PROFITABILITY AND RESOURCE USE EFFICIENCY OF BRINJAL CULTIVATION IN SOME SELECTED AREAS OF SATKHIRA DISTRICT

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CERTIFICATE

This is to certify that the research work entitled, **"PROFITABILITY AND RESOURCE USE EFFICIENCY OF BRINJAL CULTIVATION IN SOME SELECTED AREAS OF SATKHIRA DISTRICT"** conducted by **MOSTAFIZUR RAHMAN** bearing Registration No.**10-04149 (July-December/2018)** under my supervision and guidance in the partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (M. S.) IN DEVELOPMENT AND POVERTY STUDIES** in the Faculty of Agribusiness Management, Sher-e-Bangla Agricultural University, Dhaka 1207, Bangladesh. No part of this thesis has been submitted for any other degree or diploma.

I further certify that any help or source of information received during this study has been dully acknowledgement by her/him.

Dated:December,2018.
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THIS THESIS IS
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PROFITABILITY AND RESOURCE USE EFFICIENCY OF BRINJAL CULTIVATION IN SOME SELECTED AREAS OF SATKHIRA DISTRICT

ABSTRACT

The objectives of this study were to know the socio economic characteristics of the farmers in the study area; to explore the profitability and factors affecting the profitability of brinjal cultivation; to determine the resources use efficiency of brinjal cultivation and to identify the problem faced by brinjal farmers. The study was conducted in two villages of Sonabaria union under Kalaroa upazila and two villages of Dhandia union under Tala upazila of Satkhira district. Data were collected by using interview schedule from the randomly selected 80 respondents during 1st January to 28th February, 2019. After analyzing the data, the gross returns per hectare was Tk. 224100 and Tk. 233010 for brinjal farmers in Kalaroa and Tala upazila respectively. It was observed that per hectare net return was Tk. 109064 and Tk. 114934 for brinjal farmer in Kalaroa and Tala upazila respectively and per hectare gross margin was Tk. 156814 and Tk. 165084 in Kalaroa and Tala upazila respectively. Total cost of brinjal cultivation was calculated at Tk. 115036 and Tk. 118076 per hectare in Kalaroa and Tala upazila respectively. Benefit Cost Ratio (BCR) was found 1.95 and 1.97 in Kalaroa and Tala upazila respectively. Thus, it was found that brinjal production was highly profitable. From Cobb-Douglas production function analysis, it was observed that the coefficients of cost of power tiller and animal labor, manure, urea, cost of pesticides and cost of irrigation were positively significant at different level of probability for brinjal production; cost of human labor was negative and insignificant and the coefficients of seedling, TSP and cost of MP was insignificant. Resource use efficiency indicated that all of the resources were under-utilization for brinjal cultivation except over-utilization of human labor cost, and seedling cost. So there was a positive effect of key factors in the production process of brinjal cultivation. The farmers replied that high price of inputs were the most acute problem followed by attack of brinjal diseases and lack of marketing facilities were the most important problems in the study areas. Government should take necessary steps to overcome this situation.

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December, 2018 **The Researcher**

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ABBREVIATIONS AND ACRONYMS

BARC	**: Bangladesh Agricultural Research Council**
BARI	**: Bangladesh Agricultural Research Institute**
BB	**: Bangladesh Bank**
BBS	**: Bangladesh Bureau of Statistic**
BCR	**: Benefit Cost Ratio**
BER	**: Bangladesh Economic Review**
DAE	**: Department of Agricultural Extension**
DTW	**: Deep Tube -Well**
EPB	**: Export Promotion Bureau**
EU	**: European Union**
et al.	**: and others (at elli)**
FAO	**: Food and Agricultural Organization**
GDP	**: Gross Domestic Product**
GM	**: Geometric Mean**
GNP	**: Gross National Product**
GR	**: Gross Return**
ha	**: Hectare**
HYV	**: High Yielding Variety**
1OC	**: Interest on Operating Capital**
kg	**: Kilogram**
LUC	**: Land Used Cost**
MFC	**: Marginal Factor Cost**
MP	**: Murate of Potash**
MPP	**: Marginal Physical Product**
MT	**: Metric Ton**
MVP	**: Marginal Value Product**
MV	**: Modern Varieties**
NGOs	**: Non - Governmental Organizations**
No.	**: Number**
NR	**: Net Return**
OC	**: Operating Capital**
SPSS	**: Statistical Package for Social Sciences**

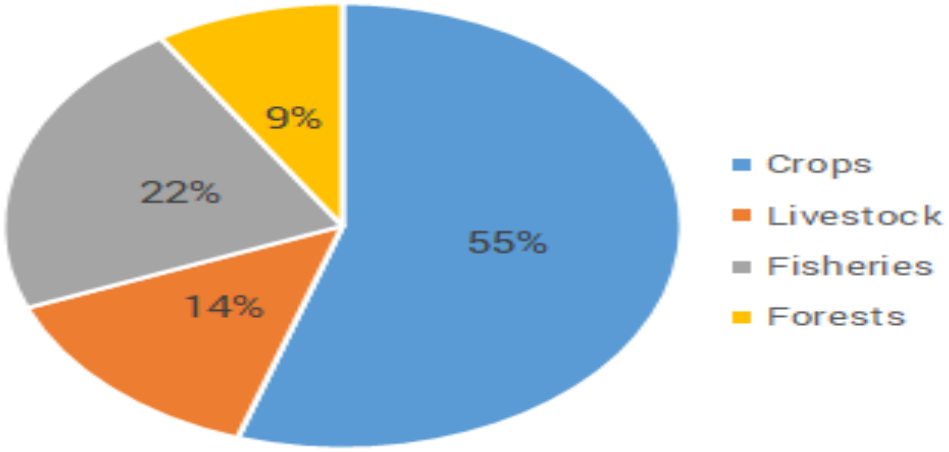
Sq. Km	**: Square Kilometer**
STW	**: Shallow Tube Well**
TPS	**: True Potato Seed**
TSP	**: Triple Super Phosphate**
TC	**: Total Cost**
TFC	**: Total Fixed Cost**
tk.	**: Taka**
TVC	**: Total Variable Cost**
UNDP	**: United Nation Development Program**

CHAPTER 1
INTRODUCTION

1.1 Prelude of the Study

Bangladesh is a developing country with an area of 147570 square kilometer inhabited by 163.70 million people, population growth rate is 1.37 and its density of population is 1103 persons per km2 (BBS, 2019). Most of the people earn their living from agriculture. The national development depends to a substantial extent on the development of its agriculture and farming. In the development terms, the position of Bangladesh is 136 out of 189 countries listed in the human development index by United Nations Development Programme (UNDP) in 2019-2020. Bangladesh has been striving for rapid development of its economy. Economic development of Bangladesh could not be achieved unless it could have achieved a breakthrough in the agricultural sector (Barman S, 2008). Bangladesh is a country dominated by agriculture. Agriculture is the backbone of the economy of this country. The agriculture sector contributes 13.60 percent to Gross Domestic Product (GDP). Agricultural land is decreasing every year due to population growth, which in turn, requires more housing, urbanization, more establishments of educational institutions, government and non-government office building playground and other infrastructural development activities. "Food for all" is the prime commitment of the present government. The overall direct contribution of the agriculture sector has decreased slightly; it has indirect contribution to the overall growth of GDP. It may be noted here that, the GDP growth rate was 6.19 percent in fiscal year 2007-08 but now is 8.1 percent. Agriculture is the mainstay of the economy of Bangladesh. The economic development is inextricably linked with the performance of this sector. About 76.75 percent of total population of this country lives in rural areas (BBS, 2019). Agriculture provides employment to nearly about 40.6 percent of its total labor forces (MoF, 2019). Agriculture occupies a key position in the overall economic sphere of the country in terms of its contribution to Gross Domestic Product (GDP). Figure 1.1 represents the sectorial share of Gross Domestic Product at constant prices (Base Year: 2005-06). Broad agriculture sector which includes crops, livestock, fisheries and forestry contributes 55 percent, 14 percent, 22 percent and 9 percent to the Gross Domestic Product (GDP) as a whole in the FY 2017-18 (MoF, 2019). An impact of climate change on agriculture has been keeping continuous pressure on food grain

production. The high population growth with declining death rate together with low growth in agricultural productivity and natural hazards adversely affect the living standards of the people in the country.



Source: BER, 2019

Figure 1.1: Sectoral Share of GDP at Constant Prices

Vegetables sub-sector plays an important role for the development of Bangladesh. Vegetables are herbaceous plant whose fruits, seeds, roots, tubers leaves, etc are used as food. Nearly 100 different types of vegetables comprising both of local and foreign origins are grown in Bangladesh. Vegetables are important in Bangladesh for nutrition, economy and food security. Vegetables can be identified as a significant one for this economy for its noteworthy contribution in raising the foreign exchange earnings and occupies an important position among the items exported from Bangladesh. Vegetables contribute 3.6 percent to the national GDP. This sector plays a significant role in meeting the protein demand, earning foreign exchange and socio-economic development of the rural poor by reducing poverty through employment generation.

The continuous monoculture of cereals leads to malnutrition that affects the working efficiency and productivity of population. To meet the challenge of this situation, production of agricultural commodities in the country must be increased. It is widely believed that crop diversification can be an effective means to improve the performance of agriculture in Bangladesh. In this context, production of brinjal would

be able to play a vital role, particularly from the view point of nutrition and profitability.

1.2 History and Overview of Brinjal Production

Brinjal also known as Eggplant or Melongene or Aubergene is one of the most important and popular Solanaceous crops under the botanical name Solanum melongena L. (2n = 24) grown in Bangladesh. There are three main botanical varieties under the species melongena.Yield potentiality of the varieties cultivated in Bangladesh is less and choice of brinjal size, shape, and skin color varies in different locations. Brinjal is a vegetable crop produced and consumed by almost all people all over the world.. Brinjal is an important vegetable not only in Bangladesh but also in other countries of the world. In Bangladesh, brinjal comes next to potato according to its volume of supply in the market. The brinjal is thought to have originated in tropical countries like India and China . Presently, brinjal is cultivated in China, Japan Philippines, U.S.A and in southern part of Europe. It is consumed mainly as vegetable item in the producing countries as well as in other countries. Brinjal is extensively cultivated in Bangladesh where Satkhira is a brinjal producing district in the country. Various categories of shape, size and colored brinjal are produced in this district. Brinjal are classified into two categories in respect of their production period. These are (1) Rabi brinjal (2) Kharif brinjal. Though it is more or less available throughout the year, its peak supply comes during December to April. Brinjals grown in our country are of different varieties. They differ in respect of size, shape and color. Islampuri, Tolla, Khotkhotia, Singhata, Moktahashi, Koli, Bottle and Laruljhuri are some locally named important varieties of brinjal produced in Satkhira district. The vegetable brinjal is grown for its fleshy fruit. Two crops are typically grown per year because brinjal can be harvested two or three times in a week (Ferdous 2007). It is cultivated in the agricultural fields as cash crop in the commercial vegetable growing areas and almost every rural household has few brinjal plants in the kitchen garden. Brinjal is an annual in temperate zones and perennial in the tropics plant grow to a height of 60 to 120 cm. (2-4 ft) and bears of a few large fruits which are oval shaped or an elongated oval. A warm season crops of brinjal requires continuous long warm weather during growth and fruit maturation. The optimum growing temperature is 22-30'C (72-86'F) and growth stop at temperature below 17'C (63' F) (Rahman, Z, 2015).

1.3 Brinjal as Food

Brinjal is known to be king of vegetables. It is liked by both poor as well as rich. It is very rich in nutritive value. Fiber and antioxidants are just two of the nutrients that make brinjal a food that can keep cancer at bay. Fiber helps clear the toxins present in digestive tract and has been found useful in the prevention of colon cancer. Additionally, the antioxidants help in fighting tree radical damage to cells which helps to keep cancer at bay. Brinjal contains potassium, an important mineral, which plays a key role in maintaining electrolyte balance in the body. It also helps in neutralizing the effects of sodium on the body thereby aiding in blood pressure control. Apart from this increased intake of anthocyanin's that are present in high amounts in brinjal, also lowers blood pressure. As brinjals are low in carbohydrates and high in fiber content, they are known to be good for people suffering from diabetes. This is because, the high fiber helps in controlling blood sugar levels in the body by controlling the absorption of glucose from food. Brinjal is rich in chlorogenic acid that acts as a powerful antioxidant agent, lowering cholesterol levels in the body. It also contains high amounts of fiber that increases the absorption of blood cholesterol by the liver to produce bile. Like most fruits and vegetables, brinjals are great for heart. Being rich in fiber, potassium, vitamin B-6 and phytonutrients like flavonoids, this vegetable lowers the risk of heart disease. The presence of antioxidants keeps arteries healthy and prevents heart attack. Eating brinjal can prevent brain damage as it contains phytonutrients that can protect cell membranes. These phytonutrients are also known to boost memory function and aid in transferring messages from one part of body to another. The food value of brinjal is given in the Table 1.1. The unripe brinjal fruit is primarily used as a cooked vegetable for the preparation of various dishes in different regions of the world. It is supposed to contain medicinal properties. White brinjal is said to be good for diabetic patients. Brinjal seeds are used to increase appetite, as they are believed to be good appetizer. Its leaves are taken to remove constipation and other intestinal problems (Chaudhary and Gaur, 2009).

1.4 Nutritional Characteristics of Brinjal

Brinjal consists of almost 95 percent of water and is superior in terms of fiber, folic acid etc. It has very small amount of fat and supplies 25 calories per serving. It contains good amounts of many essential B-complex groups of vitamins such as vitamin B5, vitamin B6, vitamin B1 & B3. These vitamins are essential in the sense that body requires them from external sources to replenish and required for fat, protein and carbohydrate metabolism. Further, this vegetable is also an excellent source of minerals like manganese, copper, iron and potassium.

Table 1.1 Nutritional Composition of Brinjal (All values are per 100 gm of edible portion)

Nutrients	Value	Nutrients	Value
Moisture	92.70%	Calcium	18.0 mg
Energy	24 Kcal	Magnesium	16.0 mg
Fiber	1.3 gm	Phosphorus	47.0 mg
Fat	0.3 gm	Iron	0.9 mg
Protein	1.4 gm	Sodium	3.0 mg
Carbohydrates	4.00%	Copper	0.17 mg
Vitamin A	6.4 mg	Potassium	2.0 mg
Vitamin B	0.15 mg	Sulphur	44.0 mg
Vitamin C	12.0 mg	Chlorine	52.0 mg
Oxalic acid	18.0 mg	ß-carotene	0.74 µg

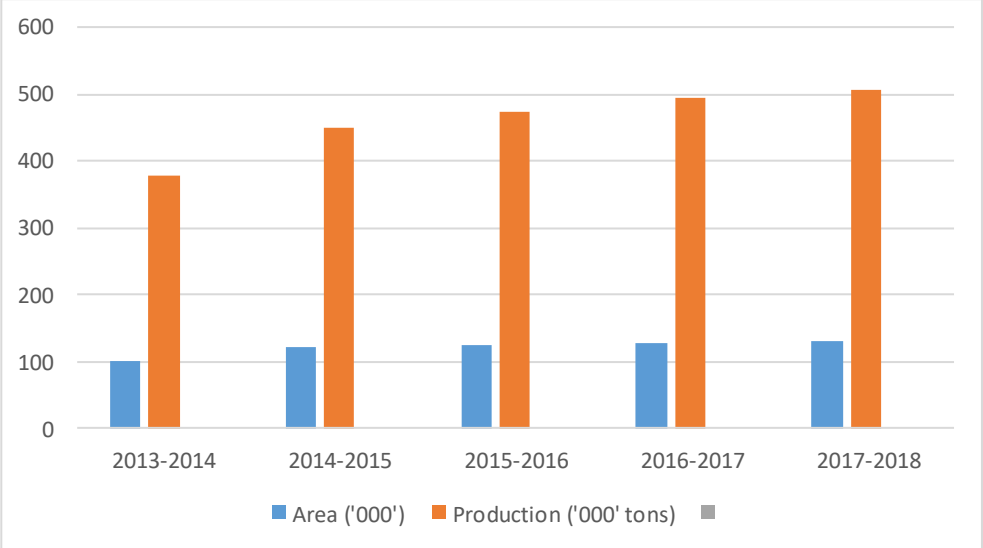
Source: (Chaudhary and Gaur, 2009) and (Chadha and Kalloo, 1993)

The antioxidant enzyme, superoxide dismutase utilizes manganese as a co-factor. Potassium is an important intracellular electrolyte that helps counter pressing (hypertension) effects of sodium.

1.5 Brinjal Cultivation in Bangladesh

Eggplant is a staple food in Bangladesh, India and other countries in South and Southeast Asia where it is called brinjal .In Bangladesh, it is the third most important vegetable in terms of cultivation and grown on about 50,000 hectares across the country (Chaudhary et al., 2018). Hence, eggplant is an important source of income to many villages' farmers. In Bangladesh, brinjal cultivation rate are increasing day by day. In figure 1.2, shows that the cultivation area for brinjal cultivation is 130 thousand acre and annual cultivation is 506 thousand ton in 2017-18 (BBS, 2019). It is cultivated in the agricultural fields as cash crop in the commercial vegetable growing areas and almost every rural household has few brinjal plants in the kitchen garden. In Bangladesh brinjal is classified into two categories in respect of cultivation period.

These are Rabi- brinjal and Kharif- brinjal. Though it is more or less available throughout the year, its peak supply comes during December to April. Brinjal grown in Bangladesh are of different varieties. They differ in size, shape and color as well. In Bangladesh, vegetables are grown on percent of the available agricultural land and yield 4 percent of the produce. Brinjal is by far the major vegetable representing some 41 percent by weight of all vegetables produced, occupying 19 percent of the land used to cultivate them. Farmers are cultivated over the years due to higher profit, relatively fast growing capacity, low risk involvement, east technological adoption, etc (Rashid, 2002). Farmers are provided with an assured income and resources as much-needed, nutritious vegetable, in the summer months when other vegetables are in short supply. Bangladesh is obtained the food sufficiency but the nutritional point of view, it has far away from achieve the safety and quality food production It is s profitable business as well as a nutritionally rich to serve the mass people



Source: BBS, 2019

Figure 1.2 Brinjal Cultivation in Bangladesh 2013-14 to 2017-18

1.6 Division Wise Brinjal Cultivation in Bangladesh (Kharif Season)

In Table 1.2, shows that the cultivation area for brinjal cultivation was highest in 11731 thousand acre and annual production was 50649 M.ton in 2017-18 (BBS, 2019) in Khulna Division.

Division	2014-2015		2015-2016		2016-2017		2017-2018	
	Area (acres)	Production (M.Ton)	Area (acres)	Production (M.Ton)	Area (acres)	Production (M.Ton)	Area (acres)	Production (M.Ton)
Barisal	797	895	733	760	768	892	1127	1470
Chattogram	3884	12428	3886	12412	40008	12761	4082	13036
Dhaka	8655	19240	8504	19841	8128	16758	8436	20254
Khulna	11956	35691	12159	55005	12328	52589	11731	50649
Mymensingh	3226	9098	3184	9563	3247	9574	3288	9755
Rajshahi	9482	40291	9918	44128	9727	43834	9765	43263
Rangpur	6913	19355	6898	20122	6955	21012	6598	19176
Sylhet	731	2794	786	2836	704	2471	733	2542
Bangladesh	**45644**	**139792**	**46068**	**164667**	**45665**	**159891**	**45760**	**160145**
Satkhira District	1099	4009	1087	3923	1083	3891	1132	3946
Status of Satkhira District	2.41 Percent	2.87 Percent	2.36 Percent	2.38 Percent	2.37 Percent	2.43 Percent	2.47 Percent	2.49 Percent

Source: BBS, 2019

Table 1.2 Area and Cultivation of Kharif Brinjal by Division 2014-15 to 2017-18

1.7 Division Wise Brinjal Cultivation in Bangladesh (Rabi Season)

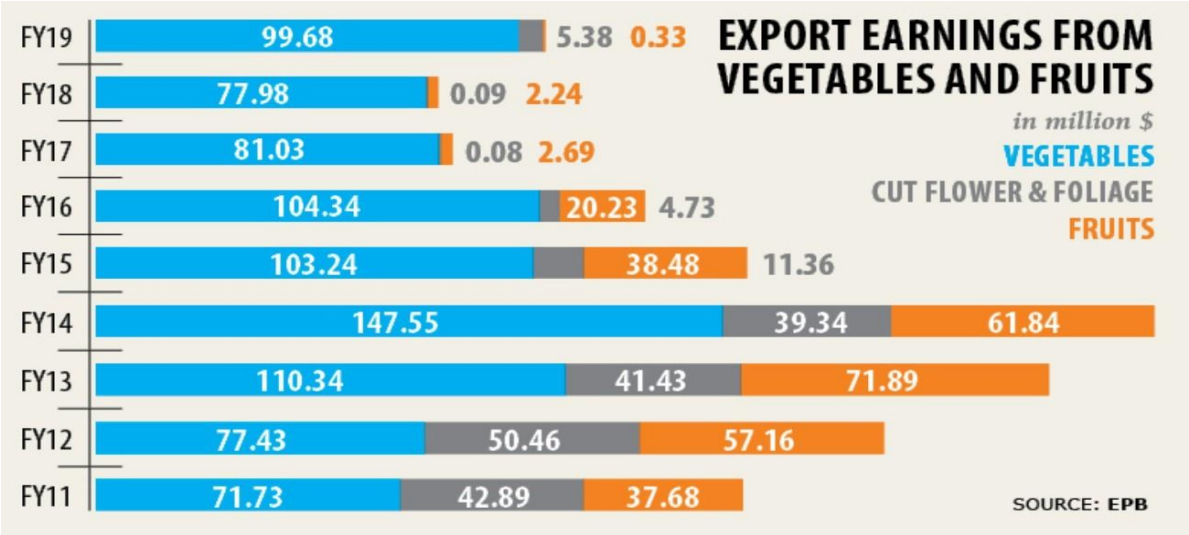
Division	2014-2015		2015-2016		2016-2017		2017-2018	
	Area (acres)	Production (M.Ton)	Area (acres)	Production (M.Ton)	Area (acres)	Production (M.Ton)	Area (acres)	Production (M.Ton)
Barisal	2046	4559	2224	5075	2311	4899	2416	5668
Chattogram	11195	35266	11433	35577	11363	35152	10995	36416
Dhaka	11197	47615	11132	47990	11591	53887	11832	56097
Khulna	13324	51270	13008	53074	13589	57005	13579	56610
Mymensingh	11948	58984	11927	64199	12087	60860	12693	61446
Rajshahi	12603	58082	12927	63019	13369	64122	13475	64376
Rangpur	11502	43614	12793	57525	12809	57498	12803	60045
Sylhet	2555	10964	3014	13691	3076	14118	2825	15204
Bangladesh	**76370**	**310354**	**78458**	**340150**	**80195**	**347541**	**80618**	**355862**
Satkhira District	1473	7898	1502	8015	1520	8155	1481	7842
Status of Satkhira District	1.92 Percent	2.54 Percent	1.91 Percent	2.36 Percent	1.89 Percent	2.34 Percent	1.83 Percent	2.20 Percent

Source: BBS, 2019

Table 1.3 Area and Cultivation of Rabi Brinjal by Divisiont 2014-15 to 2017-18

In Table 1.3, shows that the cultivation area for brinjal cultivation was highest in Khulna Division 13579 thousand acre but annual cultivation was highest in Rajshahi Division 64376 M. ton in 2017-18 (BBS, 2019).

1.8 Export Earnings From Vegetables



Source: EPB, 2019

Figure 1.3 Export Earnings From Vegetable

In Figure 1.3, shows that the export earning from vegetable was highest in 2014 that was 147.55 million US Dollar (EPB, 2019).

1.9 Justification of the Study

The economy of Bangladesh is based on agriculture which is transforming from traditional to modern system. In this transformation process the crop sector is of strategic importance to Bangladesh. This study will contributes to a better understanding of the factors which influence profitability and resource use efficiency of brinjal cultivation in Kalaroa and Tala upazila in Satkhira district. In addition, this study highlights how possible policy changes (e.g. increase of the fertilizer subsidy) might affect profitability and production of brinjal and how these factors can help to explain recent changes in agricultural land use in some parts of Kalaroa and Tala upazila of Satkhira district.

It is a matter of hope that government already emphasis about this subsector and different types of NGO also working how to improve production level and the efficiency in marketing might be achieved within a short span of time. Beside this, brinjal cultivation can make a potential contribution to our Gross Domestic Product (GDP) and can create employment opportunity.

The Study is justified on the following grounds:

- It would add new knowledge in the field of brinjal cultivation and build a foundation for further research.
- Brinjal cultivars and traders at different levels will be benefitted from the information generated through the study.
- The study might provide valuable information for the policy makers of Government and Non-Government Organizations to formulate policy in order to increase production and improvement of socio-economic status of the brinjal cultivators.
- The study might provide ideas about the potential factors for the brinjal cultivation.
- The study might provide ideas about profitability of brinjal cultivation in Bangladesh.

1.10 Specific Objectives of the Study

i. To know the socio economic characteristics of the farmers in the study area;
ii. To explore the profitability of brinjal cultivation;
iii. To determine the resources use efficiency of brinjal cultivation;
iv. To identify the problems faced by brinjal farmers.

1.11 Key Research Questions

- Is brinjal a profitable vegetable in the research area?
- What types of inputs are using in brinjal cultivation?
- What are the factors affecting in the cultivation process?

1.12 Statement of the Problems

Agriculture is the deliverance of Bangladesh. The most important livelihood of the people of Bangladesh is associated with Agriculture. Farmers of this country at the outset produce crops what satisfies family life wants then they exemplify interest on production of cash crop such as cotton, jute, tea, brinjal, tomato, coffee, and so on are mostly expected in dealing demand of home market and sell abroad in foreign currency in support of developing countries.

Vegetables are important for both domestic and export markets. Almost all households in Bangladesh include vegetables in their diets. Nutritionally, vegetables are good sources of vitamins, protein minerals and fiber. For those in the producing areas, vegetable production is a major source of income for farmers in time past the production of vegetables was largely subsistence, with a major portion of the produce consumed by the farm household. Due to increase in demand for winter season vegetables, however, producers now see brinjal cultivation as a business and produce all year round.

An efficient cultivation system is necessary to ensure increased production. The efficiency of the cultivation stem also important since it determines the producer's income, consumers living costs as well as facilitates the allocation of productive resources, among alternative uses. Brinjal are high value crops, which require intensive cultural practices and the financial, and labor inputs involved are therefore greater than those required for most staple crops. Brinjal has a substantial implication in nationalized economy.. This study was intended at determining causes of variation and aspect of success among farms growing brinjal; it is indispensable both for the farmers and planners to carry out a program considered for eliciting agricultural production. Updating knowledge on profitability of brinjal is one rationalization of this study. It is essential to evaluate substitute profitability of this investment in terms of land and other resources keen to brinjal cultivation. This research possibly will endow with a number of detailed benefits to the individual farmers for efficient operation and management of the farm and also to the research personnel for supplementary studies of related natural history and to the planners and policy makers who provide the farmers centrally for Marco- level strategy assessment.

1.13 Significance of the Study

Bangladeshi's age-old farming practices have taken a turn in recent years. There has been a technological breakthrough because of the evolution of high yielding variety seeds, increasing use of fertilizer, insecticides, pesticides, the installation of pumping sets, and factorization. The study will help provide scientific information on the necessary social and psychological factors that would influence the cultivation and any large scale brinjal cultivation in the study area as well as in Satkhira district. To maintain this tempo and pace of increased production through technological development, an assurance of remunerative prices to the farmers is a prerequisite and

this assurance can be given the farmer by developing an efficient marketing system. Thus the present study sought to provides answer to the following questions.

- What is per unit cost incurred and returns obtained from brinjal cultivation?
- What is the technological breakthrough has led to a substantial increase in cultivation on the farms and to the larger market?
- What are the possibilities of the resource for profit maximization?
- Various constraints hindering technological adoption and augmenting brinjal cultivation on sample farm etc. .

1.14 Outline of the Study

This thesis contains a total of eight chapters which have been organized in the following sequence. Chapter 1 includes introduction. The review of literature is presented in Chapter 2. Methodology of the relevant study is discussed in Chapter 3. Chapter 4 contains the socio-demographic profile of the brinjal producing farmers. Chapter 5 deals with the costs and returns of brinjal cultivation. Chapter 6 describes the factors affecting returns of brinjal cultivation. Chapter 7. Constraints problems of brinjal cultivation. Finally, Chapter 8 represents the summary, conclusions and policy recommendations.

CHAPTER 2
REVIEW OF LITERATURE

2.1 Introduction

The review of literature in any research is necessary as it provides a new dimension for reviewing the stock of knowledge and information relevant to the proposed research. Purpose of this chapter is to review the past research works which are related to present study. Available literature was intensively reviewed find out work in Bangladesh. The purpose of this chapter is to review literatures having relevance to the study. Many studies have been conducted on marketing of different agricultural commodities; a few studies are available on economic study of brinjal in Bangladesh, despite the importance of brinjal in the economy. A number of research studies had examined only production part or pest control part, but economic analysis of brinjal production is not undertaken covering all the activities related with input supply to the profitability of product to the farmers. However, some important studies on different aspects directly or indirectly related to the present study such as socioeconomic characteristics, methodological similarities etc. are reviewed. Some of the related findings of research carried out in this country or elsewhere are also reviewed in this section. This chapter identifies the methodology used in the previous studies, findings and also makes justification of conducting the present study in Bangladesh. Thus, it will be helpful to identify that what ought to be done more on this subject that means the existing research gap will be identified. With this end in view, literature and research works in the line with the present study were searched in the relevant libraries, research institutes, offices and websites. Some of the related findings of research carried out in this country or elsewhere are also reviewed in this section.

2.2 Brinjal Cultivation Related Studies

Rahman (2016) conducted a study on brinjal production in Jamalpur district through profitability analysis and factors affecting the production. Cobb-Douglas production function was applied to determine the effects of inputs on brinjal production. Human labor, seed cost, MP cost and pesticides have significant impact on brinjal production. The most important factor for variation in costs as identified was human labor and chemical fertilizers cost. Net return and cash margin of brinjal production were BDT

303,358 and BDT 345,415 per ha, respectively while the profit per Kg was BDT 6.63.Thus, brinjal is a highly profitable enterprise.

Afroza (2012) looked into the relative profitability of some selected winter vegetables like potato, brinjal and radish in two villages, Sutiakhali and Bhabakhali under Mymensingh Sadar thana. She showed that per hectare total and cash expenses of potato production were Tk. 27863 and 1067 respectively. On the other hand, net returns above full cost and cash cost were Tk. 20967 and 38160, respectively. She also revealed that per hectare total and cash expenses were Tk. 32181 and Tk.15022 for brinjal production and tk.18819 and 20132 for radish production, respectively. While the net returns above toll-costs and cash-costs were Tk. 2091 and Tk. 38010 for brinjal and Tk 10301 and Tk. 19449 for radish. She also found that factors such as sowing/ planting and harvesting were mostly responsible for variations in the yields of these vegetables.

Sangeetha and Banumathy (2011) conducted an economic analysis of major vegetables in Cuddalore district of Tamilnadu, India. The result of the regression analysis showed that there was a significant and negative relation between current price and current market arrivals of tomato and brinjal. Market arrivals played an important role in fixing current wholesale price rather than lagged price.

Barman (2008) had undertaken a comparative study to examine the efficiency of supermarket and conventional marketing channels of winter vegetable in Dhaka city. The average marketing cost of vegetable per ton was Tk, 481 and Tk. 453 respectively in supermarket and conventional market. The corresponding net margins were Tk. 11,988 per ton and Tk. 7,544 per ton respectively. The result indicated that the margin of super market was higher than conventional market. Marketing channel was more efficient in supermarket. The market efficiency of super market in conventional, Shepherd's and Acharya's method was 13.45, 78.95 and 4.87 respectively. It was 9.33, 78.93 and 746 respectively in conventional market.

Ferdous (2007) conducted a study on production and marketing of brinjal in selected area of Mymensingh. The researcher highlighted the basic information on socioeconomic characteristics, profitability, marketing cost at margin, price variation

and problems of farmer and different intermediaries. Per hectare gross return and net return were calculated Tk.108200 and Tk. 16190 respectively. Benefit Cost Ratio of brinjal was 1.18, The study revealed that the marketing cost per quintal of brinjal for Paikar, Aratdar and Retailer were Tk. 65, Tk. 10 and Tk. 71 respectively. Profit per quintal of brinjal was Tk. 35, Tk. 71 and Tk. 54 respectively for Paikar, Aratdar and Retailer. The average marketing margin was Tk. 92 per quintal. The Season at price variation was highest in the month of November and lowest in the month of January.

Halder (2003) carried a study on marketing of winter vegetable in selected areas of Bangladesh. The study revealed that per quintal marketing cost tomato was higher than that of Rabi-brinjal, cauliflower and cabbage. But per hectare marketing cost was higher for Rabi-brinjal than that of tomato, cauliflower and cabbage. The net return was higher for Rabi-brinjal than that tomato, cauliflower and cabbage. The study also found that the marketing loss of selected winter vegetables at different level of marketing shows that average 17 percent marketed vegetables were lost of which 11 percent at retail level. Higher loss at wholesale level was mainly due to the insufficient transport facilities, movement for long distance and unskilled handling of products.

Islam et al. (2000) carried out a study on economic analysis of winter vegetables like brinjal, cabbage, radish and tomato in the village Sutiakhali, Sutiakhali Union in sadar Thana of Mymensingh district. He showed that per ha of brinjal production was Tk 66,653.95 of which cash and non cash expenses amounted to Tk 32,216 and 34,407 respectively. Gross expense for producing per hectare of cabbage was Tk. 67248.10 of which 47.23 and 52.77 percent were cash and noncash expenses respectively. While net returns above cash and gross expenses were Tk. 45481 and 15719 respectively.

Sultana (1992) carried out the relative profitability of some selected winter vegetables like potato, brinjal and radish in the two villages, namely Sutiakhali and Bhabokhali under Mymensingh Sadar Thana. She showed that Per hectare total and cash-expenses of potato production were Tk. 2/863.00 and 10/0.00, respectively. On the other hand, net returns above full cost and Cash costs were Tk. 20967.00 and 38160.00 respectively. She also observed that Per hectare total and cash expenses were Tk. 32181 and 15022 for brinjal production and Tk. 18819 and 6132 for radish

production, respectively. On the other hand, the net returns above full-costs and cash-costs stood at IK. 2091and 5010 or brinjal Tk. 6561 and 19449 for radish. She also found that the factors such as sowing/planting and harvesting dates were mostly responsible for the variations in the yields of these vegetables.

Hossian (1974) conducted a short analysis of consumer demand for brinjal in Mymensingh town. The elasticity of brinjal has been estimated to be from 0,38 to 0.94, which indicated that one percent increase (or decrease) in consumers aggregate expenditure would bring less than one percent increase (or decrease) in the quantity of brinjal demanded. The computed elasticity with respect to aggregate expenditure indicated that brinjal has an inelastic demand with per capita daily consumption of brinjal was estimated to be 0.93 seen during its peak supply period. The income elasticity of brinjal for the urban panel consumers was estimated to from 0.38 to 0.94, which indicated that brinjal was a normal good and not a luxury food item of urban consumers. Price elasticities of brinjal ranged from -0.56 to -1.26 for low income people, and it ranges from -U.6l to -0.95 for high income people.

Naim-uzzaman (2004) conducted a study on comparative profitability and technical efficiency of brinjal, yard long bean and cucumber cultivation in Comilla district. Based on full cost, the average cost per hectare for brinjal, yard long bean and cucumber farmers were Tk. 45205, Tk. 49995, Tk. 47760 respectively. The cost of yard long bean was high compared to other because it need more labor and material input cost. Human labor constituted the highest cost for all vegetable which was 29 72%, 30.95% and 30.4% of total cost for brinjal, yard long bean and cucumber farmers respectively. On the basis of cash cost, the average cash cost per hectare for brinjal, yard long bean and cucumber farmers were Tk. 24616, Tk. 26950, Tk. 26159 lively. Among all the vegetable the highest yield per hectare was obtained by cucumber growers (14589 Kg.) followed by brinjal (12651 Kg.) and yard long bean (12128 Kg.) farmers. Per hectare gross return of brinjal was highest than yard long bean and cucumber. Per hectare gross margin of brinjal, yard long bean and cucumber cultivation were TK. 74093, TK. 60384 and TK. 57613 respectively. Gross margin was high in brinjal because it need less cash cost than other vegetable. Per hectare net return of brinjal, yard long bean and cucumber on full cost basis were TK. 53504, TK. 37339 and TK. 36012 respectively that indicates that net return was highest in brinjal

and followed by yard long bean and cucumber because the market price is high for brinjal though yield is high in cucumber. Seed cost, fertilizer cost, irrigation cost, pesticide cost, land use cost were significantly increased the production of brinjal. On the other hand, human labor use, power, land use cost, pesticide cost and irrigation cost had significant impact on yard long bean production in case of cucumber human labor, animal power cost, seed cost and pesticide cost are also significant. The mean technical efficiency of brinjal production is 89%, which cans that they are making production loss of 11% due to inefficiency factors. Again mean technical efficiency of yard long bean and cucumber production is 86% and 90% respectively, that means farmers are making production loss of 14% and 10% in ease of yard long bean and cucumber production, due to inefficiency factors.

Kumar et al. (2010) conducted a study on Economic Benefits of Bt brinjal. An Ex-Ante Assessment. The study revealed that Bt brinjal has enormous potential to benefit both consumers and producers. Field cultivation of Bt brinjal would add between 30 thousand tones and 119 thousand tones to total production from the existing area under it. A considerable increase in net returns from Bt hybrids is also expected. The consumers would gain by reduction in output prices and increased consumption of brinjal. The absolute gain in economic surplus from Bt brinjal hybrids could be Rs 577 coror annually at the country level under scenario I (assuming adoption rate of 15%). The expected economic surplus would be of Rs 1167 crore, under scenario II (adoption rate of 30%), and of Rs 2387 cror under scenario III (adoption rate of 60%). About 66% of the overall potential gains accrue to consumers, who would benefit from a technology-induced decrease in brinjal sale price. Since brinjal in India is an important vegetable across the low-income households, the price decrease is pro-poor. Positive nutritional effects can be expected from increased vegetable consumption. On the other hand, brinjal farmers would benefit from Bt technology as increase in productivity will be larger than drop in market prices.

Mahajan et al. (1994) conducted a survey on brinjal and tomato production in Thane district of Maharastra. The paper analyses the economics of aubergine and tomato production in Thanedistrict, Maharastra, India. Data for the 1989/90 rabi season were collected from 100 aubergine and tomato growers randomly selected from Vasai, Palghar and Dahanu tahsils. Per ha cost of cultivation was Rs 14714.76 and Rs

16690.95, for aubergine and tomato, respectively. Per ha gross return was Rs 2371565 and Rs 23755.50, or aubergine and tomato respectively. The corresponding figures for per ha net returns were Rs 9000.89 and Rs 7064.55, with benefit-cost ratios of 1.20 and 1.07 respectively.

Sailaja (1998) using data collected from 90 farmers in Guntur district, Andhra Pradesh, the resources use efficiency and productivity of tomato, brinjal, cauliflower and coccinia production are examined Results indicate that vegetable production is profitable despite major constraints such as the non-availability of quality seed, inadequate credit and marketing facilities, shortage of water and inefficiency in post-harvest handling.

2.3 Concluding Remarks

The above-mentioned discussion and review indicates that literature on profitability and resource use efficiency of brinjal cultivation was considerably inadequate particularly at Satkhira district in Bangladesh. A number of attempts were made to investigate socio-economic aspects of yield gap, profitability, growth performance, farm level technical efficiency and sustainability of brinjal cultivation in other countries, but no systematic study was available in Bangladesh regarding profitability and resource use efficiency of brinjal production. On the other hand, a few efficiency studies regarding rice, poultry and fish farming in Bangladesh are available, but no systematic farm level efficiency study on the second most important vegetable like brinjal has not been carried out. Moreover, no research has been done to identify the reasons of inefficiency of brinjal farmers in Bangladesh. Therefore, the proposed study will contribute significantly to identify and measure the inefficiency factors of brinjal cultivation and to generate valuable knowledge and information which would be highly useful both at micro and macro level to farmers, GOs and NGOs and policy makers for formulating appropriate policy for widespread cultivation of brinjal in Bangladesh.

CHAPTER 3
MATERIALS AND METHODOLOGY

3.1 Introduction

This chapter presents a detailed sequential steps of research work for instance, selection of the study areas, selection of study period, sources of data, processing of data and analytical techniques.

3.2 Description of the Study Area

3.2.1Location

Figure 3.1 Map of Kalaroa Upazila Showing the Study Area

Kalaroa is a border upazila in Satkhira district of Khulna division in Bangladesh. Kalaroa upazila (Satkhira district) area 232.64 sq km, located in between 22°48' and 22°57' north latitudes and in between 88°54' and 89°09' east longitudes. It is bounded by Sharsha, Jhikargachha and Manirampur upazilas on the north, Satkhira sadar and Tala upazilas on the south, Keshabpur, Manirampur and Tala upazilas and the Kobadak river on the east, West Bengal state of India on the west.

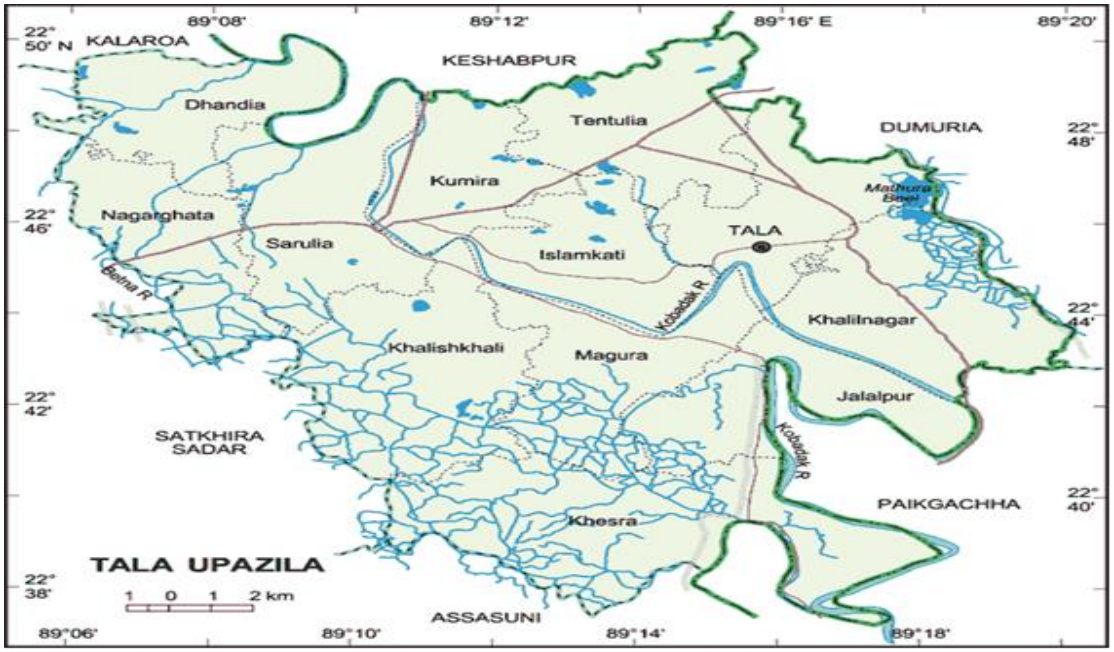


Figure 3.2 Map of Tala Upazila Showing the Study Area

Tala upazila (Satkhira district) area 344.15 sq km, located in between 22°32' and 22°50' north latitudes and in between 89°05' and 89°20' east longitudes. It is bounded by Kalaroa, Keshabpur and Dumuria upazilas on the north, Assasuni upazila on the south, Dumuria and Paikgachha upazilas on the east, Satkhira sadar upazila on the west.(Banglapedia,2019)

3.3 Area and Population

Kalaroa Thana was formed in 1851 and it was turned into an upazila in 1983. Once Kalaroa was the headquarters of Satkhira Sub Division which was transferred to Satkhira in 1961. It consists of 1municipality,11 unions,112 mouzas,136 villages. Kalaroa had a population of 237,992. Males constituted 49.08 percent of the population and females 50.92 percent. Muslims formed 93.89 percent of the population, Hindus 5.19 percent, Christians 0.76 percent and others 0.15 percent Its density of population 1000 per km2 (2,600/sq mi).

Tala Thana was formed in 1913 and it was turned into an upazila in 1989.It consists of 12 unions,150 mouzas, 230 villages. Tala had a population of 299,820. Males constituted 49.83 percent of the population and females 50.17 percent Muslims formed 73.46 percent of the population, Hindus 25.76 percent, Christians 0.62 percent and others 0.16%.Its density of population is 870/km2 (2,300/sq mi).(Banglapedia,2019)Climate of Kalaroa & Tala upazila is semi humid in summer

and cold in winter. Annual average temperature of this area is 34.5°C; maximum 36°C in May and minimum10.5°C in January. Humidity is about 70 percent on an average. Annual average rainfall of this area is 1700 millimeters (BBS, 2018).

3.4 Selection of the Study Area

Satkhira district was selected as one of the major brinjal cultivating area in Bangladesh, where Kalaroa and Tala upazilas are most famous for its production and partially fulfill the demand within country and abroad. The research on profitability and resource use efficiency of brinjal production in these particular places have not been conducted. For selection of the study area a preliminary visit was made in the respective areas. Four villages namely Ramkrisnapur, Sonabaria from Kalaroa and Dhandia, Fulbari from Tala upazila under Satkhira district which are the extensive brinjal producing areas were selected with the consultation of Department of Agricultural Extension (DAE) personnel of the respective upazilas and district. Random sampling technique was applied for selecting the brinjal cultivars in these areas.

The reasons for selecting this study area are given below:

- These villages had some identical characteristics like homogeneous soil type, topographical and climatic condition for brinjal cultivation.
- Easy accessibility and good communication facilities.
- Comparatively higher concentration of brinjal cultivation.
- Getting well co-operation from the selected respondents and
- No such study was conducted in this area.

3.5 Sources of Data

For the present study data were collected from the primary and secondary sources. Primary data were obtained from the brinjal farmers and secondary data were collected from various published sources. Main secondary data sources were Ministry of Finance, Bangladesh Bureau of Statistics (BBS), Department of Agricultural Extension (DAE), Export Promotion Bureau, Bangladesh Bank (BB), and other related agencies in Bangladesh.

3.6 Selection of Samples and Sampling Techniques

It is not possible to make a farm business survey covering all farmers. So sampling was done to represent some farms to minimize time and cost of the study. The purpose of sampling is to select a sub-set of the population that is representative of the population. It would be necessary only to select one individual to identify the population characteristics. The term 'population refers to the households, the farms etc. where a sample is representative under a study. The sampling process requires five activities

- Specification of the sampling unit.
- Preparation of an adequate sample frame.
- Selection of the sampling method.
- Determination of the sample size.
- Selection of the sample.

3.7 Data Collection Method and Time Frame

Data were amassed from four villages such as Sonabaria, Ramkrisnapur in Sonabaria union and Dhandia, Fulbari in Dhandia union under Kalaroa and Tala upazilas. Twenty respondents were interviewed from each village for gathering data. Data were collected by using a structured questionnaire during January to March, 2019.

Table 3.1 List of Villages with Sample Size

Upazila	Union	Villages	Sample size
Kalaroa	Sonabaria	Ramkrisnapur	20
		Sonabaria	20
Tala	Dhandia	Dhandia	20
		Fulbari	20
Total			**80**

3.8 Methods of Data Collection and Data Collecting Instruments

Both technical and socio-economic data were needed for this research. The researcher himself was collected the data by interviewing the selected respondents.

The measures taken were:

- Built-in-check in the interview schedule;
- Field checking and
- Independent re-interviewing of the respondents.

3.9 Preparation of the Survey Schedule

Preparation of survey schedules is of crucial importance in this study. A comprehensive survey schedule was prepared to collect necessary information from the concerned respondent in such a way that all relevant information needed for brinjal cultivation could be easily obtained within the shortest possible time. The interview schedule was pretested for judging their suitability. After pre testing, the schedule was finalized.

3.10 Collection of Data

To satisfy the objectives of the study, necessary data were collected by visiting each farm personally and by interviewing them with the help of a pretested interview schedule. Usually most of the respondent does not keep records of their activities. Hence it is very difficult to collect actual data and the researcher has to rely on the memory of the respondent. Before going to an actual interview, a brief introduction of the aims and objectives of the study was given to each respondent. The question was asked systematically in a very simple manner and the information was recorded on the interview schedule. When each interview was over the interview schedule was checked and verified to be sure that information to each of the items had been properly recorded. In order to minimize errors, data were collected in local units. These were subsequently converted into appropriate standard unit.

Data collection period was 1 st January to 31st March, 2019. In order to obtain reliable data the researcher initially visited for several times to introduces himself with the people of the study areas during the season. Secondary data were collected through literature and different publications from Bangladesh Bureau of Statistics (BBS), Department of Agricultural Extension (DAE) and Bangladesh Bank (BB) etc.

3.11 Editing and Tabulation of Data

After collection of primary data, the filled schedules were edited for analysis. These data were verified to eliminate possible errors and inconsistencies. All the collected data were summarized and scrutinized carefully. For data entry and data analysis, the Microsoft Excel programs and SPSS programs were used. It might be observed here that information was collected initially in local units and after checking the collected data, it was converted into standard units. Finally, a few relevant tables were prepared according to necessity of analysis to meet the objectives of the study.

3.12 Analytical Techniques

Production function is a relation (or mathematical relationship) specifying the maximum output that can be produced with given inputs for a given level of technology. It applies to a firm or as an aggregate production function to the economy as a whole. Functional analysis was employed to show the individual effect of input use and other related factors of producing brinjal. The Cobb-Douglas production function was use to estimate the effects of key variables to the cultivation of brinjal.

The stochastic Cobb-Douglas production frontier model was used for estimating technical efficiency of brinjal producer in the study areas and the model is given below:

$$Y= aX_1^{b1}\ aX_2^{b2}\ aX_3^{b3}\ aX_4^{b4}\ aX_5^{b5}\ aX_6^{b6}\ aX_7^{b7} aX_8^{b8} e^{ui}$$

To identify the factors affecting the gross return on brinjal production, the Cobb-Douglas production function has used:

$$\ln Y = \ln b_o + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + b_9 \ln X_9$$

Where,

X_1 = Cost of human labor per hectare (Taka),

X_2= Cost of power tiller per hectare (Taka),

X_3= Cost of seed per hectare (Taka),

X_4= Cost of manure per hectare (Taka),

X_5 = Cost of urea per hectare (Taka),

X_6 = Cost of TSP per hectare (Taka),

X_7 = Cost of MP per hectare (Taka),

X_8 = Cost of irrigation per hectare (Taka),

X_9 = Cost of pesticide per hectare (Taka).

b_0= Intercept and b_1…….b_9= parameters

3.13 Procedure of Computation of Costs

The farmers cultivating brinjal had to incur cost for different inputs used in the cultivation process. The input items were valued at the prevailing market price and sometime at government price in the area during survey period, or at the priced at which farmers bought. Sometimes, the farmers purchased hired labor, seed, fertilizer, manure and insecticide from the market and it was easy to pricing these items. But, farmers did not pay cash for some input such as family labor, home supplied seed, manure etc. So it was very difficult to calculate the cost of production of these inputs. In this case opportunity cost principle was used. In calculating the production cost, the following components of cost were considered in this study area:

- Human labor
- Cost of Power Tiller/ Land preparation/ Mechanical power cost
- Seed/seedling
- Manure
- Fertilizer
- Insecticides
- Irrigation
- Pesticides cost
- Interest on operating capital and
- Land use

3.13.1 Cost of Human Labor

Human labor cost appeared to be the most important component of cultivation. Human labor was required for different operations like 1and preparation, transplanting, sowing, weeding, fertilizer application, irrigation, harvesting, storing, marketing .and so on. Human labor cost was classified into two categories family labor and hired labor. Family labor consists of the farm operator himself. Family labor cost was calculated by applying the principle of opportunity cost. In the study areas

the average wage rate was estimated at TK. 350.00 per man-day. Eight hours of work were equivalent to one man-day in pricing the labor no discrimination was made between the family and the hired labor. Family labor was priced at the prevailing wage paid in cash to hired labor. There was no fixed wage rate all over the season and different wage rates were found for different activities in different seasons.

3.13.2 Cost of Power Tiller

Now a day's power tiller is widely used in lieu of animal power, because power tiller is cheaper and less time consuming than draft power. In the study area, the sample farmers used power tiller on rental basis for land preparation. Few of the farmers used their own power tiller, A power tiller owner supplied fuel as well as driver for land preparation. On an average per decimal ploughing cost was Tk. 40. The rent of power tiller was considered as the actual amount of money paid by the farmers in cash.

3.13.3 Cost of Seedling

The cost of seedling is important item for brinjal cultivation. In the selected study areas, the farmers used seedlings for brinjal cultivation. Family supplied seeds/seedlings were priced at the prevailing market price and. cost of purchased seedlings was priced on the basis of actual price paid by the farmers in the study areas. For per decimal, on the average farmers used 60 numbers of seedlings in the study areas. In general one seedling was purchased by Tk.1.

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3.13.4 Cost of Manure

Organic manure mainly includes in cow dung, oil cake. In the study areas farmers used cow dung and oil cake as organic fertilizer. The average market price of cow dung and oil cake was estimated at Tk. 1 and Tk. 20 per kg respectively.

3.13.5 Cost of Fertilizer

It is very important for brinjal cultivation to use the fertilizer in recommended dose. In the study area, farmers used mainly three types of chemical fertilizer i.e., Urea, TSP (Triple Super Phosphate), MP (Muriate of Potash) for growing brinjal cultivation. Fertilizer cost was calculated according to the actual price paid by the farmers.

3.13.6 Cost of Insecticide

Most of the sample farmers used Dithane M-45, Thiovit 80wp and Rovral 50wp for brinjal production. The cost of these insecticides was calculated by the prices paid by farmers.

3.13.8 Cost of Irrigation

The cost of irrigation included the rental charge of machine plus the costs of fuel. Someone rent/borrow only water from the shallow tube well (STW) owners by paying some charge.

3.13.9 Interest on operating capital

Interest cost was compute at the rate of 12% per annum. It was assumed that if farmers would take loans from a bank, they would have to pay interest at the above mentioned rate. Since all expenses were not incurred it the beginning of the production process, rather they were spent throughout the whole production period the cost of operating was, therefore, computed by using the following formula:

$$\text{Interest on operating capital} = \frac{\text{Operating Capital} * \text{Rate of interest x Time}}{2}$$

This actually represented the average operating costs over the period because all costs were not incurred at the beginning or at any fixed time. The cost was charged for a period of 6 months at the rate of Tk. 12 per annum.

3.13.10 Land Use Cost

The price of land was different for different plots depending upon location and topography of the soil. The cost of land used was estimated by the cash rental value of land. In calculating land use cost, average rental value of land per hectare for a particular year. In computing rental value of land of the land used cost (LUC), it was calculated according to farmer's statement.

3.14 Profitability Analysis

Cost and return analysis is the most common method of determining and comparing the profitability of different farm household. In the present study, the profitability of

brinjal cultivation is calculated by the following way-

3.14.1 Calculation of Gross Return

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

Gross Return= Quantity of the product * Average price of the product.

3.14.2 Calculation of Gross Margin

Gross margin is defined as the difference between gross return and variable costs. Generally, farmers want maximum return over variable cost of production. 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.

3.14.3 Calculation of Net Return

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

Net return = Total return – Total production cost.

The following conventional profit equation was applied to examine farmer's profitability level of brinjal producing farms in the study areas.

$$\text{Net profit, } \pi = \Sigma P_m Q_m - TFC.$$

Where,

π = Net profit/Net return from brinjal cultivation (Tk/ha);

P_m = Per unit price of brinjal (Tk/kg);

Q_m = Total quantity of the brinjal cultivation (kg/ha);

TFC = Total fixed cost (Tk) and

i = 1, 2, 3,....., n (number of inputs).

3.14.4 Undiscounted Benefit Cost Ratio (BCR)

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

to total cost per hectare.

$$\textbf{BCR} = \frac{\textbf{Total Return}}{\text{Total Cost}}$$

- If BCR > 1, the project is expected to deliver a positive net present value to a firm and its investors.
- If BCR<1, the projects costs outweigh the benefits and it should not be considered.
- If BCR=1, the ratio indicates that the NVP of project equals to the cost.

3.15 Measurement of Resource Use Efficiency of Brinjal Production

In order to test the efficiency, the ratio of Marginal Value Product (MVP) to the Marginal Factor Cost (MFC) for each input were computed and tested for its equality to 1. i.e., MVP/MFC = 1.

The marginal productivity of a particular resource represents the additional to gross returns in value term caused by an additional one unit of that resource, while other inputs are held constant. When the marginal physical product (MPP) is multiplied by the product price per unit, the MVP is obtained. The most reliable, perhaps the most useful estimate of MVP is obtained by taking resources (Xi) as well as gross return (Y) at their geometric means.

That is, $\frac{MVP}{MFC} = r$

Where, r = Efficiency ratio MVP = value of change in output resulting from a unit change in variable input (BDT) MFC = price paid for the unit of variable input (BDT)

Under this method, the decision rules are that, when: r >1, the level of resource use is below the optimum level, implying under-utilization of resources. Increasing the rate of use of that resource will help increase productivity. r <1, the level of resources use is above the optimum level, implying over utilization of resources. Reducing the rate of use of that resource will help improve productivity. r = 1, the level of resource use is at optimum implying efficient resource utilization.

The most reliable, perhaps the most useful estimate of MVP is obtained by taking all input resources (Xi) and gross return (Y) at their geometric means (Dhawan and

Bansal, 1977). All the variables of the fitted model were calculated in monetary value. As a result the slope co-efficient of those independent variables in the model represent the MVPs, which were estimated by multiplying the production co-efficient of given resources with the ratio of geometric mean (GM) of gross return to the geometric mean (GM) of the given resources, that is,

$$MVP\ (Xi) = \beta_i \quad \frac{\bar{Y}(GM)}{\ddot{X}i(GM)}$$

Where, $\bar{Y}$ (GM) = Geometric mean of gross return (BDT)

$\ddot{X}i$ (GM) = Geometric mean of different independent variables (BDT)

β_i = Co-efficient of parameter

i = 1, 2,……..n

3.16 Problem Faced in Collecting Data

During the period of data collection, the researcher faced the following problems.

- Most of the farmers felt disturbed to answer questions since they thought that the researcher might use the information against their interest. To earn the confidence of the farmers a great deal of time was spent.
- The farmers do not keep records of their activities and day to day expenses. Therefore the author had to depend upon their memory.
- The farmers were usually busy with their field works. So, the researcher sometimes also had to pay extra visits to meet the farmer.

CHAPTER 4
SOCIO-ECONOMIC CHARACTERISTICS OF THE BRINJAL FARMERS

4.1 Introduction

This chapter deals with the socioeconomic characteristics of the sample farmers. Socioeconomic characteristics of the farmers are important in influencing production planning. People differ from one another in many respects. Behavior of an individual is largely determined by his/her characteristics. There are numerous interrelated and constituent attributes that characterize an individual and profoundly influence development of his/her behavior and personality. It was, therefore, assumed that enterprise combination, consumption pattern, purchase pattern, and employment patterns of different farm household would be influenced by their various characteristics. Finally socioeconomic aspects of the sample households were examined.

4.2 Selected Characteristics of the Farmers

Nine characteristics of the farmers were selected for this research. The characteristics include: age, level of education, family size, experience in brinjal cultivation, farm size, land under brinjal cultivation, annual family income, family types and family expenditure.

4.2.1 Age

Age of the farmers ranged from 17 to 74 years. On the basis of age, the farmers were classified into three categories: (17 to 30 years), (31-45 years) and (above 45). The distribution of the brinjal farmers according to their age is shown in Table 4.1.

Table 4.1 Distribution of the Farmers According to Their Age

Age Categories (Years)	Kalaroa upazila		Tala upazila	
	Unit	Percent	Unit	Percent
Young Aged (Up to 30)	16	40	17	42.5
Middle Aged (31-45)	17	42.5	18	45
Above 45 years	7	17.5	5	12.5
Total	**40**	**100**	**40**	**100**

(Source: Field Survey, 2019)

Analyses of data furnished in Table 4.1 showed that majority (42.5 and 45) percent of the farmers in both upazilas were middle aged as compared to (40 and 42.5) percent being young and (17.5 and12.5) percent being old categories respectively. Almost (82.5 to 87.5) of the farmers fell in the young to middle aged category. This indicates that decision making in relating of farming aspects in the study area could have considerable influence by young and middle aged farmers.

4.2.2 Level of Education

The education scores of the farmers ranged from 0 to 16 and the average was 4.33. On the basis of their educational scores, the brinjal farmers were classified into four categories, namely "illiterate (0-0.5), primary (1-5), secondary (6-10) and above secondary (above 10). The distribution of the farmers according to their education is shown in Table 4.2.

Table 4.2 Distribution of the Farmers According to Their Education

Categories (Years of Schooling)	Kalaroa upazila		Tala upazila	
	Unit	Percent	Unit	Percent
Illiterate/Can Sign Only(0-0.5)	21	52.5	19	47.5
Primary Level(1-5)	7	17.5	5	12.5
Secondary Level(6-10)	8	20	1	27.5
Above Secondary Level(>10)	4	10	3	7.5
Total	**40**	**100**	**40**	**100**

(Source: Field Survey, 2019)

Table 4.2 indicated that the majority (52.5 and 47.5 percent) of the brinjal farmers had illiterate compared to 20 and 27.5 percent of them having secondary level of education. About 17.5 and 12.5 percent of the farmers were primary level of education, while 10 and 7.5 percent had above secondary level of education.

4.2.3 Family Size

The family size of the brinjal farmers ranged from 2 to 9 members. On the basis of their family size the farmers were classified into the following three categories: "small family" (up to 4), "medium family" (5-6) and "large family" (above 6). Table 4.3 contains the distribution of the brinjal farmers according to their family size.

Table 4.3 Distribution of Farmers According to Their Family Size

Categories (Person)	Kalaroa upazila		Tala upazila	
	Unit	Percent	Unit	Percent
Small family(2-4)	10	25	8	20
Medium family(5-6)	17	42.5	20	50
Large family(>6)	13	32.5	12	30
Total	**40**	**100**	**40**	**100**

(Source: Field Survey, 2019)

Table 4.3 showed that the majority (42.5 and 50) percent of the brinjal farmers had "medium family" of 5 to 6 members compared to more different than (32.5 and 30) percent of them having "large family" of above 6 members. The proportion of "small family" had (25 and 20) percent.

4.2.4 Family Types

Family Types by the farmers varied from 1 to 2. Based on their family types, the farmers were classified into two categories namely nuclear family and joint family. The distribution of the brinjal farmers according to their family types is presented in Table 4.4.

Table 4.4 Classification of the Respondents According to Their Family Types

Family Types	**Kalaroa upazila**		**Tala upazila**	
	Unit	Percent	Unit	Percent
Nuclear family	25	62.5	24	60
Joint family	15	37.5	16	40
Total	**40**	**100**	**40**	**100**

(Source: Field Survey, 2019)

Data presented in Table 4.4 indicates that majority (62.5 and 60) percent of the respondents had nuclear family and (37.5 and 40) percent of the farmers had joint family types.

4.2.5 Experience in Brinjal Cultivation

The experience score of the respondents ranged from 2 to 60. On the basis of experience, the respondents were classified into three categories namely, low experience, medium experience and high experience, as shown in Table 4.5.

Table 4.5 Distribution of the Farmers According to Their Experience

Categories (Years)	Kalaroa upazila		Tala upazila	
	Unit	Percent	Unit	Percent
Low (2-20)	8	20	10	25
Medium (21-40)	25	62.5	24	60
High (above 40)	7	17.5	6	15
Total	**40**	**100**	**40**	**100**

(Source: Field survey, 2019)

Data contained in the Table 4.5 revealed that the majority (62.5 and 60) percent of the farmers had medium experience as compared to (20 and 25) percent and (17.5 and 15) percent having low and high experience respectively.

4.2.6 Farm Size

The farm size of the respondents varied from 0.05 to 3.95 hectares. The respondents were classified into the following three categories based on their farm size: "marginal farm" (upto 0.2 ha), "small farm" (0.21 – 1.0 ha) "medium farm" (1.0 -3.0) and ‘large farm’ (above 3 ha) (DAE, 1999). The distribution of the farmers according to their farm size is shown in Table 4.6.

Table 4.6 Distribution of the Farmers According to Their Farm Size

Categories (Hectare)	**Kalaroa upazila**		**Tala upazila**	
	Unit	Percent	Unit	Percent
Marginal farm(up to 0.2 ha)	1	2.5	2	5
Small farm(0.21-1.0 ha)	19	47.5	21	52.5
Medium farm(1.01-3.00 ha)	18	45	16	40
Large farm (>3 ha)	2	5	1	2.5
Total	**40**	**100**	**40**	**100**

(Source: Field Survey, 2019)

Table 4.6 indicated that the highest (47.5 and 52.5 percent) of the farmers possessed small farms compared to 45 and 40 percent of them having medium farms and 2.5 and 5 percent of the farmers had marginal farms. Only 5 percent and 2.5 percent of the farmer has large farm. Majority of the farmers were under medium farmer's category which is consistent with national scenario.

4.2.7 Land Under Brinjal Cultivation

Land under brinjal production of the respondents varied from 0.06 to 4.80 hectares. The respondents were classified into the following four categories based on their farm size. The distribution of the farmers according to their land under brinjal cultivation is shown in Table 4.7.

Table 4.7 Distribution of the Farmers According to Their Land Under Brinjal Cultivation

Categories (Hectare)	**Kalaroa upazila**		**Tala upazila**	
	Unit	Percent	Unit	Percent
Marginal farm(up to 0.2 ha)	6	15	7	17.5
Small farm(0.21-1.0 ha)	22	55	17	42.5
Medium farm(1.01-3.00 ha)	11	27.5	16	40
Large farm (>3 ha)	1	2.5	0	
Total	**40**	**100**	**40**	**100**

(Source: Field Survey, 2019)

Table 4.7 indicated that the highest (55 and 42.5) percent of the farmers possessed small farm under brinjal cultivation in Kalaroa and Tala upazila respectively compared to 27.5 and 40 percent of them having medium farm under brinjal cultivation and 15 and 17.5 percent had marginal farm under brinjal cultivation. Only 2.5 percent of the farmer had large farm under brinjal cultivation in Kalaroa upazila but farmers in Tala upazila had no large farm under brinjal cultivation.

4.2.8 Annual Family Income

Annual income score of the respondents ranged from 70 to 500 (in thousands). On the basis of the annual income, the respondents were classified into three categories as shown in Table 4.8.

Table 4.8 Distribution of the Brinjal Farmers According to Annual Income

Categories ('000' Tk.)	**Kalaroa upazila**		**Tala upazila**	
	Unit	Percent	Unit	Percent
Low income (52-150)	9	22.5	7	17.5
Medium income (151-350)	24	60	29	72.5
High income (above 355)	7	17.5	4	10
Total	**40**	**100**	**40**	**100**

(Source: Field Survey, 2019)

Data presented in Table 4.8 indicate that the highest proportion 60 percent and 72.5 percent of the respondent had medium annual income in both upazila, while (22.5 and 17.5) percent had low income and (17.5 and 10) percent of the farmers in both upazila had high income.

4.2.9 Family Expenditure

Family expenditure score of the respondents ranged from 47 to 477 per years (in thousands). On the basis of the annual family expenditure, the respondents were classified into three categories as shown in Table 4.9.

Table 4.9 Distribution of the Brinjal Farmers According to Their Family Expenditure

Categories ('000' Tk.)	**Kalaroa upazila**		**Tala upazila**	
	Unit	Percent	Unit	Percent
Low expenditure (47-150)	17	42.5	23	57.5
Medium expenditure (151-350)	19	47.5	15	37.5
High expenditure (above 332)	4	10	2	5
Total	**40**	**100**	**40**	**100**

(Source: Field Survey, 2019)

Data presented in Table 4.9 indicate that the highest proportion (47.5 percent) of the respondent in Kalaroa upazila had medium family expenditure, where farmers in Tala upazila 37.5 percent had the highest proportion in medium expenditure compared to 42.5 percent and 57.5 percent had low family expenditure and 10 percent and 5 percent had high family expenditure in both upazilas.

CHAPTER 5
PROFITABILITY OF BRINJAL CULTIVATION

5.1 Introduction

This chapter mainly deals with the estimation and analysis of costs of brinjal cultivation. The costs were classified into variable costs and fixed costs. Most of the inputs were valued at the current market price and sometimes governments' price in the study area during the survey period and also the prices at which farmers bought the inputs. But, for some unpaid inputs such as family labor, non-cash price was actually paid and pricing was very difficult in such cases. In these cases, the rule of opportunity cost was followed.

In this chapter, in terms of brinjal cultivation per hectare yield, gross return, gross margin, net return and undiscounted benefit-cost ratio are discussed. Therefore, a financial return of producing brinjal was calculated from the standpoint of farmers. All the returns were accounted for the study period. A brief account showing how the individual costs and returns were estimated in the present study, which is presented below. For analytical advantages, the cost items were classified under the following heads:

- Human labor
- Land preparation
- Seed / Seedling
- Fertilizer
- Manure
- Pesticide
- Irrigation

5.2 Pattern of Input Use

5.2.1 Pattern of Input Use for Brinjal Cultivation

Farmers in the study areas used various inputs for brinjal cultivation. Farmers used on an average family labor was 77 man-days and hired labor was 46 man-days. On an average, they planted 11973 pieces seedlings per hectare of land. They applied at the rate of Urea 218 kg/ha, TSP 145 kg/ha and MP 80 kg/ha. It was observed that among

the chemical fertilizer, farmers used highest amount urea for the studied upazilas. In the study areas, farmers also applied gypsum (69 kg/ha), zinc (10) and manure 1650 kg/ha for brinjal cultivation.

Table 5.1 Level of Input Use per Hectare of Brinjal Cultivation

Particulars	Upazila			
	Kalaroa	Tala	All	Price (Tk./unit)
Human labor (man-day)				
Family	75	79	77	350
Hired	48	44	46	350
Seedling (piece)	11520	12426	11973	1
Urea (kg)	210	226	218	16
TSP (kg)	150	140	145	30
MP (kg)	82	78	80	16
Manure (kg)	1500	1800	1650	3
Gypsum (kg)	68	70	69	12
Zinc (kg)	9	11	10	200

Source: Field Survey, 2019

5.3 Variable Costs

5.3.1 Human Labor Cost

Human labor is one of the most important variable inputs in the production process. Human labor is required for various activities and management of the selected farms such as- farm preparation, raising dyke, weeding, sorting, grading, harvesting etc. Human labor was classified into: (a) hired labor and (b) family labor. It is easy to calculate hired labor costs. To determine the cost of family labor, the opportunity cost concept was used. In this study, the opportunity cost of family labor was assumed to be as wage rate per man i.e., the wage rate, which the farmers actually paid to the hired labor for working a man-day. The labor of women and children was converted into man-equivalent day by presenting a ratio of 2 children day = 1.5 women day = 1 man equivalent day (Miah, 1987). In this study a man-day was considered to be 8 hours of work. For avoiding complexity, average rate has been taken into account. Labor wage rate varies with respect to different seasons. Thus, the computed average

rate was Tk. 350 per man-day for brinjal cultivation. Use of hired labor and its relevant cost incurred were shown in Table 6.2. The per hectare labor cost was Tk. 16800 and Tk 15400 in Kalaroa and Tala upazila respectively, which constituted 14.57 and 13.04 percent of total cost. Hired labor cost was higher in Kalaroa upazila than in Tala upazila.

5.3.2 Cost of Land Preparation

In the study area, power tiller was mainly used for land preparation. Power tiller was used on contact basis. Most of the farmer used home supplied animal labor for levelling their land. By adding power tiller cost and animal labor cost, the total cost of land preparation was found Tk. 4250 and Tk. 4320 in Kalaroa and Tala upazila respectively, which was 3.69 and 3.66 percent of their total costs of production (Table 5.2).

5.3.3 Seed cost / Seedling cost

Seed is a major input of brinjal cultivation in the study area. The farmers used purchased seed from market. There was a variation in the per unit price of seed from location to location and time to time. But cost was calculated on the basis of actual price paid by the farmers. The average price of brinjal seedling was Tk. 1 per piece. Per hectare average costs of seed were estimated at Tk. 11520 and Tk. 12426 in Kalaroa and Tala upazila respectively, which constituted 9.99 and 10.52 percent of total cost (Table 5.2).

5.3.4 Cost of Fertilizer

Fertilizer is an important input for brinjal cultivation. Farmers applied different kinds of fertilizer such as Urea and TSP MoP. Uses of these fertilizers influence in increasing the growth of brinjal cultivation. The purpose of using fertilizer in the farm is to create a condition which facilitates to increase in production of good quality natural feeds, thereby increasing brinjal cultivation. The cost of fertilizer was estimated by using the prevailing market rate which was actually paid by the farmers. The prices of these fertilizers were assumed to be same in all categories of farms. The average prices of Urea, TSP and MoP were Tk. 16 per kg, Tk. 30 and Tk. 16 per kg respectively in the study area.

The estimated costs of fertilizer are shown in Table 6.2. Per hectare costs of Urea was Tk. 3360 and Tk. 3616 in Kalaroa and Tala upazila respectively, which constituted 2.91 and 3.06 percent of total cost (Table 5.2).

Per hectare costs of TSP was Tk. 4500 and Tk. 4200 in Kalaroa and Tala upazila respectively, which created 3.90 and 3.56 percent of total cost (Table 5.2).

Per hectare costs of MoP was Tk. 1312 and Tk. 1248 in Kalaroa and Tala upazila respectively, which established 1.14 and 1.06 percent of total cost (Table 5.2).

Per hectare costs of Gypsum was Tk. 816 and Tk. 1120 in Kalaroa and Tala upazila respectively, which constructed 0.71 and 0.95 percent of total cost (Table 5.2).

Per hectare costs of Zinc were Tk. 1800 and Tk. 2200 in Kalaroa and Tala upazila respectively, which embodied 1.56 and 1.86 percent of total cost (Table 5.2).

5.3.5 Cost of Manure

Manure (cow dung) was commonly used as organic fertilizer for cultivating brinjal. There was no fixed rate for buying manure in the study area. Farmers used purchased manure. Cost of manure was computed at the prevailing market price, which was estimated to be Tk. 3 per kg during the study period.

Per hectare cost of using manure was calculated at Tk. 4500 and Tk. 5400 in Kalaroa and Tala upazila respectively, which accounted for 3.90 and 4.47 percent of total cost (Table 5.2).

5.3.6 Cost of Pesticides

The pesticides used by the farmers in the study area were Basudin, Dimocrone, Sumithion, Theovit, Furadon, Malathianon, etc. Table 5.2 reveals that per hector cost of pesticides were Tk. 3550 and Tk. 3740 in Kalaroa and Tala upazila respectively, and their percentages of total cost of production was 3.08 and 3.17 percent.

5.3.7 Cost of Irrigation

Brinjal needs a huge amount of water. In the study area, farmers had to depend on one shallow tube well (STW) and deep tube-well (DTW). These tube-wells were diesel operated or electricity operated. The cost of irrigation water was charged at fixes rate for per unit area of irrigated land .All irrigation water charges were paid in cash. Per hectare costs of irrigation cost were Tk. 13500 and Tk. 12600 in Kalaroa and Tala upazila respectively, and their percentages of total cost of production was 11.71 and 10.77 percent.

Table 5.2 Per Hectare Costs of Brinjal Cultivation

Particulars	**Upazilas**				
	Kalaroa		**Tala**		**All areas**
	(Tk/ha)	Percent	(Tk/ha)	Percent	**(Tk/ha)**
Hired labor	16800	14.60	15400	13.04	16100
Cost of land preparation	4250	3.69	4320	3.66	4285
Seedling	11520	10	12426	10.52	11973
Urea	3360	2.92	3616	3.06	3488
TSP	4500	3.91	4200	3.56	4350
MP	1312	1.14	1248	1.06	1280
Manure	4500	3.91	5400	4.47	4950
Gypsum	816	0.71	1120	0.95	1104
Zinc	1800	1.56	2200	1.86	2000
Pesticide	3550	3.08	3740	3.17	3645
Irrigation	13500	11.74	12600	10.77	13050
Sub-total	65638	57.06	66270	56.12	66225
Interest on operating capital	1648	1.43	1656	1.40	1652
A. Total variable cost	**67286**	**58.49**	**67926**	**57.52**	**67877**
Lease value	21500	18.69	22500	19.06	22000
Family labor	26250	22. 82	27650	23.42	26950
B. Fixed Costs	**47750**	**41.51**	**50150**	**42.48**	**48950**
Total cost (A+B)	**115036**	**100**	**118076**	**100**	**116827**

Source: Field Survey, 2019

5.3.8 Total Variable Cost

In the study area, the total variable costs varied from year to year. It was observed that the total per hectare variable cost for brinjal cultivation was Tk. 67286 and Tk. 67926 in Kalaroa and Tala upazila respectively, which comprised of 58.49 and 57.52 percent of total cost (Table5.2).

5.3.9 Fixed Costs

5.3.10 Lease Value of Land

The farmers used the land as per conditions of leasing arrangement. The term leasing cost means the cost which was required for brinjal farmers to take land lease which would be used for brinjal cultivation to a particular period of time. Leasing cost varies from one place to another depending on the location, soil fertility, topography of the soil and distance from the sources of water etc. Land leasing cost was the single highest cost item in the study areas. The value of own land was calculated as opportunity cost concept. Land use cost for brinjal production was estimated at the prevailing rental value per hectare in the study area. The rental value of per hectare land was estimated at Tk. 21500 and Tk. 22500 in Kalaroa and Tala upazila respectively, which occupied 18.69 and 19.06 percent of total cost (Table 5.2).

5.3.11 Family Labor

In the study area, it was estimated that per hectare family labor cost for brinjal cultivation was Tk. 26250 and Tk. 27650 in Kalaroa and Tala upazila respectively and their percentages of total cost of production was 22.82 and 23.42 percent (Table 5.2).

6.3.12 Total Fixed Cost

In the study area, it was estimated that per hectare total fixed cost was Tk. 47750 and Tk. 50150 in Kalaroa and Tala upazila respectively, which comprised of 41.51 and 42.48 percent of total cost (Table 5.2).

5.4 Total Cost

The total costs were calculated by adding up total variable cost and total fixed cost. In the study per hectare total cost of brinjal cultivation was calculated at Tk. 115036 and Tk. 118076 in Kalaroa and Tala upazila respectively (Table 5.2).

5.5 Returns of Brinjal Cultivation

5.5.1 Gross Return

Gross return is the pecuniary value of total product. Per hectare gross return were calculated by multiplying the total amount of production by their respective market prices. In the study area, per hectare average yield of brinjal was 12450 kg/ha and 12945 kg/ha and average market prices of brinjal was Tk 18 in both the Upazilas and

its monetary value was Tk. 224100 and Tk 233010 in Kalaroa and Tala upazila respectively (Table 5.3) in both the Upazilas.

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6.5.2 Net Return

In general net return is termed as entrepreneur's income. To evaluate the profitability of brinjal cultivation, net return is an important aspect. Net return is the difference between gross return and total costs. Per hectare net return was estimated at Tk. 108794 and Tk. 114934 in Kalaroa and Tala upazila respectively (Table 5.3) which indicates that brinjal cultivation is profitable business for the brinjal farmers (Table 5.3).

6.5.3 Gross Margin

Farmers usually want to gain maximum return over variable cost of production. The probable reason is that estimation of fixed cost of production is difficult to determine. Thus the gross margin analysis has been taken into account to calculate the relative profitability of brinjal cultivation. The gross margin of brinjal cultivation was estimated at Tk. 156544 and Tk. 165084 in Kalaroa and Tala upazila respectively (Table 5.3).

Table 5.3 Per Hectare Returns of Brinjal Cultivation in the Study Areas

Items	**Kalaroa**	**Tala**	**All**
Yield (kg/ha)	12450	12945	12697.5
Price (Tk/kg)	18	18	18
Gross returns (GR)	224100	233010	228555
Total variable costs (TVC)	67286	67926	67606
Total costs (TVC+TFC)	115036	118076	116556
Net return (GR-TC)	109064	114934	111999
Gross margin (GR-TVC)	156814	165084	160949
Benefit-cost ratio (BCR) = GR/TC	1.94	1.97	1.955

Source: Field Survey, 2019

5.5.4 Benefit Cost Ratio (Undiscounted)

Benefit cost ratio was calculated by dividing gross return by gross cost or total cost. It implies return per taka invested. It helps to analyze financial efficiency of the farm. It was evident from the study that the benefit cost ratio of brinjal cultivation was accounted for 1.95 and 1.97 in Kalaroa and Tala upazila respectively implying that Tk. 1.95 or Tk. 1.97 would be earned by investing Tk. 1.00 for brinjal production. So, the brinjal cultivation was found to be profitable for farmers (Table 5.3) in both the Upazilas particularly better in Tala upazila.

5.6 Concluding Remarks

It was evident from the results that per hectare total variable cost for brinjal cultivation were more than per hectare total fixed costs for brinjal cultivation in both the Upazilas. Brinjal cultivation provides higher returns to the farmers. Brinjal cultivation is gaining popularity in the country gradually due to its high yield potentiality and high demand in domestic market as well asthe international market. Sample farmers showed their opinion that higher yield and income encouraged them to continue brinjal cultivation in the study area.

CHAPTER 6

FACTORS AFFECTING AND RESOURCE EFFICIENCY OF BRINJAL CULTIVATION

6.1 Introduction

An attempt has been made this chapter to identify and measure the effects of the major variables on brinjal cultivation. Cobb-Douglas production function was chosen to estimate the contribution of key variables on the production process of brinjal cultivation. The estimated values of the model are presented in Table 6.1.

6.2 Functional Analysis for Measuring Production Efficiency

Production function is a relation or a mathematical function specifying the maximum output that can be produced with given inputs for a given level of technology. Keeping in mind the objectives of the study and considering the effect of explanatory variables on output of brinjal cultivation, nine explanatory variables were chosen to estimate the quantitative effect of inputs on output.

Management factor was not included in the model because specification and measurement of management factor is almost impossible particularly in the present study, where a farm operator is both a labor and manager. Other independent variables like soil condition, time etc. which might have affected production of farm enterprises, were excluded from the model on the basis of some preliminary estimation. A brief description is presented here about the explanatory variables included in the model.

6.3 Estimated Values of the Production Function Analysis

- F-value was used to measure the goodness of fit for different types of inputs.
- The coefficient of multiple determinations (R^2) indicates the total variations of output explained by the independent variables included in the model.
- Coefficients having sufficient degrees of freedom were tested for significance level at 1 percent and 5 percent levels of significant.
- Stage of production was estimated by returns to scale which was the summation of all the production elasticity of various inputs.

The estimated coefficients and related statistics of the Cobb-Douglas production function for brinjal cultivation are shown in Table 6.1.

Table 6.1 Estimated Values of Coefficients and Related Statistics of Cobb-Douglas Production Function

Explanatory Variables	Coefficient	Standard error	p- value
Intercept	3.962	.762	.000**
Cost of human labor (X_1)	-.010	.067	.857^{NS}
Cost of power tiller and animal labor (X_2)	.746	.142	.000**
Cost of seed/seedling (X_3)	.012	.042	.756^{NS}
Cost of manure (X_4)	1.069	.204	.000**
Cost of urea (X_5)	.382	.231	.032*
Cost of TSP (X_6)	.103	.138	.224^{NS}
Cost of MoP (X_7)	.003	.041	.926^{NS}
Cost of pesticide (X_8)	.435	.292	.000**
Cost of irrigation (X_9)	.148	.077	.003**
R^2	0.856		
Adjusted R^2	0.824		
Return to scale	2.888		
F-value	246.644**		

Source: Field Survey, 2019.

Note: ** Significant at 1 percent level;

* Significant at 5 percent level and

NS: Not Significant

6.4 Interpretations of Results

Cost of Human Labor (X_1): The estimated coefficient of human labor for brinjal cultivation was -0.010 and negatively insignificant. It expresses that 1 percent increase in the cost of human labor for brinjal cultivation, remaining other factors constant, would decrease gross returns by 0.010 percent (Table 6.1).

Cost of Power Tiller and Animal Labor (X_2): The estimated coefficient of land preparation for brinjal cultivation was 0.746 and significant at 1 percent level. It indicates that 1 percent increase in the cost of power tiller and animal labor for brinjal cultivation, remaining other factors constant, would increase gross returns by 0.746 percent (Table 6.1).

Cost of Seed/Seedling (X_3): The regression coefficient of seedling cost was 0.012 which was insignificant for brinjal cultivation. It implies that 1 percent increase in the cost of seedling, keeping other factors constant, would increase gross returns by only 0.012 percent (Table 6.1).

Cost of Manure (X_4): The regression coefficient of manure cost was 1.069 which was positive and significant at 1 percent level for brinjal cultivation. It implies that 1 percent increase in the cost of manure, keeping other factors constant, would increase gross returns by only 1.069 percent (Table 6.1).

Cost of Urea (X_5): The regression coefficient of urea cost was 0.382 and significant at 5 percent level for brinjal cultivation. It marks that 1 percent increase in cost of urea, remaining other factors constant, would increase gross returns by 0.382 percent (Table 6.1).

Cost of TSP (X_6): The estimated coefficient of TSP for brinjal cultivation was 0.103 and insignificant. It hints that 1 percent increase in the cost of TSP for brinjal cultivation, remaining other factors constant, would increase gross returns by 0.103 percent (Table 6.1).

Cost of MoP (X_7): The estimated coefficient of MoP cost was 0.003 which was positive and insignificant for brinjal cultivation. It means that 1 percent increase in the MoP cost, keeping other factors constant, would increase gross returns by 0.003 percent (Table 6.1).

Cost of Pesticide (X_8): The estimated coefficient of pesticide cost was 0.435 which was positive and significant at 1 percent level for brinjal cultivation. It specifies that 1 percent increase in the pesticide cost, keeping other factors constant, would increase gross returns by 0.435 percent (Table 6.1).

Cost of Irrigation (X_9): The estimated coefficient of irrigation cost was 0.148 which was positive and significant at 1 percent level for brinjal cultivation. It testifies that 1 percent increase in the irrigation cost, keeping other factors constant, would increase gross returns by 0.148 percent (Table 6.1).

Coefficient of Multiple Determination (R^2)

The values of the coefficient of multiple determination of brinjal cultivation was found to be 0.856 which connoted that about 85 percent of the total variation in the gross return could be explained by the included explanatory variables of the model. So we can say the goodness of fit of this regression model is better since R^2 indicates the goodness of fit of the regression model (Table 6.1).

Adjusted R^2

Here the term adjusted means adjusted for the degrees of freedom. The adjusted R^2 for brinjal cultivation was found to be 0.824 which illustrated that about 82 percent of the variations of the output were explained by the explanatory variables included in the model (Table 6.1).

Return to Scale in Brinjal Cultivation

The summation of all the production coefficients brinjal cultivation is equal to 2.888. This means that production function for brinjal cultivation exhibits increasing returns to scale. This means that, if all the variables specified in the model were increased by 1 percent, gross return would also be increased by 2.888 percent (Table 6.1).

F-value

The F-statistic was computed to denote the overall goodness of fit of any fitted model. The F-value for the brinjal cultivation was estimated at 246.644 which were highly significant at 1 percent level. It denotes that the explanatory variables included in the model were important for explaining the variation in gross return of brinjal cultivation (Table 6.1).

6.5 Resource Use Efficiency of Brinjal Cultivation

In order to identify the status of resource use efficiency, it was considered that a ratio equal to unity testified the optimum use of that factor, a ratio more than unity hinted that the yield could be increased by using more of the resources. A value of less than unity pointed out the unprofitable level of resource use, which should be decreased to minimize the losses because farmers over used this variable. The negative value of MVP proves the indiscriminate and inefficient use of resource.

Table 6.2 showed that the ratio of MVP and MFC of human labor (-0.096) for brinjal cultivation was negative and less than one, which pin down that in the study area human labor for brinjal cultivation was over-utilization. So, farmers should decrease the use of human labor to attain efficiency level.

The ratio of MVP and MFC of power tiller and animal labor cost (29.86) for brinjal cultivation was positive and more than one, which tagged that in the study area power tiller and animal labor cost was under-utilization (Table 6.2). So, farmers should increase the use of power tiller and animal labor to attain efficiency considerably.

The ratio of MVP and MFC of seed/ seedling was found as 0.45 for brinjal cultivation was positive and less than one, which tabbed that in the study area use of seed/ seedling for brinjal cultivation was over-utilization (Table 6.2). So, farmers should decrease the use of seed for brinjal cultivation to attain efficiency considerably.

It was evident from the (Table 6.2) that the ratio of MVP and MFC of manure (71.32) for brinjal cultivation was positive and more than one, which demonstrated that in the study area use of manure for brinjal cultivation was under-utilization. So, farmers should increase the use of manure to attain efficiency in brinjal cultivation.

It was evident from the (Table 6.2) that the ratio of MVP and MFC of urea (67.46) for brinjal cultivation was positive and more than one, which pointed out that in the study area use of urea for brinjal cultivation was under-utilization. So, farmers should increase the use of urea to attain efficiency in brinjal cultivation.

Table 6.2 Estimated Resource Use Efficiency of Brinjal Cultivation

Variable	Geometric mean (GM)	$\bar{Y}$ (GM)/$\bar{x}_i$ (GM)	Co-efficient	MVP (Xi)	r=MVP/MFC	Decision rule
Yield (Y)	329179.21					
Human labor cost (X_1)	34260.95	9.61	-.010	-0.096	-0.096	Over-utilization
Power tiller and animal labor cost (X_2)	8222.63	40.03	.746	29.86	29.86	Under-utilization
Seed/Seedling cost (X_3)	8770.80	37.53	.012	0.45	0.45	Over-utilization
Manure (X_4)	4933.57	66.72	1.069	71.32	71.32	Under-utilization
Urea cost (X_5)	1863.79	176.62	.382	67.46	67.46	Under-utilization
TSP cost (X_6)	3289.05	100.08	.103	10.31	10.31	Under-utilization
MoP (X_7)	877.08	375.31	.003	1.13	1.13	Under-utilization
Pesticide cost (X_8)	7674.45	42.89	.435	18.66	18.66	Under-utilization
Irrigation cost(X_9)	19734.31	16.68	.148	2.47	2.47	Under-utilization

Source: Field Survey, 2019.

The ratio of MVP and MFC of TSP (10.31) for brinjal cultivation was positive and more than one, which indicated that in the study areas use of TSP for brinjal cultivation was under-utilization (Table 6.2). So, farmers should increase the use of TSP to attain efficiency considerably.

It was evident from the (Table 6.2) that the ratio of MVP and MFC of MoP (1.13) for brinjal cultivation was positive and more than one, which indicated that in the study area use of MoP for brinjal cultivation was under used. So, farmers should increase the use of MoP to attain efficiency in brinjal cultivation.

It was evident from the (Table 6.2) that the ratio of MVP and MFC of pesticide (18.66) for brinjal cultivation was positive and more than one, which indicated that in the study area use of pesticide for brinjal cultivation was under used. So, farmers should increase the use of biopesticide to attain efficiency in brinjal cultivation.

(Table 6.2) revealed that the ratio of MVP and MFC of irrigation used for brinjal cultivation was positive and more than one (2.47), which indicated that irrigation application was underutilized. So, farmers should increase the use of irrigation with safe water to attain efficiency in brinjal cultivation.

6.6 Concluding Remarks

It is evident from the Cobb-Douglas production function model, that the included key variables had significant and positive effect on brinjal cultivation except the negative and insignificant effect of human labor cost and positive and insignificant effect of seed, TSP and MP cost. Resource use efficiency indicated that all of the resources were under-utilization for brinjal cultivation except over-utilization of human labor and seed/seedling cost. So there is a positive effect of key factors in the cultivation process of brinjal cultivation.

CHAPTER 7
PROBLEMS OF BRINJAL CULTIVATION

7.1 Introduction

Brinjal as a source of livelihood has been an age-old practice for thousands of farmers in Bangladesh. But farmers are socially, economically and educationally backward. Farmers faced a lot of problems and constraints in brinjal cultivation. They are economically unable to invest the required amount for brinjal because of scarcity of financial capital. Farmers generally complain of getting insufficient support from governmental agencies. It is also complained that, famers do not get required technical and financial support from the government.

In the present study an effort has been made to identify and analyze the major problems and constraints faced by the farmers in producing brinjal in the study areas. For the sake of analytical convenience, the problems and constraints were classified into three general groups

1. Economic and Technical problems
2. Marketing problems
3. Social and natural problems.

7.2 Economic and Technical Problems

It was observed that farmers faced some economic and technical problems and constraints relating to the brinjal cultivation. The major economic and technical problems and constraints faced by the brinjal farmers are discussed.

7.2.1 Lack of Financial Capital or Institutional Credit: Cultivation of brinjal needs proper doses of fertilizer, irrigation water and insecticides in addition to special agronomic care and therefore, brinjal growers need sufficient money to buy the necessary inputs. In the study areas about 72.5 percent of total brinjal growers reported that they did not have adequate amount of operating capital (Table 7.1). Most of the growers did not get institutional credit and therefore, they had to borrow money from neighbors, relatives, bank and money lenders at exorbitant rate of interest. Financial disability and pressing need for cash money forced them to borrow money from non-institutional sources.

7.2.2 Lack of Scientific Knowledge and Technology: Low productivity of brinjal is a serious problem. In the study area, most of the brinjal growers were illiterate and they followed traditional methods. About 68.8 percent of the brinjal growers reported that the productivity of brinjal was low due to lack of scientific knowledge about cultural practices (Table 7.1).

7.2.3 Insufficient Irrigation: Water is an important input for brinjal cultivation. In the study area, about 41.3 percent brinjal growers had faced this problem (Table 7.1). This selected winter vegetable growers opined that lack of irrigation facilities was a major constraint to brinjal cultivation.

7.2.4 High Price of Fertilizers and Insecticides: Fertilizer and insecticides are vital inputs in the cultivation of brinjal. During cultivation period, the prices of fertilizers and insecticides went up due to profit making motive of both retail and wholesale dealers. It was reported that about 56.3 percent brinjal growers complained about high price rate of fertilizers and insecticides (Table 7.1)

7.2.5 Lack of Human Labor Availability: Cultivation of brinjal was labor intensive. Non-availability of human labor was one of the major problems faced by the brinjal growers. It was observed from Table 7.1 that about 48.8 percent of the brinjal growers faced acute shortage of human labor in brinjal cultivation.

7.2.6 Non-Availability of Quality Seeds and High Price of Seedling: Non-availability of improved seeds was another limiting factor in producing brinjal. About 63.8 percent farmers reported this problem (Table 7.1). They reported that in local market HYV seeds were not available. Most of the growers purchased seeds but they opined that in many cases, the seeds were not good quality and the price of seed was too high during the sowing/ planting period.

7.3 Marketing Problems

One of the serious problem of winter vegetables cultivation was the marketing problems. In the study areas, most of the farmers used to sell their product to the "paikar" at farm gate level. A few farmers sold their produce at the village hat. There were some problems relating to the marketing of brinjal which are highlighted below:

7.3.1 Low Market Price of Product at Harvesting Period: It was observed that the price of brinjal in the harvesting period was very low. About 90 percent vegetables growers reported that the price of brinjal was low during the harvesting period and soon after the harvesting period (Table 7.1). Many of the farmers were compelled to make distress sale in order to meet the urgent needs of cash for their day-to-day's household expenditures that led to increase the supply of their produce in the village market at harvesting period and thereby lowering the selling price per unit. Thus the cultivation of brinjal became a less profitable venture.

7.3.2 Storage Problem: Lack of proper storage facilities was the most important problem. In fact, 80 percent of vegetable growers complained against the storage problem (Table 7.1). Storage of brinjal is not possible under ordinary condition because this vegetable crop is perishable. Therefore, due to lack of proper storage facilities the farmers did not get fair price.

7.3.3 Lack of Market Information: In the study areas, 40 percent farmers did not get the market information properly. As a result they did not get fair price of their produce as compared to terminal market (Table 7.1).

7.3.4 Carrying and Handling Problems: Due to carrying and handling problem the growers used to sell their produce to 'paikar' at the local markets and a few growers sold their produce at farm gate. Table 7.l shows that about 53.8 percent of total brinjal growers treated about carrying and handling as a problem. Farmers also reported that they could not take advantage of the higher price prevailing at distant market due to lack of carrying and handling facilities.

Table 7.1 Problems of Brinjal Cultivation

SL.NO	Problems and Constraints	Brinjal Farmers (N=80)	
		Unit	Percent
Economic and Technical Problems			
01.	Lack of Financial Capital or Institutional Credit	58	72.5
02.	Lack of Scientific Knowledge and Technology	55	68.8
03.	Insufficient Irrigation	33	41.3
04.	High Price of Fertilizers and Insecticides	45	56.3
05.	Lack of Human Labor Availability	39	48.8
06.	Non-Availability of Quality Seeds and High Price of Seedling	51	63.8
Marketing Problems			
01.	Low Market Price of Product at Harvesting Period	72	90
02.	Storage Problem	64	80
03.	Lack of Market Information	32	40
04.	Carrying and Handling Problems	43	53.8
Social and Natural Problems			
01.	Attack by Disease and Pest	48	60
02.	Crop Damage by Wild or Domestic Animal	24	30
03.	Loss of Production due to Theft	50	62.5

Source: Field Survey , 2019

7.4 Social and Natural Problems

It was found that farmers were facing some social and natural problems in cultivating brinjal. These are discussed below:

7.4.1 Attack by Disease and Pest: Farmers cultivating brinjal mentioned that considerable amount of yield of this vegetable were lost by the attack of pests and diseases. In the study areas about 60 percent brinjal growers faced this problem (Table 7.1).

7.4.2 Crop Damage by Wild or Domestic Animal: Crop damage by wild animals was also a problem in brinjal cultivation. Brinjal growers reported that damage by mice was a considerable problem to them. Famers gathered an experience that in the early stages the plants were affected by cattle and goats. They eat the leaves of brinjal. About 30 percent vegetable growers reported that their produces were attacked by wild and domestic animals (Table 7.1).

7.4.3 Loss of Cultivation due to Theft: During the harvesting period, stealing of brinjal was a common phenomenon which discouraged the growers to grow this vegetable. In the study area, about 62.5 percent of brinjal growers reported that their produces were stolen (Table 7.1).

7.5 Concluding Remarks

It is no doubt that brinjal can play an important role in earning cash money and can save both import and foreign currency. Since brinjal is a profitable crop and has huge domestic demand; its cultivation should be expanded. It was observed that the farmers were facing some acute problems and constraints. The inefficiency of the extension services, low market price of brinjal and high input prices would hinder the expansion of area. ln spite of the problems and constraints in brinjal cultivation, the farmers in the study areas are still now cultivating this vegetable. Because brinjal is a profitable crop and its method of cultivation is easy. Moreover, it is labor intensive. Thus, the idle family labor could be utilized during the cultivation period.

CHAPTER 8
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 Summary of the Study

Vegetable plays a significant role for creation of farmer's income, food and nutritional security, employment to large numbers of people. Brinjal is a nutritious vegetable as well as people have easy access to mitigate their demand on its round the year in Bangladesh. This research is to promise to find the factors effect on brinjal cultivation and estimate the profitability of brinjal cultivation at Kalaroa and Tala upazila in Sathkira district. Kalaroa and Tala upazila in Sathkira district are renowned for brinjal cultivation since long time. The selected areas are typically remote areas of Sathkira while the family size was 4.80, lion share of people are professionally dependent on agriculture and mostly farmers are illiterate. The research found that brinjal cultivation is a profitable enterprise. Human labor, seed cost, MoP and pesticides costs are statistically significant effects on brinjal cultivation. Costs of human labor and chemical fertilizers were occupied the major share of total cost of brinjal cultivation. According to BCR calculation, the benefit of brinjal cultivation at the sample area was three times more compare to the total cost. Though it is a profitable business, it could have more extended the business if the farmers are having close contact with the agricultural extension services, getting good marketing.

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From the socio-economic characteristics of the brinjal farmers, the highest proportion (42.5 percent) of the farmers was 31-45 years aged in Kalaroa upazila and the majority (45 Percent) of the brinjal farmers was 31-45 years aged in Tala upazila under Satkhira district. The majority (52.5 percent and 47.5 percent) of the brinjal farmers were illiterate in Kalaroa and Tala upazila respectively. The highest proportion (42.5 percent) of the farmers in Kalaroa upazila had medium family size of 5-6 members and majority (50.5 percent) of the brinjal farmers in Tala upazila had also medium family size of 5-6 members. The majority (62.5 percent and 605 percent) of the brinjal farmers had nuclear family in Kalaroa and Tala upazila under Satkhira district. The majority (62.5 percent and 60 percent) of the brinjal farmers had medium experience of 21-40 years in Kalaroa and Tala upazila under Satkhira district. The highest (47.5 percent and 52.5 percent) of the

farmers possessed small farms in Kalaroa and Tala upazila respectively. The highest (55 percent and 42.5 percent) of the farmers possessed small land under brinjal cultivation in Kalaroa and Tala upazila respectively. The majority proportion (60 percent and 72.5 percent) of the respondent had medium annual income in Kalaroa and Tala upazila. The highest proportion (47.5 percent) of the respondent in Kalaroa upazila had medium family expenditure, where farmers in Tala upazila 37.5 percent had the highest proportion in medium expenditure

To determine the profitability of brinjal cultivation both the inputs and outputs were valued at market price during the study period. For analytical advantages, the cost items were identified as human labor, land preparation, seed, manure, urea, TSP, MoP, pesticide and irrigation. Cost and returns were worked out to estimate profitability of brinjal cultivation.

Per hectare power tiller cost of land preparation for cultivating brinjal was Tk. 4250 and 4320 respectively in Kalaroa and Tala upazila. The per hectare hired labor costs was Tk.716800 and 15400 for brinjal farmers which comprised 14.575 percent and 13.04 percent of their respective total costs of production.

The results of profitability analysis was found that per hectare costs of seedling was Tk. 11520 and Tk. 12426 for brinjal farmer in Kalaroa and Tala upazila respectively. Per hectare manure cost was Tk. 4500 and Tk. 5400 for brinjal farmer in Kalaroa and Tala upazila respectively. Per hectare fertilizer cost of Urea were Tk. 3360, Tk. 3616, TSP Tk. 4500, Tk. 4200, , MoP, Tk. 1312, Tk. 1248, Gypsum Tk. 816, Tk. 1120, Zinc sulphate Tk. 1800 and Tk. 2200 for brinjal farmers in Kalaroa and Tala upazila respectively. Per hectare pesticide cost was Tk. 3550 and Tk. 3740 in Kalaroa and Tala upazila respectively. Per hectare cost of irrigation cost was Tk. 13500 and Tk. 12600 for brinjal farmers in Kalaroa and Tala upazila respectively. Interests on operating capital per hectare was Tk. 1648 and Tk. 1656 and land (lease value) use cost per hectare was Tk. 21500 and Tk. 22500 for brinjal farmer in Kalaroa and Tala upazila respectively. Family labor cost per hectare was Tk. 26250 and Tk. 27650 respectively in Kalaroa and Tala

upazila. The average yield of brinjal was 12450 and 12945 kg per hectare in Kalaroa and Tala upazila respectively. The gross returns per hectare was Tk. 224100 and Tk. 233010 for brinjal farmer in Kalaroa and Tala upazila respectively. It was observed that per hectare net return was Tk. 109064 and Tk. 114934 for brinjal farmers in Kalaroa and Tala upazila respectively. It was further observed that per hectare gross margin was Tk. 156814 and Tk. 165084 for brinjal farmers in Kalaroa and Tala upazila respectively.

In this study, Cobb-Douglas production function model was used to determine the effects of key variable inputs. The most important nine explanatory variables were included in the model to explain the gross income or return of brinjal cultivation. Most of the variables in the production function were significant in explaining the gross return except the negative and insignificant effect of human labor cost. The coefficient with expected sign indicates the selected inputs contributed positively to the gross return. The values of the coefficient of multiple determination of brinjal cultivation was 0.824 which implied that about 82 percent of the total variation in the gross return could be explained by the included explanatory variables of the model. Production function for brinjal cultivation exhibits increasing returns to scale (2.888). This means that, if all the variables specified in the model were increased by 1 percent, gross return would also increase by 2.888 percent. . The F-value for the brinjal cultivation was 246.644 which were highly significant at 1 percent level. Resource use efficiency indicated that all of the resources were under-utilization for brinjal cultivation except over utilization of human labor and seed / seeding. So there was a positive effect of key factors in the production process of brinjal cultivation. This study also identified some of the problems and constraints associated with brinjal cultivation. The findings revealed that high price of input, lack of sufficient fund, lack of marketing facilities, low price of output, lack of scientific knowledge and technology, attack of brinjal diseases and lack of extension services were the major obstacle which stand in the way of brinjal in the study areas.

8.2 Conclusions

The main reason behind cultivating brinjal is the far and wide detained observation that brinjal is emerging as a lucrative vegetable. Brinjal is well thought-out as the most important vegetable crops and has more multipurpose usages in Bangladesh. High

cultivation of brinjal depends on the spreading out of HYV and hybrid variety of seed, improved management and timely supplying of inputs. The rate of taking up of modern technology and sustainability of brinjal cultivation depend largely on its economic prosperity. The situation of brinjal cultivation is extremely to a great extent competitive. The profits it begets and hope it will help to add tax in the national economy is an immense contribution.

The findings of the study indicates that higher net profit per ha (Tk. 114934) in Tala upazila. This research shows farmers cultivate more land and earn highest net profit. Priority should be given to the development of such roads which link villages to the main roads and markets. Most of the farmers are illiterate. Dissemination of market information should be increased so that farmers can get fair price of the brinjal.

After farming of brinjal, total household income of rural people augmented appreciably which enabled them to spend more on the basic items such as food, education, clothing, health care and housing compared to before. Brinjal also helps in ameliorating the nutritional status of the rural people. It designates that livelihood and standard of living of brinjal farmers enhanced to some extent. If quality inputs and cultivation technology can be made available to the farmers in time, yield and cultivation of brinjal may be augmented which can help the farmers to enlarge income and pack up livelihood conditions.

Government or no additional agency can the brinjal farmer can put down his hands on durable ready cash the instant his produce is inclined of nothing like a good number other crops which yield proceeds as and when the production is prepared for sale. This pretends as a most important unifying force for the farmers.

8.3 Recommendations

Some recommendations are given below:

1. The price of brinjal should be readjusted from time to time safeguarding justice to the growers of brinjal.

2. Government should reduce the pesticide and insecticide price.

3. The consciousness of the farmers needs to be increased. They may be delivered adequate training so that they can produce brinjal appropriately.

4. Modern technology should be taking on for superior labor cost control.

5. Agricultural credit facilities to be ensured easily.

6. Provision for the introduction of crop insurance should be introduced. Therefore, the risk of brinjal cultivation would be minimized and farmers will get more ensured environment to cultivate brinjal.

7. In the view of actual field experiences gained so far, it is accomplished that farmers did not get fertilizers at the government rate. So public interventions might be required for ensuring the reasonable price of fertilizers. Furthermore, farmers reported that they were suffered from adulterated fertilizers. Consequently, public initiative should be taken to maintain fertilizer quality.

8. Quality seeds of improved varieties in right quantity are recognized to be one of the key elements for enhancing agricultural production. Farmers also reported that they were suffered from seed adulteration. So the DAE and other related institutions should make improved seed available to the farmers and government should take initiatives to control adulteration of seeds.

8.4 Limitation of the Study.

The present study suffers from a number of limitations. The limitations of the study are as follows:

- Inadequate fund and time for the study were the important limitations. Due to shortage of fund and time, the study could not cover wide areas for collection of necessary information from the brinjal farmers.

- The study was conducted in four villages namely Sonabaria and Ramkrisnapur under Kalaroa upazila and Dhandia and Fulbari under Tala upazila of Satkhira district, which might not represent other regions of the district. Moreover, the sample size was small, i.e., only 80 farmers were selected for the study.

- The researchers had to depend on the memory of the farmers for collecting primary information because many of them did not keep any written record or kept record partially.

- Respondents were very busy. A study that brings in interview of 80 farmers cannot conclude anything accurately and as such, it was based on miss information.

- The largest part of the farmers in the study area contemplation that the investigator was a government officer. So, they originally hesitated to answer the questions relating to their income and expenditure. Some were afraid of imposition of new taxes.

Despite a few limitations, the findings of the present study may provide some valuable information for the farmers, extension workers and researchers.

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Sl.No:

APPENDIX

An Interview on

PROFITABILITY AND RESOURCE USE EFFICIENCY OF BRINJAL CULTIVATION IN SOME SELECTED AREAS OF SATKHIRADISTRICT

1 .Identification of the farmer:

Name: …….. Gender: ……..

Village …….. Thana…… ….

Age: ……Years Education: ..... Years

2. Farming Experiences:

How long you have involved in farming..... Years

3. Family type: Nuclear family/ Joint family

4. Family size:

What is the number of your family members included yourself?

Total members…….. Children (<15yrs)……

Adult Male…….. Adult Female……

5. Educational status of the family

(Please mention the years of education of your Family members)

Members	Gender	Age	Educational Years

1=(0 years),2 =(1-5 Years), 3=(6-8 years), 4=(9-10 years), 5=(11-12 years), 6=(13-above Years)

6. Farm size

(Please indicate the area of your land in your possession)

Types of land	Area (acres)
a. Own Cultivated Land	
b. Share In	
c. Share Out	
d. Mortgaged In	
e. Mortgaged Out	
f.Others(….....)	
Total=(a+b+d-c-e)	

7. Farmer Expenditure

(Please mention you monthly expenditure in following source)

SL. No.	Items	Monthly Expenditure (Taka)	Yearly Expenditure (Taka)
1	Food		
2	Energy (Petrol, Gas, Electricity)		
3	Health care		
4	Education		
5	Transportation		
6.	Clothing		
7	Festivals & Social Economics		
8	House Rent		
9	Cell phone expense		
10	Entertainments		
11	Others(.....)		

8. Crop Management Information

Please mention the following regarding Brinjal cultivation

Management practices	Brinjal **Cultivation**
Amount of land (Acres)	
Variety	
Seed rate (Kg/Acre)	
Number of irrigation	
Number of Inter-cultural operation	

9. Cost of Cultivation (Tk / Bigha)

A. Human Labor Requirement (man/day), please mention of your Human Labor requirement

Name of items	**Brinjal Cultivation**			
	No. of labor		**Taka/labor**	**Total(Tk)**
	Own	**Hired**		
Main land Preparation (tillage & laddering)				
Plant Planting				
Manure & Fertilizer				
Weeding				
Irrigation				
Pest Management				
Harvesting				
Carrying & Storing				
Total				

Note: 1 Bigha = 33 Decimal

B. Cost of Animal or Mechanical Powers Used

(Please mention your cost of animal or mechanical powers used)

Name of practice		**Brinjal Cultivation**			
		Name of Machine/Animals	**Rent Per Acre(Taka)**	**Cultivated area (Bigha)**	**Total (Taka)**
Tillage	Machinical Power				
	Animal Power				
Weeding	Machinical Power				
	Animal Power				
Total					

(M= Machine , A= Animal)

C. Materials Inputs Used (Per Bigha)

(Please mention about material input used)

Inputs	Unit Price	Brinjal Cultivation	
		Amount (kg)	Taka
Seed			
Manure			
Fertilizer			
a. Urea			
b. TSP			
c. MP			
d. Gypsum			
e. Boron			
Pesticide			
Irrigation			
Others(.....)			
Total			

D. Amount of Brinjal Production(Per Bigha)

(Please mention about Brinjal production)

Harvesting	Total Production (monds)	Unit Price (Tk)	Total Taka

10. Farmers Income Sources

(Please mention the amount of annual income from the following sources)

a) Agricultural sources

SL. No.	Crop Name	Amount of Income (in TK.)
1	Rice	
2	Jute	
3	Maize	
4	Potato	
5	Mustard	
6	Pulse Crop	
7	Oil Crop	
8	Spice Crop	
9	Vegetables	
10	Fruits	
11	Cow, Goat, Sheep	
12	Fish Resources	
13	Poultry	
Total		

b) Non-Agricultural Sources

SL. No.	Income Resources	Amount of Income (in TK.)
1	Business Service	
2	Service	
3	Remittance	
4	Day Labor	
5	Other Family Members	
6	Others Income Source	
Total		

11. Please mention the problems faced by you in Brinjal cultivation

a)……..

b)……..

c)……..

d)……..

e)……..

12. What are your suggestions to overcome the above problems?

a)……

b)……..

c)……..

d)……..

e)……..

Thank you for kind co-operation

Signature of the interviewer

Date :……