaha upazila, 57 percent of the sample populations were 20-40 years, 22 percent were 40-60 years and 14 percent sample found who were above 60 (Figure 5.1**)**. In this figure we saw most of the people age between 20 to 40 years in every upazila.

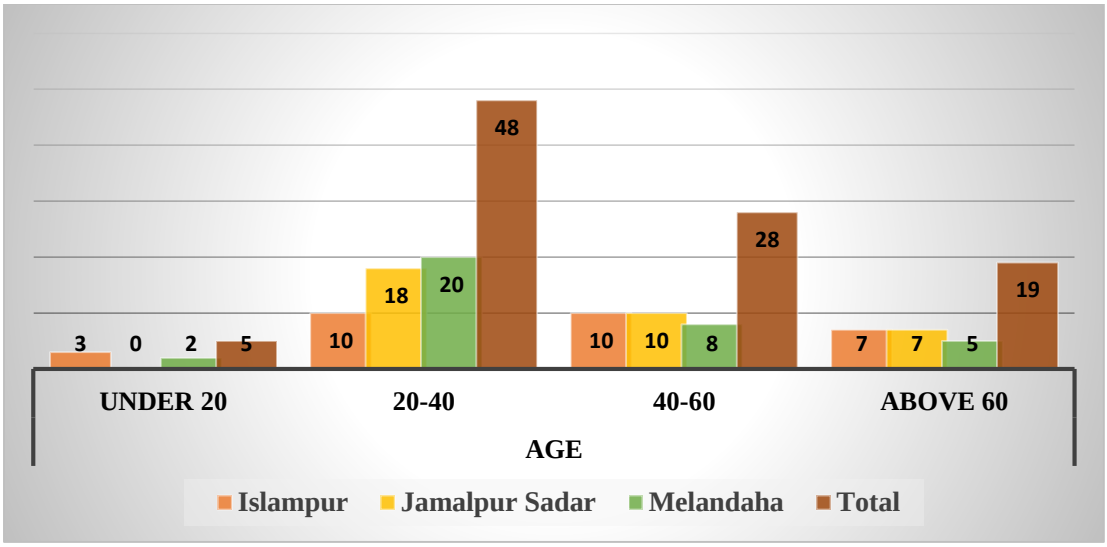


Figure 5.1: Age of the respondent by Study Area

5.4 Education

Figure 5.2 showed that, in Islampur upazila, about 10 percent of the study population aged 5 years or more were found to have no education and/or read/write, about 28 percent were found to have primary level education, about 40 percent were found to have secondary and/or higher secondary level education and 8 percent people were found to have attained/completed graduation level of education. In Sadar upazila, about 8 percent of the study population aged 5 years or more were found to have no education and/or read/write, about 30 percent were found to have primary level education, about 50 percent were found to have secondary and/or higher secondary level education and 5 percent people were found to have attained/completed graduation level of education. In Melandaha upazila, about 11 percent of the study population aged 5 years or more were found to have no education and/or read/write, about 30 percent were found to have primary level education, about 36 percent were found to have secondary and/or higher secondary level education and 8 percent people were found to have attained/completed graduation level of education.

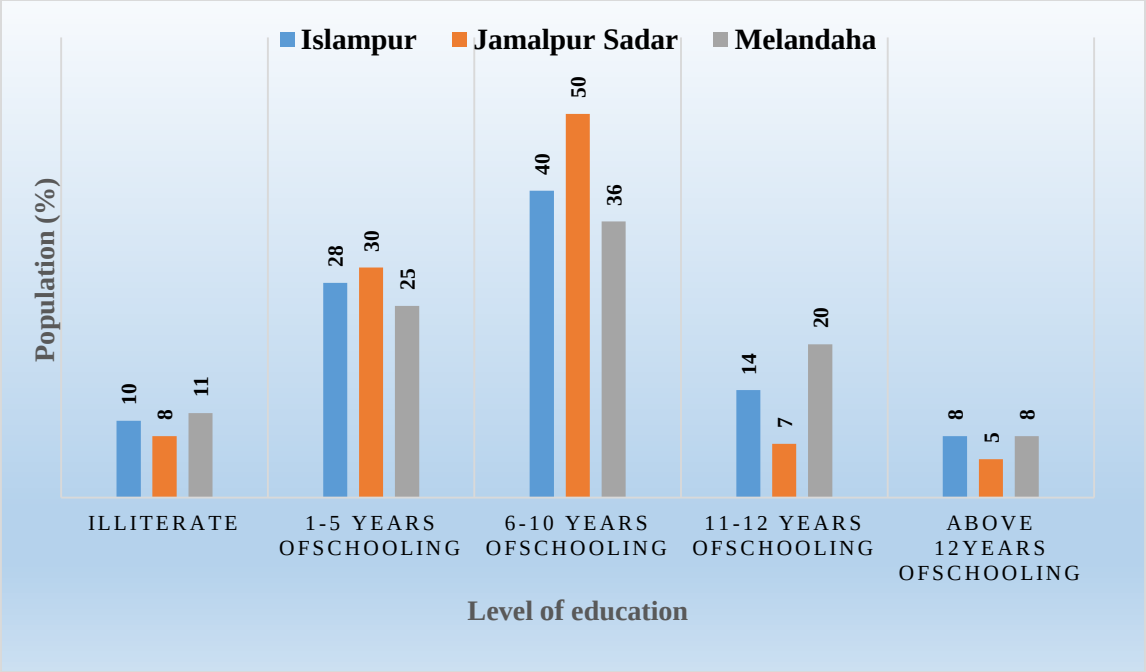


Figure 5.2: Education of the Household Members by Study Area
Source: Field survey, 2020

5.5. Annual Family income

a) Agricultural work

Table 5.2: Agricultural Work

Sector	Average annual Income	Mean
Crops	62900	121270
Poultry	18500	
Livestock	25870	
Fisheries	14000	

Crops, poultry, livestock and fisheries are the main agricultural income source of the sample. Most of the framer generate income by agriculture sector. Crop production was the main source of income among them average yearly income from crop production found about Tk. 62900. Now a day's poultry and dairy farm have been developed in the study

area. Farmers about Tk. 18500 yearly income from poultry. The mean value of annual family income by agriculture was Tk. 121270.

b) Non-Agriculture work

Main non agriculture was found day labor, Auto driver, Truck driver, domestic worker, small business, foreign remittance, services. Annual average income by non-agriculture source was found Tk. 100000. The total average annual income was found Tk. 221270.

5.6 Annual Family Expenditure

Sample farmer, annual average expenditure was found Tk. 186500. Main family expenditure was use for food consumption. Others main cost were child's education cost, clothing cost, medicine cost transportation, festival cost, entrainment cost etc Average annual family savings was found Tk. 34770.

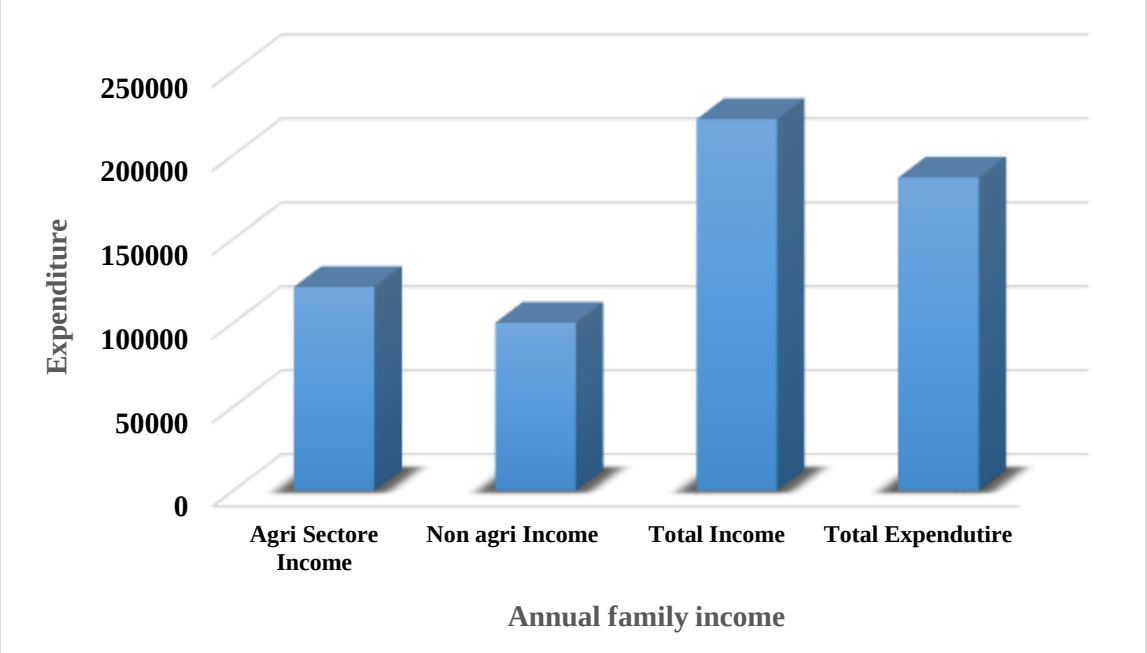


Figure 5.3: Annual Family Income and Expenditure by Study Area
Source: Field survey, 2020

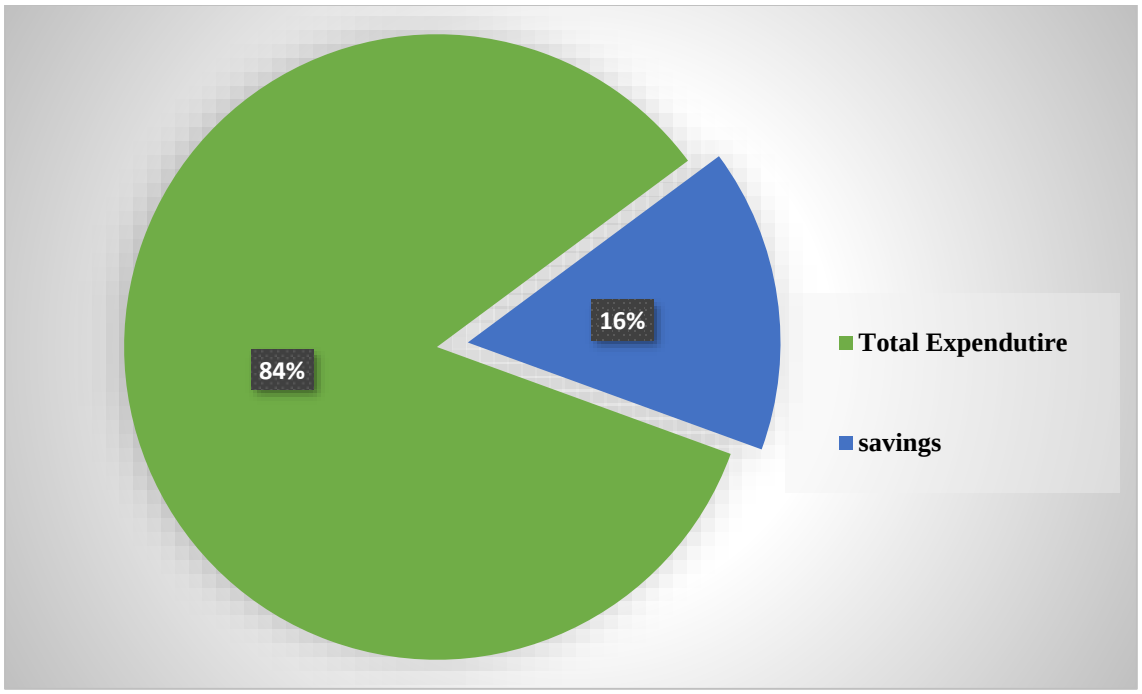


Figure 5.4: Annual Family Expenditure and Savings by Study Area
Source: Field survey, 2020

5.7 Agricultural Training

Among the respondent farmers in Islampur upazila, only 66.67 percent farmer's got training on Jute cultivation whereas, about 80 percent farmers got training in Sadar upazila, and 71.43 percent farmers got training in Melandaha upazila (Table 5.4). These training have improved their perceptions of good seed use, use of resistant varieties, application of insecticides and pesticides, water management, and so on.

Table 5.3: Agricultural Training of the respondent by Study Area

Training Received	Islampur Upazila		Sadar Upazila		Melandaha Upazila	
	No.	%	No.	%	No.	%
Yes	20	66.67	28	80	25	71.43
No	10	33.33	7	20	10	28.57
Total	30	100	35	100	35	100

Source: Field survey, 2020

5.8 Membership of any social organization

Among the respondent farmers in Islampur upazila, 83.3 percent Jute growers were found to have membership in different NGOs and/or farmers' organizations whereas Sadar upazila 94.29 percent of Jute grower's farmers had membership in different NGOs and/or farmers' organizations and 85.71 percent of Jute farmers had membership in different social organization in Melandaha upazila (Table 5.5).

Table 5.4: Membership in any organization of the respondent by Study Area

Membership	Islampur Upazila		Sadar Upazila		Melandaha Upazila	
	No.	%	No.	%	No.	%
Yes	25	83.33	33	94.29	30	85.71
No	5	16.67	2	5.71	5	14.29
Total	30	100	35	100	35	100

Source: Field survey, 2020

5.9 Concluding Remarks

From the above discussions it is clear that there are some variations in socioeconomic characteristics between the respectively Islampur, Sadar and Melandaha upazila Jute growers. But the magnitude of the variations was not large. There are substantial indications suggesting that both respectively Islampur, Sadar and Melandaha Jute growers were progressive.

CHAPTER –6

PROFITABILITY OF JUTE PRODUCTION

6.1 Introduction

The main purpose of this chapter is to assess the costs, returns and profitability of growing Jute. Profitability is a major criterion to make decision for producing any crop at farm level. It can be measured based on net return, gross margin and ratio of return to total cost. The costs of all items were calculated to identify the total cost of production. The returns from the crops have been estimated based on the value of main products and by-products.

6.2 Profitability of Jute Production

6.2.1 Variable Costs

6.2.1.1 Cost of Land Preparation

Land preparation is the most important components in the production process. Land preparation included ploughing, laddering and other activities needed to make the soil suitable for Jute cultivation. For land preparation in Jute production, no. of tiller was required 5 times with Tk. 1250 per tiller. Thus, the average land preparation cost of Jute production was found to be Tk. 6250 per hectare, which was 10.02 percent of total cost (Table 6.1).

6.2.1.2 Cost of Hired Human Labour

Human labour cost is one of the major cost components in the production process. It is one of the most important and largely used inputs for producing Jute. It is generally required for different operations such as land preparation, sowing, weeding, fertilizer and insecticides application, irrigation, harvesting and carrying, threshing, cleaning, drying, storing etc. The quantity of average hired human labour used in Jute production was found to be about 88 man-days per hectare and average price of human labour was Tk. 300 per man-day. Therefore, the total cost of hired human labour was found to be Tk. 26400 representing 42.32 percent of total cost (Table 6.1).

6.2.1.3 Cost of Seed

Cost of seed varied widely depending on its quality and availability. Per hectare total cost of seed for Jute production were estimated to be Tk. 1000, which constituted 1.60 percent of the total cost (Table 6.1).

6.2.1.4 Cost of Urea

In the study area, farmers used different types of fertilizers. On an average, farmers used urea 115 kg per hectare. Per hectare cost of urea was Tk. 2070, which represents 3.32 percent of the total cost (Table 6.1).

6.2.1.5 Cost of TSP

Among the different kinds of fertilizers used, the rate of application of TSP (25 kg). The average cost of TSP was Tk. 625 which representing 1.00 percent of the total cost (Table 6.1).

6.2.1.6 Cost of MoP

The application of MoP per hectare (22 kg). Per hectare cost of MoP was found Tk. 374.00, which represents 0.60 percent of the total cost (Table 6.1).

6.2.1.7 Cost of Gypsum

Among the different kinds of fertilizers used, the rate of application of Gypsum (10 kg). The average cost of Gypsum was found Tk. 120.00 which representing 0.19 percent of the total cost (Table 6.1).

6.2.1.8 Cost of Insecticides

Farmers used different kinds of insecticides to keep their crop free from pests and diseases. The average cost of insecticides for Jute production was found to be Tk. 1800 which was 2.89 percent of the total cost (Table 6.1).

Table 6.1: Per Hectare Costs of Jute

Cost Items	Quantity	Price Per Unit (Tk.)	Costs/Returns (Tk ha^{-1})	% of total
A. Gross Return				
Main product (Jute Fiber)	62.5 mound	1450	90625.00	97.84
By-product (Stick)			2000.00	2.16
Total return			**92625.00**	**100.00**
B. Gross Cost				
C. Variable Cost				
Seed	5 kg	200	1000.00	1.60
Irrigation	2 times	800	1600.00	2.56
Power tiller	5 times	1250	6250.00	10.02
Hired labour	88 persons	300	26400.00	42.32
Urea	115 kg	18	2070.00	3.32
TSP	25 kg	25	625.00	1.00
MOP	22 kg	17	374.00	0.60
Gypsum	10 kg	12	120.00	0.19
Fertilizers cost			3189.00	5.11
Manure	350 kg	5	1750.00	2.81
Insecticides			1800.00	2.89
Total Variable Cost (TVC)			**41989.00**	**67.31**
D. Fixed Cost				
Land use cost			5000.00	8.02
Family labour	45	300	13500.00	21.64
Interest on operating capital			1889.51	3.03
Total Fixed Cost (TFC)			**20389.51**	**32.69**
E. Total costs (TC)			**62378.51**	**100.00**

Source: Field survey, 2020

6.2.1.9 Cost of Irrigation

Cost of irrigation is one of the most important costs for Jute production. Production of Jute largely depends on irrigation. Right doses application of irrigation water help to increase bulb diameter, number of cloves, and number of leaves and plant height. As a result yield per hectare is being increased. The average cost of average irrigation was found 2 times in survey area and Tk 800 to be per hectare, which was found Tk.1600 per heater that represents 2.56 percent of the total cost (Table 6.1).

6.2.1.10 Cost of manure

It was observed in the present study area that farmers used cow dung for producing their enterprises. They bought a large portion of cow dung from the milk producers. It was found about Tk. 1750 per hectare.

6.2.1.11 Total Variable Cost

Therefore, from the above different cost items it was clear that the total variable cost of Jute production was Tk. **41989.00** per hectare, which was **67.31** percent of the total cost (Table 6.1).

6.2.2 Fixed Cost

6.2.2.1 Rental Value of Land

Rental value of land was calculated on the basis of opportunity cost of the use of land per hectare for the cropping period of four months. Cash rental value of land has been used as cost of land use. On the basis of the data collected from the Jute farmers the land use cost was found to be Tk. 5000 per hectare, and it was 8.02 percent of the total cost (Table 6.1).

6.2.2.2 Cost of Family Labour

Human labour cost is one of the major cost components in the production process. It is one of the most important and largely used inputs for producing Jute. It is generally required for different operations such as land preparation, sowing, weeding, fertilizer and insecticides application, irrigation, harvesting and carrying, threshing, cleaning, drying, storing etc. The quantity of average family supply labour (Without hired labour)used in

Jute production was found to be about 45 man-days per hectare and average price of human labour was Tk. 300 per man-day. If we pay those labour it was found to be Tk. 13,500 representing 21.64 percent of total cost (Table 6.1).

6.2.2.3 Interest on Operating Capital

It may be noted that the interest on operating capital was calculated by taking in to account all the operating costs incurred during the production period of Jute. Interest on operating capital for Jute production was estimated @ 9% as bank rate and calculated Tk. 1889.51 per hectare, which represents 3.03 percent of the total cost (Table 6.1).

6.2.3 Total Cost (TC) of Jute Production

Total cost was calculated by adding all the cost of variable and fixed inputs. In the present study per hectare total cost of producing Jute was found to be Tk. 62378.51 (Table 6.1).

Table 6.2: Per Hectare Cost and Return of Jute Production

Cost Item	Cost/Returns (Tk/ha)
A. Gross Return	92625.00
B. Variable Cost	41989.00
C. Fixed Cost	20389.51
D. Total costs	62378.51
E. Gross Margin (A-B)	50636.00
F. Net Return (A-D)	30246.50
G. Undiscounted BCR (A/D)	1.48

6.2.4 Return of Jute Production

6.2.4.1 Gross Return

Return per hectare of Jute cultivation is shown in table 6.2. Per hectare gross return was calculated by multiplying the total amount of product with respective per unit price. It is evident from table that the average yield of Jute per hectare was 62.5 mound and the

average price of Jute was Tk. 1450. Therefore, the gross return was found to be Tk. 92625.00 per hectare (Table 6.2).

6.2.4.2 Gross Margin

Gross margin is the gross return over variable cost. 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 Tk. 50636.00 per hectare (Table 6.2).

6.2.4.3 Net Return

Net return or profit was calculated by deducting the total production cost from the gross return. On the basis of the data the net return was estimated as Tk. 30246.50 per hectare (Table 6.2).

6.2.5 Benefit Cost Ratio (Undiscounted)

Benefit Cost Ratio (BCR) is a relative measure, which is used to compare benefit per unit of cost. Benefit Cost Ratio (BCR) was found to be 1.48 which implies that one taka investment in Jute production generated Tk. 1.48 (Table 6.2). From the above calculation it was found that Jute cultivation is profitable in Bangladesh.

6.3 Concluding Remarks

From the above discussion it is easy to understand about the different cost items and their application doses of farmers, yields and returns per hectare of Jute cultivation. Jute production is a labour intensive enterprise. It is most essential to use modern inputs such as seeds, fertilizers, human labour, power tiller, pesticides and irrigation efficiently. Timely and efficient use of these inputs are the most important to increase production and profitability. On the basis of above discussions it could cautiously be concluded here that cultivation of Jute is a profitable. Cultivation of Jute would help farmers to increase their income earnings.

CHAPTER 7
MAJOR FACTORS AFFECTING AND TECHNICAL EFFICIENCY OF JUTE PRODUCTION

7.1 Introduction

The estimation of efficiency with the help of production function has been a popular area of applied econometrics. Technical efficiency reflects the ability of a farmer to obtain the maximum possible output from a given level of inputs and production technology. It is a relative concept, since each farmers production performance is compared to a best-practice input-output relationship or production frontier. A farmer is technically inefficient in the sense that if it fails to produce maximum output from a given level of inputs. Technical inefficiency is then measured as the deviation of a farmer from the best-practice frontier. The main objective of this chapter is to estimate the technical inefficiency as well as frequency distribution of Jute farmers through technical efficiency analysis. The technical efficiency in production was estimated by using the stochastic frontier production. The primary advantage of a stochastic frontier production function is that it enables one to estimate U, (non-negative random variable which is under the control of the farmers).

Since the pioneering work on technical efficiency by Farrell in 1957, which drew upon the works of Debreu (1951) and Koopmans (1951), considerable effort has been directed at refining the measurement of technical efficiency. Empirical studies suggest that farmers in developing countries fail to exploit the potential of technology perhaps due to inefficient decision making due to various reasons of which management capacity is important one.

7.2 Interpretation of ML Estimates of the Stochastic Frontier Production Function

Maximum likelihood estimation begins with writing a mathematical expression known as the Likelihood Function of the sample data. The likelihood of a set of data is the probability of obtaining that particular set of data, given the chosen probability distribution model. This expression contains the unknown model parameters. The values of these parameters that maximize the sample likelihood are known as the Maximum Likelihood Estimates or MLE's. 7.1

The maximum likelihood estimates for parameters of the Cobb-Douglas stochastic frontier production function and technical inefficiency effect model for Jute production for all farmers are presented in Table 7.1.

Table 7.1: ML Estimates for Parameters of Cobb-Douglas Stochastic Frontier Production Function and Technical Inefficiency Model for Jute Farmers.

Variables	Parameter	Coefficients	T-value	P-value
Stochastic Frontier:				
Constant (X_0)	β_0	13.33***	10.85	0.000
Human Labour (X_1)	β_1	-0.0796*	-1.81	0.086
Urea (X_2)	β_2	0.0412***	6.99	0.000
TSP (X_3)	β_3	0.2179***	2.61	0.009
MoP (X_4)	β_4	-0.0596*	-1.88	0.077
Gypsum (X_5)	β_5	-0.3754NS	-1.37	0.171
Irrigation (X_6)	β_6	-0.0009**	-2.44	0.029
Seed (X_7)	β_7	-0.0051***	-3.05	0.006
Inefficiency Model				
Constant	δ_0	-38.76**	-2.14	0.032
Farm Size (Z_1)	δ_1	-0.0847NS	-1.33	-0.183
Age (Z_2)	δ_2	0.4308**	1.89	0.059
Education (Z_3)	δ_3	1.456**	1.95	0.048
Training (Z_4)	δ_4	-4.55NS	-0.03	0.975
Experience (Z_5)	δ_5	-0.0251***	-5.80	0.005
Retting Technology (Z_6)	δ_6	-0.0510***	-8.10	-0.003
Log-likelihood Function		291.41		
R-squared		0.9359		

Note: *, ** and * indicates significant at 1, 5 and 10 percent level respectively**.

Source: Field survey, 2020

Human Labor (X_1)

The regression coefficient of labour cost (X_1) of Jute production was negative and significant at 10 percent level of significance, which implied that if the expenditure on labour was increased by 1 percent then the yield of Jute would be decreased by 0.0796 percent, other factors remaining constant (Table 7.1).

Urea (X_2)

The regression coefficient of urea cost (X_2) of Jute production was positive and significant at 1 percent level of significance, which implied that if the expenditure on urea was increased by 1 percent then the yield of Jute would be increased by 0. 0412 percent, other factors remaining constant (Table 7.1).

TSP (X_3)

The regression coefficient of TSP cost (X_3) of Jute production was positive and significant at 1 percent level of significance, which implied that if the expenditure on TSP was increased by 1 percent then the yield of Jute would be increased by 0. 2179 percent, other factors remaining constant (Table 7.1).

MoP (X_4)

The regression coefficient of MoP cost (X_4) of Jute production was negative and significant at 10 percent level of significance, which implied that if the expenditure on MoP was increased by 1 percent then the yield of Jute would be decreased by 0.0596 percent, other factors remaining constant (Table 7.1).

Gypsum (X_5)

The regression coefficients of Gypsum cost (X_5) was not significant.

Irrigation (X_6)

The regression coefficient of irrigation cost (X_6) of Jute production was negative and significant at 5 percent level of significance, which implied that if the expenditure on irrigation was increased by 1 percent then the yield of Jute would be decreased by 0.0009 percent, other factors remaining constant (Table 7.1).

Seed cost (X_7)

The regression coefficient of irrigation cost (X_7) of Jute production was negative and significant at 1 percent level of significance, which implied that if the expenditure on irrigation was increased by 1 percent then the yield of Jute would be decreased by 0.0051 percent, other factors remaining constant (Table 7.1).

Interpretation of R squared

R-squared is a goodness-of-fit measure for linear regression models. The statistic indicates the 93 percentage of the variance in the dependent variable that the independent variables explain collectively. R-squared measures the strength of the relationship between the model and the dependent variable on a convenient 0 – 100% scale

7.3 Interpretation of Technical Inefficiency Model

In the technical inefficiency effect model experience, training, jute retting technology and Farm size have expected (negative) coefficients. The negative and significant at 1 percent. Coefficient of experience implies that experienced farmers are technically more efficient than non-experienced farmers. The negative coefficient of training postulates that trained farmer are more efficient than others. (Table 7.1)

The negative coefficient jute retting technology explained that modern technology is more efficient than traditional retting technology. The negative coefficient of Farm Size postulates that if farm size being large then farmer are technically more efficient than others. (Table 7.1)

The coefficients of farmer's age and education is positive meaning that these factors have no impact on the technical inefficiency. That is, these factors do not reduce or increase technical inefficiency of producing Jute. (Table 7.1)

Table 7.2: Frequency Distribution of Technical Efficiency of Jute Farms

Efficiency (%)	No. of farms	Percentage of farms
0-60	8	8
61-80	11	11
81-90	4	4
91-99	65	65
100	12	12
Total number of farms	100	100
Minimum	0.45	
Maximum	1.00	
Mean	0.92	
SD	0.14	

Source: Field Survey, 2020

7.4 Technical Efficiency and Its Distribution

Table 7.2 shows frequency distribution of farm-specific technical efficiency for Jute farmers. It reveals that average estimated technical efficiencies for Jute are 92 percent which indicate that Jute production could be increased by 08 percent with the same level of inputs without incurring any further cost. Increase of only managerial skills result a substantial increase of output for Jute. It was observed that about 65 percent of sample farmers were found to have received outputs which were very close to the maximum frontier outputs maintaining the efficiency level. On the other hand, only 19 per cent of sample farmers obtained up to 80 percent technical efficiency level. And 12 percent sample farmer are 100 percent efficient. The minimum and maximum technical efficiencies were observed to be 45 and 100 per cent respectively.

7.5 Concluding Remarks

From the above discussion it is easy to understand about the different cost items and their application doses of farmers, yields and returns per hectare of Jute cultivation. Jute production is a seed and labor intensive enterprise. It is most essential to use modern inputs such as seeds, fertilizers, human labour, power tiller, pesticides and irrigation efficiently. Timely and efficient use of these inputs are the most important to increase production and profitability. On the basis of above discussions it could cautiously be concluded here that cultivation of Jute is a profitable. Cultivation of Jute would help farmers to increase their income earnings.

CHAPTER 8
PROBLEMS AND CONSTRAINTS TO JUTE PRODUCTION

8.1 Introduction

The interviewed jute farmers faced a variety of multi-dimensional difficulties and constraints (socioeconomic, technical, market related) that affected the increased significantly in recent years as a result of increased costs of seed, fertilizers and wage rates. Inadequate and costly finance can, therefore, be a major constraint to expand the jute cultivation. Deb and Bairagi (2009) identified the similar problems of jute cultivation as well as their livelihood. Lack of quality seed, high cost of jute production, lack of training facilities, inadequate credit facility, high disease infestation, high prices of inputs, unstable jute price, shortage of labor at peak period, lack of retting water and weed problem were the main constraints in jute production and processing **(Table 8.1).**

Costs of jute cultivation were reported to have jute cultivation in Bangladesh. Jute farmers indicated that they have less formal training in technical matters regarding jute cultivation, which keeps them away from using technology and up-to-date information. Another important constraint was 'lack of technical knowledge'. Price is the one of the main factor which determines the economic scale of production of jute. Price of raw jute is fluctuated year after year and not stagnates. Jute is a labor intensive crop which requires more human labors for different field operations. Sufficient agricultural labors are not available in rural areas and most of the working force has gone to search for better job in different urban areas of the country. Another great problem faced by the jute grower is the lack of quality retting water. Retting facilities are not available nearby jute fields and jute bundles have to transport in road side ditches. Drought in the season may hamper retting process and thus quality of jute fibre. Wilting of plant at later stages is another biological constraint reduces the fibre yield and quality to some extent. 'Inadequate supply of quality fertilizer' was the most commonly encountered problem for the jute farmers in the study area. Jute farmer also reported that poor health status was a barrier to conduct jute farming. They often suffered from diarrhea, cholera, dysentery, skin diseases, malnutrition, night blindness, and mosquito-borne diseases such as dengue fever and malaria.

In addition, they reported that social insecurity and natural calamities hindered their jute cultivation. Jute farmers did not have enough leaflets, booklets and other information materials on jute cultivation. Therefore, producing good quality seeds to supply adequate seed on time, supply of adequate finance though credit program, extension of technical knowledge by training program, selecting appropriate time and site for jute cultivation, taking appropriate preventive and controlling measures and extension of different facilities in the study area are essential.

Table 8.1 Problems and Constraints of Jute Production by no. of Farmers

Category	Problems	% of respondent (n=100)
Crop management	Lack of quality seed	89
	High cost of production	85
	Timely availability of quality seed	56
	Timely availability of suitable land	45
	Inadequate supply of quality fertilizer	40
	Weed problems	35
	Lack of technical know how	67
Socio-economics	Shortage of labor during the time of harvesting and retting	59
	High price of inputs such as seed, fertilizer, insecticide	45
	High labor wages	89
	Small holding of land	23
	Low return	95
Market	Unstable jute price	90
	Low price of jute	87
	No grading system (grade wise price)	78
Retting	Lack of retting pond	80
	Lack of retting water	75
	Lack of adequate knowledge in improved retting and grading	60
	Transportation problem in retting	55
Others	High rate of disease (stem rot) infestation	74
	Inadequate credit facility	70
	Lack of training facilities	68

Source: Field survey, 2020

8.2 Concluding Remarks

The above mentioned discussions as well as the results presented in Table 8.1 indicates that Jute growers in the study area have currently been facing some major problems in conducting their Jute farming. These are the major constraints for the producers of Jute in the study area. Public and private initiatives should be taken to reduce or eliminate these problems for the sake of better production of Jute.

CHAPTER-9

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

9.1 Summary

Since jute is the main cash crop of the farmers, they had to sale jute in order to meet family needs. Known as the ‘Golden Fiber’, Jute was one of the major cash crops of Bangladesh. During British rule and then the Pakistan period, the production of jute and related goods was the single largest industry in this region. Even after the emergence of Bangladesh as an independent state; jute was the main contributor to foreign exchange earnings for more than a decade. The widespread use of alternative products like plastic and hemp has reduced the demand for jute. And, still, it is one of the most important export items in this country. As a result the low market price and low demand of jute have been the major problems of the jute growers. As jute crop is economically an important crop of Bangladesh, any problem this crop faces should be studied carefully and should be removed as early as possible. At present, the jute farmer faces some serious problem both in fibre and in seed sector. Since two years, jute has been passing through a crisis due to low and unstable price at the growers' level. It is also being observed that recently different organizations organizing seminars, symposium etc. and publishing various articles in newspaper regarding present ailing situation on raw jute production and goods. All are concerned how to overcome this situation and salvage the jute industry (Yusuf, 2007). Therefore, the present study is conducted to determine the existing status and practices of jute cultivation and to identify the existing constraints which hindering jute cultivation of the jute farmers. According to the Department of Agricultural Extension, jute is farmed on approximately 700,000 to 800,000 hectares of land in Bangladesh. About 8 million bales of unprocessed jute is derived from the cultivation. Jute is cultivated in every district to some extent.

The sampling frame for the present study were selected purposively as to select the area where the Jute cultivation was intensive. On the basis of higher concentration of Jute crop production, three upzillas Islampur, Jamalpur sadar and Melandaha under of Jamalpur was selected. A sample size of 100 is generally regarded as the minimum requirement for larger population that will yield a sufficient level of certainty for decision-making (Poate and Daplyn, 1993). In this case, who were cultivating different varieties of Jute in the selected areas were selected as samples. Farmers generally plant Jute from mid- May to June and harvest after three months. Data for the present study have collected during the period of May 2020 to June 2020. Primary data were collected from primary producers. Selected respondents were interviewed personally with the help of pre-tested questionnaires. The collected data were checked and verified for the sake of consistency and completeness. Editing and coding were done before putting the data in computer. All the collected data were summarized and scrutinized carefully to eliminate all possible errors. Data entry was made in computer and analysis was done using the concerned software Microsoft Excel and STATA.

Economic profitability is a major criterion to make decision for producing any crop at farm level. It can be measured based on net return, gross margin and ratio of return to total cost. The average land preparation cost of Jute production was found to be Tk. 6250 per hectare. The quantity of hired human labor used in Jute production was found to be about 88 man-days per hectare and average price of human labor was Tk. 300 per man-day. Therefore, the total cost of hired human labor was found to be Tk. 26400 representing 42.32 percent of total cost. Per hectare total cost of seed for Jute production was estimated to be Tk. 1000. On average, farmers used Urea, TSP, MoP and Gypsum was 115 Kg, 25 kg, 22 kg and 10 kg per hectare. The average cost of insecticides for Jute production was found to be Tk. 1800. Whereas the average cost of irrigation was found to be Tk. 1600 per hectare. The total variable cost of Jute production was Tk. 41989 per hectare, which was 67.31 percent of the total cost.

The average yield of Jute per hectare was 62.5 mound and total price of Jute was Tk. 92625. The gross return, gross margin and net return were found to be Tk. 92625, Tk. 50636.00 and Tk. 30246.50 per hectare. Benefit Cost Ratio (BCR) was found to be 1.48 which implies that one-taka investment in Jute production generated Tk. 1.48.

Technical efficiency reflects the ability of a farmer to obtain the maximum possible output from a given level of inputs and production technology. Technical efficiency is then measured as the deviation of a farmer from the best-practice frontier. The regression coefficients of Human Labour (X_1), MoP (X_4), Gypsum (X_5) , Irrigation (X_6), and Seed (X_7) were negative but the coefficient of Urea (X_2) and TSP (X_3) was found positive.

In the technical inefficiency effect model experience, training, jute retting technology and Farm size have expected (negative) coefficients. The negative and significant at 1 percent. Coefficient of experience implies that experienced farmers are technically more efficient than non-experienced farmers. The negative coefficient of training postulates that trained farmer are more efficient than others. The negative coefficient jute retting technology explained that modern technology is more efficient than traditional retting technology. The negative coefficient of Farm Size postulates that if farm size being large then farmer are technically more efficient than others. The coefficients of farmer's age and education is positive meaning that these factors have no impact on the technical inefficiency. That is, these factors do not reduce or increase technical inefficiency of producing Jute.

Average estimated technical efficiencies for Jute are 92 percent which indicate that Jute production could be increased by 08 per cent with the same level of inputs without incurring any further cost. Increase of only managerial skills result in a substantial increase of output for Jute.

Farmers faced a lot of problems in producing Jute. The problems were social and cultural, financial and technical. Lack of quality seed was one of the most important limitations of producing Jute in the study area. Lack of operating capital, high price of quality seed, high cost of irrigation water, shortage of human labor and lack of quality tillage were the major problems faced by farmers. These are the major constraints for the producers of Jute in the study area. Public and private initiatives should be taken to reduce or eliminate these problems for the sake of better production of Jute.

9.2 Conclusion

Bengal is producing Jute since ancient times. People of Bangle was using these to make rope and clothes by local handloom weavers. The land and climate of Bangladesh are very suitable for jute cultivation. Thus, the quality of jute in this country is better than other jute producing countries in the world. Known as the 'Golden Fibre', Jute was one of the major cash crops of Bangladesh. During British rule and then the Pakistan period, the production of jute and related goods was the single largest industry in this region. Even after the emergence of Bangladesh as an independent state; jute was the main contributor to foreign exchange earnings for more than a decade. The widespread use of alternative products like plastic and hemp has reduced the demand for jute. And, still, it is one of the most important export items in this country. At present Bangladesh is the **second-largest** producer of jute, (India being the first). But Bangladesh produces the finest quality jute fiber. Globally jute is now one of the most important natural fibers because of being biodegradable and compostable. So as an eco-friendly natural product, the potential of jute and jute goods is increasing day by day. Traditionally the jute grown in this country is used to make hessian fabric, jute carpets, sacks, ropes, and twines. Due to increasing global demand, Bangladeshi manufacturers and exporters are now focusing on diversified jute products. Also, the government's ban on production, sale, and use of *polythene* in 2002 and making it mandatory to pack rice, sugar, wheat, and fertilizers in jute bags in 2010 by the government, have encouraged producers to expand the sector of jute-goods.

If the modern inputs could be made available to the farmers in time, production of this crop might be increased which could help them in alleviating rural poverty in many areas. Jute are only produced in rainy season. However, farmers in the study areas, to some extent have started to produce summer Jute. Farmers were not known about the application of inputs in right time with right dose. Thus, well-planned management training in accordance with their problems, needs, goals and resources base may lead to viable production practices and sustainable income from Jute cultivation.

9.3 Suggestion

At present, after cotton, comes the demand for jute. Jute is in great demand due to the cheapness, softness, strength, length, lustre and uniformity of its fibre. These great qualities make this fiber popular in the market as well. It has diversified uses. It is unfortunate that jute production in Bangladesh is gradually going down. However, it is a matter of great regret that our farmers fail to get back even their production cost. Cost of productions becomes higher, but the price of jute becomes lower at the time of harvest. So, farmers become looser.

Based on the results of the study, the following recommendations are furnished.

a) As most of the jute farmers are technically efficient at present production technology, improved method of production technology with sufficient storage ability should be introduced.

b) According to the law, the use of jute made packages for wrapping these 19 products- paddy, rice, wheat, maize, fertilizer, sugar, pepper, turmeric, onion, ginger, garlic, pulses, coriander, potato, flour, corn flour, mushroom, poultry and fish-feed; has been made compulsory.

c) Jute based cropping pattern should be developed and disseminated to those areas of Bangladesh where their production is suitable.

d) Government should take necessary measures to lower the price of inputs which have positive significant impact on yield. It will increase the net benefit of jute producers.

e) Jute retting technology should be develop for quality fiber production.

f) Jute farmers had to sell their product at low price during harvesting or just after harvest. An appropriate storage scheme should be developed so that the farmers are not forced to sell their product at low price in harvest period.

9.4 Limitations of the Study

There are some limitations of the study thus are indicated below.

a. Most of the data were collected through interview of the farmers and sometimes they did not well-cooperate with the interviewer.
b. The information were gathered mostly through the memories of the farmers which were not always correct.
c. Due to resource and time constraints, broad based and in-depth study was hampered to some extent.

REFFERENCE

Abdullah, A.B.M., 2013. Challenges of 21st Century: Global climate changes and jute based-development strategy of Bangladesh. Asiatic Society Bangladesh, Dhaka.

Afroz, S. and Islam, M. (2012). Economics of Aus rice and Jute cultivation in some selected areas of Narsingdi district of Bangladesh. *The Agriculturists,* **10**(2): 90-97.

Aigner, D.J., Lovell, C.A.K. and Schmidt, P.J. (1977). Formulation and Establishment of Stochastic Frontier Production Function Models. Journal of Econometrics. **6**:21-37.

Ali, M. 2000. Dynamics of Vegetable Production and Consumption in Bangladesh. Shanhua, Taiwan: Asian Vegetable Research and Development Center.

Bangladesh Development Research Working Paper Series. BDRWPS no. 9, Bangladesh Development Research Centre.

BB (2017). Annual Review of Import Payments, Bangladesh Bank, Head Office, Bangladesh Bank, Motijheel, Dhaka.

BBS (2010). Statistical Year Book of Bangladesh. Bangladesh Bureau of Statistics. Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh.

BBS (2013). Household Income and Expenditure Survey-2010, Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic Bangladesh, Dhaka.

BBS (2014). Community Report, Population and Housing Census, Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic Bangladesh, Dhaka.

BBS (2015). Statistical Yearbook of Bangladesh, Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic Bangladesh, Dhaka.
BBS (2016). Yearbook of Agricultural Statistics, Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic Bangladesh, Dhaka.

BBS (2017). Statistical Pocketbook of Bangladesh, Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic Bangladesh, Dhaka.

BBS. (2011). Monthly Statistical Bulletin of Bangladesh, Bangladesh Bureau of Statistics, Ministry of Planning, Government of the

Beattie, B.R. and Taylor, C.R. (1985). The Economics of Production. Montana State University, John Wiley & Sons, New York.

Beattie, B.R. and Taylor, C.R. (1985). The Economics of Production. Montana State University, John Wiley & Sons, New York.

BER (2017). Bangladesh Economic Review, Department of Finance, Ministry of Finance, Government of the People's Republic of Bangladesh, Dhaka.

BER. 2006. Bangladesh Economic Review. Ministry of Finance. Government of the People's Republic of Bangladesh.

Chadha, K.L. and Kallo, G. (1993). Advances in Horticulture, Vol. 5- Vegetable Crops: Part-I (New Delhi, India: Malhotra Publishing.

Deb, U., Bairagi, S.K. (2008). Profitability and Marketing of Jute in Bangladesh. Paper Presented at the International Conference on Prospects of Jute & Kenaf, held at the Bangladesh-China Friendship Conference Centre, Dhaka on 08-09 February 2008; by International Jute Study Group (IJSG).

Deb, U., Bairagi, S.K. (2009). Economics of Jute Cultivation in Bangladesh. Research Report prepared under the IRBD Programme, Centre for Policy Dialogue (CPD). cpd.org.bd/index.php/aboutus/cpd_team/mr-subir-kanti-bairagi/

Dev. D.C. and Bairagi. C.K. (2008). A study on economic profitability and marketing of jute in Bangladesh. *Bangladesh Journal of Agricultural Resources,* 13(4): 71-77. Development strategy of Bangladesh.

Dillon, J.L. and Hardaker, J.B. (1993), Farm Management Research for Small Farmer Development, Food and Agricultural Organization, Rome.

Forman, M.S.H. (2011). A comparative economic analysis of Aus rice and jute production in some selected areas of Mymensingh district. M.S. thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh.

Fuss, M. and Mcfadden, D. (1978). Production Economics: A Dual Approach to Theory and Application. North Holland, Amsterdam. Global climate changes and jute based development strategy of Bangladesh. Asiatic Society Bangladesh, Dhaka.

Hasan, K. (2015). A comparative economic analysis of Aus rice and jute production in some selected areas of Narayangonj district. M.S. thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh.

Heady, E.O. and Dillon (1969). Agricultural Production Functions. Iowa State University Press, Ames. House), pp. 105-135.

http://live.bmd.gov.bd/

http://www.bbs.gov.bd/site/page/47856ad0-7e1c-4aab-bd78-892733bc06eb/Population-and-Housing-Census

http://www.bjri.gov.bd/

http://www.dam.gov.bd/classified_home

http://www.dam.gov.bd/damweb/PublicPortal/MarketDisplayFullScreenBangla.php

https://en.wikipedia.org/wiki/Jute

https://en.wikipedia.org/wiki/Jute_cultivation

https://krishijagran.com/agripedia/a-complete-guide-of-jute-cultivation-in-simple-steps-know-these-unheard-hybrid-jute-varieties/

https://www.daily-bangladesh.com/english/Jute-packaging-mandatory-for-19 products/36990

https://www.statista.com/statistics/438359/share-of-economic-sectors-in-the-gdp-in-bangladesh/#:~:text=Share%20of%20economic%20sectors%20in%20the%20GDP%20in%20Bangladesh%202019&text=In%202019%2C%20the%20share%20of,sector%20contributed%20about%2052.85%20percent.

https://www.worldatlas.com/articles/top-jute-producing-countries-in-the-world.html

Islam K, de Silva H, (2011). Jute Value Chain in Bangladesh: Information and Knowledge Gaps of Smallholders. Knowledge-basede economics. Khairul Islam | DNET | khairul-[dot]helal[at]gmail[dot]com. Harsha de Silva

Islam, C.L., Bakar, N.A., Khan, M.R. (2009). Genetic diversity and relationships of different jute species in Bangladesh. *The Agriculturists*, **9**(02): 105-113.

Jondrow, J., Lovell, C.A.K., Masterov, L.S. and Schmidt, P. (1982). On the Estimation of Technical Efficiency in the Stochastic Frontier Production Function Model. *Journal of Economics. 19: 233-238.*

Khan, B.C. (2013). A comparative assessment of financial and economic profitability of aus rice and jute in Bangladesh. M.S. thesis, Department of Agricultural Economics, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur.

Kundu, N.D. (2011). Profitability of jute production and value addition activities of jute products in some selected areas of Madaripur district. M.S. thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh.

Mannan, S.A. (2001), An analysis of agro-economic potentials of jute production in Bangladesh, Ph. D. thesis, Bangladesh Agricultural University. Mymensingh.
Meherunnahar, M. and Paul, D.N.R. 2009. Bt Brinjal: Introducing Genetically Modified Brinjal (Eggplant/ Aubergine) in Bangladesh.

Mollah M.A.F., Alam, M.A., Islam, N., Mosaddeque, Q.M., Khan M.A.H. (2008). Socio-economic Study of Deshi Jute Seed Growers in Some ***Sheheli and Roy (2014), Progressive Agriculture 25: 38-46*** 46 Selected Areas of Bangladesh.j. innov.dev.strategy. 2 (2).pp-5-10.Pacific.Tokyo:AsianProductivity Organization. Republic of Bangladesh, Dhaka.

Rahman, M.M. (2001). Policy and prospect of jute and allied fibers with special reference to Bangladesh. Bangladesh Institute of Labor Studies

Rahman, M. Z. (2000), Effect of spacing on the growth, yield and storability of some garlic germplasm, M.S. in Horticulture thesis, Bangladesh Agricultural University, Mymensingh.

Rahman, S. and Bala, R.K. (2009). A study on ecological and environmental sustainability of jute production system in Bangladesh. *Economic Affairs,* **46**(3): 347-353.

Roy, B. (2013). Farmers' Knowledge on Jute Seed Production in Kishorgonj District. MS Thesis. Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Sheheli, S. and Roy, B. (2014). Profitability, Constraints and opportunities of raw jute production: a household level analysis in Bangladesh. *Progressive Agriculture,* **25**(2): 38-46.

Shin, K.Y. (2001). "Recent Development in Vegetable and Fruit Marketing," in Marketing of Vegetables and Fruits in Asia

Siddique, S.A. (2011). Profitability analysis of jute growing farmers in some selected areas of Mymensingh district. M.S. thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh.

Sinha, T.J., Rayhan, L.K., Jamal, F., Mahmud, A.S. (2014). A study on crop diversification for profitability in jute and allied fibre crops in Jessore district in Bangladesh. *The Journal of Agriculture & Natural Resources Sciences,* **1**(2): 265-283.

Yasmin, H.E. (2009). A study on profitability and value addition activities of jute production in a selected area of Jessore district. M.S. thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh.

Yusuf, S. (2007). “Jute Industry: Present and Future”, The Financial Express, Oct 20, 2007.