FINANCIAL PROFITABILITY AND RESOURCE USE EFFICIENCY OF ONION CULTIVATION IN SOME SELECTED AREAS OF FARIDPUR DISTRICT IN BANGLADESH

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CERTIFICATE

This is to certify that thesis entitled, **"FINANCIAL PROFITABILITY AND RESOURCE USE EFFICIENCY OF ONION CULTIVATION IN SOME SELECTED AREAS OF FARIDPUR DISTRICT IN BANGLADESH"** *submitted to the Department of Agricultural Economics, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of* ***MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS****, embodies the result of a piece of bona fide research work carried out by* ***MESHKAT HASAN*** *bearing Registration No.* ***13-05468*** *under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

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

……

15 February, 2021
Dhaka, Bangladesh

Dr. Bazlul Ameen Ahmad Mustafi
Former Director (Admin), BRRI
Supervisor

Dedicated to My Beloved

Mother and Elder Brother

FINANCIAL PROFITABILITY AND RESOURCE USE EFFICIENCY OF ONION CULTIVATION IN SOME SELECTED AREAS OF FARIDPUR DISTRICT IN BANGLADESH

ABSTRACT

The present study was designed to measure resource use efficiency of onion farmers and to estimate the profitability of onion production in selected areas of three upazila Sadarpur, Charvadrashan and Saltha in Faridpur district. Primary data were collected from 120 farmers which constituted 40 farmers from each upazila respectively. A random sampling was followed. Both tabular and statistical analyses were applied in this study. The major findings of the study reveal that onion productionis profitable. Total cost of production was Tk. 258581.00 per hectare. Gross returns were Tk. 512160.00 and net returns was Tk. 253579.00. Per hectare yields of onion bulb was found 12804.00 kg. Per hectare human labor was used 150 man-days. Benefit Cost Ratio (BCR) was found to be 1.98. Production function analysis suggested that, among the variables included in the model, cost of bulb, total labor cos, and irrigation cost had a positive and significant effect but land preparation cost had positive but insignificant on the gross return of onion production, except for cost of pesticide & cost of fertilizer had a negative and insignificant effect on the gross return of onion cultivation. This study also identified some of the problems and constraints associated with onion cultivation. The problems and constraints, of course, are interrelated with one another and hence, need to be removed comprehensively through an integrated programme for the overall development of onion cultivation.

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February, 2021.

Meshkat Hasan

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ABBREVIATIONS AND ACRONYMS

BARC	Bangladesh Agricultural Research Council
BB	Bangladesh Bank
BBS	Bangladesh Bureau of Statistic
BCR	Benefit Cost Ratio
BER	Bangladesh Economic Review
DAE	Department of Agricultural Extension
DoF	Department of Fisheries
EU	European Union
et al.	and others (at elli)
FFP	Fourth Fisheries Project
FRS	Fisheries Research Institute
GDP	Gross Domestic Product
GNP	Gross National Product
GR	Gross Return
Ha	Hectare
HSC	Higher Secondary Certificate
MFC	Marginal Factor Cost
MPP	Marginal Physical Product
MVP	Marginal Value Product
MV	Modern Varieties
NGOs	Non Government Organizations
TC	Total Cost
TFC	Total Fixed Cost
TVC	Total Variable Cost
AEO	Agriculture Extension Officer
SPSS	Statistical Package for Social Sciences
sq. km	Square Kilometer
OC	Operating Capital
TK.	Taka
USA	United States of America

CHAPTER 1

INTRODUCTION

CHAPTER-1

INTRODUCTION

1.1 General Background of the Study

Bangladesh is a country mostly based on agriculture. Agriculture is at the forefront of Bangladesh's economic growth. Economic development is inextricably linked to the performance of the sector. The performance of this sector has a major impact on major economic objectives such as job creation, poverty alleviation, human resource development and food security. Agriculture in Bangladesh depends heavily on the weather, and the entire crop can be harvested within a few hours when storms hit the country. Farms are often very small due to population growth, unequal distribution of land ownership, and inheritance regulations. In Bangladesh, food security for many people is associated with agricultural development. Apart from this, agriculture has a direct link to issues such as poverty alleviation, quality of life and job creation. To ensure sustainable food security for the people, a profitable, sustainable, and environmentally friendly agricultural system is essential.

The country has a large population of 168.2 million covering an area of 147570 sq km (BER, 2021). About 61.82 percent of the country's population lives in rural areas (BBS, 2020). Agriculture provides employment almost 40.6 percent of its total workforce (BER, 2022).

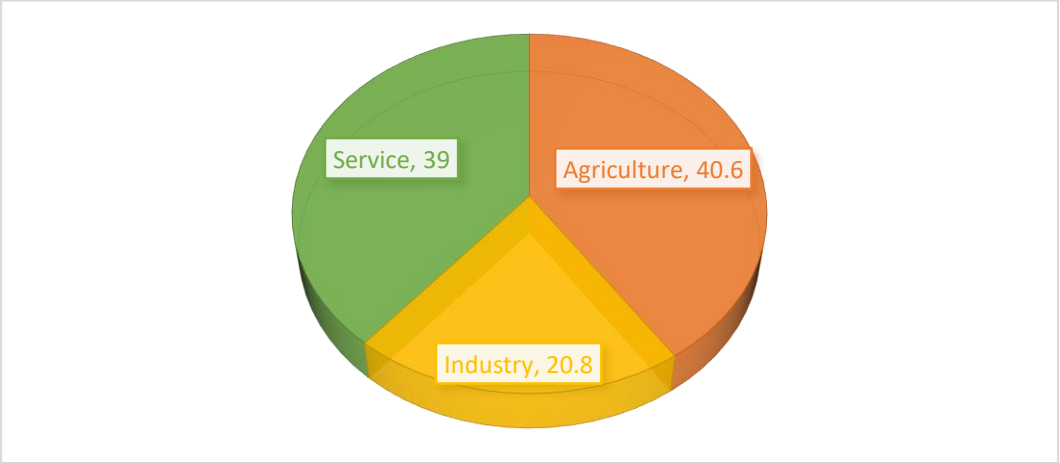


Figure-1.1: Sectoral Share of Employment in Bangladesh.

In the above graph, we can see that the sectoral contribution of Agriculture, Industry & Service sector are 40.6%, 20.8% & 39% of employment in Bangladesh. (BER-2022)

1.2 Present Status of Spices production in Bangladesh

Tasting food and making it fun by adding portions of different vegetables during cooking or making dough or salad is a very common practice everywhere. Spices are a symbol of aristocracy, health, tonic, immunity, energy, and motivation. The people of Bangladesh cannot imagine food without the use of spices. Many spices are expensive plants. The great advantage of large spices is also beneficial. It can play an important role in raising farmers' income, creating jobs, eradicating poverty, ensuring food security, empowering women and enhancing Bangladesh's social development. Under taste and flavor the spices are highly nutritious and the amount of treatment proven by modern scientists. From ancient times the spices were also used to treat many ailments. The most widely used spices are onions, garlic, ginger, turmeric, chili, pepper, cinnamon, cardamom, clove, coriander, cumin, mint, fenugreeks, fennel and tamarind etc. Apart from this, there are many other spices used by people in different places.

Table-1.1: Area & Production of Onion in Bangladesh

Year	Production (MT)	Area (Ha)
2013-14	1380000	451000
2014-15	1720000	460000
2015-16	1866000	459000
2016-17	1734000	441000
2017-18	1803000	426000
2018-19	1900000	443000
2019-20	2110000	438000

Source: BBS (2020)

1.3 Origin and Status of Onion

Onion (Allium cepa L.) is one of the oldest vegetables grown in our history, from central Asia where it spread throughout the world. Modern archaeologists, botanists, and historians are unable to determine the exact time and place of their initial cultivation (because these vegetables are extinct and their planting leaves no trace), yet other written records enable us to draw a very interesting picture of their origin.

There are two schools of thought about the home of onion growing, and both look back on the period 5,500 years ago in Asia. Some scientists believe that onions were first cultivated in central Asia and others in the Middle East by Babylonian culture in Iran and Western Pakistan. Yes, those are based on the ancient remnants of food that survived to the teeth of time, but many believe that organized farming began much earlier, thousands of years before more complex writing tools and tools were created. Onions were cultivated in ancient Egypt 5,500 years ago, in India and China 5,000 years ago, and in Sumerian 4,500 years ago. With the planned planting of onions from 3,500 BC, the ancient civilizations that used them quickly relied heavily on these large vegetables. The major onions producing countries are China, India, USA, Iran, Russia, Egypt, Turkey, Pakistan, Brazil, Netherland, Nigeria, Mexico, Korea, Spain, Algeria, Bangladesh, Ukraine, Myanmar, Japan, and Uzbekistan (FAOSTAT-2019). Onion rank among the spice plants in Bangladesh both locally (4.58 lakh ha) and productive (19.54 lakh metric tons) (BBS 2020). The special level of onion has its own aroma (taste) because it is often used in food and in the preparation of masala. It is an important part of Bangladesh cuisine and is often consumed by the rich and the poor, but domestic production does not meet the annual requirement. It is indestructible in nature.

Traditionally, onions are grown in winter. The Spices Research Center of Bangladesh Agricultural Research Institute (BARI) recently released two new varieties of onions, which are grown in the summer. Released onion varieties are not yet widely available in the farmers' field. Bangladesh needs 2.3 million tons of onions a year to meet its demand. But Bangladesh produces only 1.9 million tons of onions and imports 0.50 million tons of onions (Alam, 2015). Therefore, we should increase the production of onions a year. Local winter varieties are most common in Faridpur, Pabna, Rajshahi, Manikganj, Narsingdi, Bogra and the great Rangpur, during the period December to May.

The total area under onion production in our country is 1.35 lakh hectares and a total production of 11.59 lakh metric tons in the 2019-20 planting year. In all Bangladesh prefectures, Faridpur covers the highest land use area for onion production (65991 hectares), the highest production (2.7 lakh metric tons) in the 2019-20 planting year (BBS, 2020). It is grown in almost every district of Bangladesh, but yields are very low (9.58 tons / ha) compared to other onion producing countries in the world such as China, India, USA, Egypt, Iran, and Turkey where yields per hectare reported 22.08, , 18.70, 60.54, 32.14 and 24.18 tons, respectively (FAOSTAT-2019).

Table 1.2: Worldwide production

Country	Area (ha)	Production (Ton)
China	1127609	24908392
India	1220000	22819000
U.S.A	52370	3170270
Egypt	87948	3081047
Iran	61661	2379096
Turkey	68136	2131513
Russia	83343	2135974
Pakistan	137900	1833200
Netherlands	34356	1779600
Republic of Korea	21498	1412108

Source: FAOSTAT (2019)

Onions are produced in Bangladesh in three different ways (Anonymous, 1991). This method is used to produce the first crop of bulbs and bulbs. But this method involves high costs especially for maintaining good storage areas for maternity gloves. In the second method, the crop is sown by sowing bulbs directly into the field usually by spreading and is rarely in rows. The third method involves the remaining bulblings in the bulb bed and replanting the bulblings in a large field after 5-7 weeks.

The highest yields from local varieties such as Faridpuri and Taherpuri are between 7.48 and 8.98 tons per hectare. This varieties are also more widely accepted by farmers who earn higher returns on their investment compared to previous crop varieties.

However, a huge gap exists every year between total demand and onion production in Bangladesh. Shortages are met by imports from India, Pakistan, and China. Bangladesh needs to spend $ 183 million a year on foreign exchange to import onions, a politically sensitive issue with its wide range of offers and reasonable prices for government.

1.4 Nutritive, Medical Value of Onion

Onions have many medicinal properties. Diuretic is also used for bruises and cuts. It also relieves headaches and insect bites. Onions are a very rich spice because they contain an acceptable amount of various nutrients, which are readily available in the human body. Onions contain vitamin B and trace elements of vitamin C and iron and calcium residues. The distinguishing feature of an onion is its pungency it causes a flexible oil known as alylpropyl-disulphide (Yawalkar 1985). The edible portion of 100 gm of onion contains 1.10 gm protein, 9.34 gm carbohydrate, 23 mg of calcium and 40 kilocalories. Table 1.4 shows that the edible component provides different types of bio-chemical substances (USDA, 2019).

Table 1.3: Biochemical Substances of Onion (Value per 100 gm)

Name of substances	Quantities
Water	89.11 gm
Energy	40 kcal
Protein	1.10 gm
Total lipid (fat)	0.10 gm
Carbohydrate	9.34 gm
Fiber, total dietary	1.7 gm
Sugars, total	4.24 gm
Calcium, Ca	0.023 gm
Potassium, K	0.146 gm
Iron, Fe	0.00021 gm
Vitamin C, total ascorbic acid	0.0074 gm
Vitamin B1, Thiamin	0.000046 gm
Vitamin B2, Riboflavin	0.000027 gm

Source: USDA, 2019

1.5 Statement of the Problem

Agriculture plays a major role in the country's economic development. But the onion farmers face many problems in our country. They can face inputs problem, capital problem, High quality bulb problem, irrigation problem, and many other problems. They can also face low price problem. They don’t get proper price in the onion cultivation season. They have limited or no scope to store the onion. For betterment of

onion farmer, Government of Bangladesh should take some steps. Government should give subsidy of inputs and also ensure the floor price of onion. Government should make more storage capacity for preserving onion for off season. If Government can take this strategy properly then our country can be self-sufficient in onion cultivation.

1.6 Objectives of the Study

The present study was undertaken to achieve the following objectives:

1. To identify socio-demographic profile of onion farmers in the study area;
2. To estimate the financial profitability from onion cultivation;
3. To find out the resource use efficiency of onion cultivation; and
4. To identify the problems facing by onion farmers and to suggest policy options to overcome them.

1.7 Justification of the Study

The economic growth of an agricultural-based country like Bangladesh depends largely on the development of the agricultural sector. The agro-climate conditions in Bangladesh are conducive to plant diversity but 80% of the crop is cultivated areas are currently confined to grain production especially rice (Alam,2014). Due to population growth, the demand for cereals has increased dramatically.

The climate of Bangladesh is also suitable for onion cultivation. There are many causes for low yield rate onion in Bangladesh which Government should support onion farmers by providing subsidy on inputs. Most of the onion farmers are afraid of investing in onion cultivation due to insufficient information on onion farming, credit facilities and marketing techniques. While making production decision, they consider cost of production against the yield of the crop. Production, area and yield of onion in faridpur district are fluctuating over the period. One of the main reasons is that farmers do not get good price for their products. Even they cannot make stable decision whether they should continue onion cultivation in the following year or not. A few studies have been conducted in Bangladesh to determine financial profitability and resource use efficiency of onion cultivation. Finally, it is expected that the findings of the study will be helpful for the individual farmers for increasing the resource use efficiency by effective operation and management of their farms through pointing drawbacks and it will also be helpful for policy makers and extension workers to frame out a useful policy.

CHAPTER 2

REVIEW OF LITERATURE

CHAPTER-2

REVIEW OF THE LITERATURE

The main purpose of this chapter is to review some related studies regarding this current study. Only a few studies have been conducted so far related to the resource use efficiency and profitability of onions in Bangladesh. Also, some of these studies may not be fully applicable to current research, but the findings, method of analysis and suggestion have a significant impact on current research. A review of some of the research activities related to the current studies, which have been done in the past, is discussed below.

Elias, Jabbar and Mondal (2000) conducted economic research on onion production in selected areas of Bangladesh. They estimate the cost of onion production per area per Tk. 7376 and central return Tk. 9931. They have obtained a medium yield of 242 millimeters of onions per hectare.

Arif (2008) conducted research on onion production in Comilla selected areas region. He indicated that the gross returns per hectare are Tk. 101858.56, 102358.56 and 101358.56; the total cost was Tk. 64251.10, 65179.58 and 64741.42; net returns babe Tk. 37607.46, 37178.98 and 366617.14 in small, medium, and large categories of fans respectively.

Akhter *et al.* (2001) conducted research on onion production in selected areas of Bangladesh. This study has shown that onion production is very profitable and can provide cash for farmers. In terms of profitability, onion production was more popular than other winter vegetables. The yield per unit and the gross return of onion were found to be higher than other competing plants.

Barakade *et al.* (2014) conducted an economic study on the production of onions in selected areas of Bangladesh. They estimate the cost of producing acre onions per Tk. 7376 and the average total benefit to TK. 9931. They have obtained a medium yield of 242 millimeters of onions per hectare.

Bevanthade *et al.* (2003) conducted a study on the production of onions in the Amravati region of India's Maharastra Province. Sixty-eight farmers were selected from 6 villages in the Amravati region. Assignments were categorized according to their production area.

The average areas for Group I, II and III were 209.54, 241.07 and 255.3 hectares, respectively. The production costs of A (operating costs), B (A + fixed costs) and C (B + inputs for family work) were 13164.85, 19020. 23 and 19668.123 Rs / ha, respectively. On average, the losses during harvest and storage were 73 percent, the yield was 2335.3 q / ha, and the total return was 33878.44 Rs / ha. Cost C, total cost: profit was 1: 1.70, production cost was 83.61 Rs / q and profit were 59.19 Rs / q, using the current price of 142.8 Rs / q.

Sabur and Mollah (2001) examined the trends, seasonal and seasonal variations, and related benefits of spices in Bangladesh. The result showed that all the spices except turmeric and ginger indicate poor growth rates in production from the independent. The growth rate of the production of all spices was low compared to other food crops but slowed down in the event of a slight trend. The actual price is always the same or less the same during the study. Production and price volatility were high in onions and garlic and low in ginger and turmeric. Price fluctuations are directly related to production volatility. The season depends largely on product destruction and seasonal price fluctuations in recent years. All selected spices other than coriander have a significant advantage compared to competing plants other than potatoes and lentils. On average, 82 percent of the produce is sold at harvest time.

Mahmood (2005) conducted research on selected spices in the Comilla region of Bangladesh. He demonstrated the relative benefits of selected spices, compared to their competing crops. Onions were the most profitable crop among all the competing plants such as potatoes, lentils, and garlic. The net profit per hectare of onions obtained by Tk. 26673.7, which allowed potato Tk. 25875.30, lentil Tk. 20652.10 and garlic Tk. 16755.49.

Hossain (2001) investigated the effect of joint planting of nuts and onions in various crops at the agricultural research station, Shyampur, Rajshahi, Bangladesh during the 1993-94 and 1994-95 Rabies season. Six treatments namely, only nuts (1: 0), one onion (0: 1), one row of onions in two rows of nuts (1: 1), two rows of alternate nuts and two rows of onions (2: 2), three rows of altered nuts and two rows of onions (3: 2) and four rows of altered nuts two rows of onions. A high yield of nuts and a crop of onions have been found on their own crop.

Rahman (2005) conducted an economic study on the production of onions in selected areas in the Rajbari region. The total profit for the corresponding farmers was Tk. 118765.50, Tk. 157606.75, Tk. 155627.25, and Tk. 145360.50 respectively and their net benefits were Tk. 81280.15, Tk. 115376.84, Tk. 111553.04, and Tk. 103637.30, respectively. Per hectare the yields of small, medium, large, and medium farmers were 9501.24 kg, 12608.54 kg, 12450.18 kg and 11628.84 kg. Per hectare human labor was employed for 309.65 days making up 40.82 percent of the total cost to all farmers which was the highest cost of everything. Compared to other farmers, the efficiency of resource utilization was higher for middle-income farmers and its BCR was 3.73. Yield variations were greatly influenced by the amount and size of the human activity, plowing, harvesting, irrigation and the timing of sowing, planting and harvesting.

Saha (2001) examined the comparative benefits of different onion varieties in a selected area of Pabna District. All the researched species were found to be beneficial. But Faridpuri varieties have been found to be more profitable than other varieties. The total return per hectare of the taherpuri, Indian and Faridpuri onion species was Tk. 112389.00, Tk. 106570.00, Tk. 135640.89, respectively; The net returns were Tk. 46756.28, Tk. 50405.65, and Tk. 67945.41, respectively. It was found that the net profit variability was strongly influenced by human consumption, agriculture, bulbs, fertilizers, pesticides, and irrigation water.

Awal *et al.* (2001) A study was conducted to evaluate the impact of various uses and to determine the optimal use of the resource in onion production. Research results have shown that the return of onions is closely related to raw materials, family work, employment, ashes, TSP, MP and bulb without irrigation, animal labor, cattle, urea, and pesticides. These findings also indicate that onion growers are not successful in allocating resources. In addition, farmers have the opportunity to increase productivity through efficient use of household chores, cow dung, irrigation with pesticides on the onion farm.

Alam (2003) conducted a study to study the effects of planting time and nitrogen on growing, harvesting and storing onions in the summer. A maximum yield of 11.32 t / ha has been obtained since 11 April. Nitrogen also showed a significant effect on summer onion harvesting. The highest percentage of weight loss (40.72 percent), decay (19.13 percent), and germination (4.72 percent) were recorded from 12 May.

The combination of treatment on 11 April during planting x BARI Piaz-3 x 0 kg N / ha showed a very low percentage of weight loss (22.89 percent), decay (8.17 percent) and germination (1.33 percent).

Rahman (2004) researched the effect of growth controls on the growth and production of three varieties of onions grown in sets. Taherpuri produced high yields of bulbs (14.99 t / ha). The use of all growth controls significantly increased crop, number of leaves per plant, bulb width, bulb weight, and bulb yield compared to control onion crops.

Haque (2005) conducted a comparative economic analysis of the production of onions and garlic in a selected area in Santhia Plains in the Pabna region. Both onions and garlic were beneficial. Growing onions was more profitable than growing garlic. Per hectare the average yield of onions and garlic was 8412 kg and 4510 kg respectively. The cost per hectare of production, total margin, and residue for the return of onions to Tk. 49437, Tk. 101230, and Tk. 93567 respectively. On the other hand, the corresponding figures for the production of garlic were Tk. 49386, Tk. 43693, and Tk. 36304 respectively.

Alam (2015) examined the effects of planting time on crop growth, factors that contribute to yield, yield and onion bulb quality. Planting on October 30 yielded a maximum yield of 462.33 kg / ha compared to 443.00, 405.58 and 331.75 kg / ha obtained from October 15, November 15 and December 30 respectively. The highest bulb yield per hectare was obtained in the second closest space of 25x10 cm2 (465.42 kg / ha), followed by that of the nearest 20x10 cm2 (454.06 kg / ha).

Islam *et al.* (2007) conducted research on the growth and reaction of onion crops (Allium cepa L.) genotypes at different levels of fertilizer. Studies have shown the effect of four levels of fertilizer namely. 0: 0: 0, 60:65:80, 120: 130: 160 and 240: 260: 320 kg / ha (N: P: K) on growing, producing, and producing donated bulbs of six onion genotypes i.e., Thaherpuri Brown, BARI Onion 1, Faridpuri Bhati, Suksagar, Nasirbala and Pusa Red. Fertilizer at 120: 130: 160 kg / ha produced a high yield of bulbs (14.9 t / ha). Relative studies revealed that bulb harvest was positively related to different yield components but showed a negative correlation with the content of the bulb dry matter (%).

The retrospective analysis showed that the rate of change of the bulb yield depends on the degree of change in plant height, number of leaves and roots, and root length. The growth of roots per plant seems to be very important in increasing yields.

Ullah (2008) conducted experiments at the Regional Agricultural Research Station, Rahmatpur, Barisal to study the impact of different sulfur levels on bulb harvesting, tolerance and economic return of onions. The highest yields of bulbs (19.75 t / ha and 19.88 t / ha) were obtained at sulfur levels between 60 kg / ha and 75 kg / ha for two consecutive years. Both the growing weight and the loss of decay were greatly influenced by the fermentation of the sulfur. The highest rate (9146 percent) of the average return (AR) with the gross margin of Tk. 181844 / ha was obtained at a sulfur level of 60 kg / ha.

Haque *et al.* (2009) conducted a study on the economics of onion and garlic under zero cultivation and traditional methods of planting in growing areas of Bangladesh. Studies have shown that the cost of planting onions is Tk. 93517, Tk. 87696, and Tk. 72001 per hectare at full cost, variable costs and base cost. The main advantage of planting onions was Tk. 64236 per hectare. The average cost of profits was 1.68,1.80 and 2.19 at full cost, variable costs and base cost, respectively. Human activity, bulb / bulb, compost, urea, TSP irrigation and onion and garlic pesticide have had a positive impact on the yield. Timely availability of HYV bulbs, lack of technical knowledge, high prices and unavailability of fertilizers on time, pest infestation and disease, low market prices and lack of proper storage facilities were major problems for onion and onion planting.

Hasan *et al.* (2012) conducted a study on the return on investment in summer onion research and extensions in Bangladesh. The results showed that local growth and onion production increased exponentially due to the adoption of the summer onion farm standard.

Baree *et al.* (2011) conducted a research study comparing the technical efficiency of onion-producing farms in Bangladesh. Experience coefficients were significant for poor branding on small and medium-sized farms. Education coefficients were not good for small and medium farms and were good for large farms. The technical efficiency of the onion farm producing small, medium, and large farms varies from 55 percent to 99 percent, 57 percent to 99 percent and 56 percent to 99 percent and technical efficiency is 77 percent, 87 and 84 respectively.

which meant that in addition to other costs there was a rate of increase in production per hectare of onions by 23 per cent, 13 per cent and 16 per cent on small, medium, and large farms respectively by making good use of existing production technologies.

Haque *et al.* (2011) researched the benefits of planting onions in selected areas of Bangladesh. The onion crop yielded 9869 metric tons per hectare. Cash gross and net return were obtained in Tk. 85308 and Tk. 79487 per hectare, respectively. The average cost of profits was 1.85. Inputs such as human activity, bulblings, compost, urea, TSP, irrigation, and pesticides have had a positive effect on the onion crop. Profits from growing onions were found to be higher than other competing crops such as mustard, nuts, and cabbage. Timely availability of HYV onion bulbs, lack of technical knowledge, high prices and unavailability of fertilizer on time, lack of proper storage facilities were major problems for onion planting in research areas and required immediate attention to address these issues. problems.

Ibrahim *et al.* (2011) conducted a study on weed control in weed control, performance, and benefit of onion (Allium cepa) in the Nigerian forest area. The results showed that all weed control measures ($P < 0.05$) significantly reduced weed control. Similarly, the survival percentage of onions is affected by the use of chemicals. The size of the bulb, the number of bulbs and the onion yield are affected by the use of chemicals. The use of oxyfluorfen has provided excellent performance across all measured parameters. It can be concluded that the profitability of onion production is higher in Guinea savannah than in the Forest zone and the benefits in the Forest area can be increased by the use of selected herbicides (Oxyfluorfen) at a recommended rate.

Shah *et al.* (2011) researched the study of onion production capacity, its limitations and its prospects for improvement in the Punjab farming system, Pakistan. The area under onion crops has been up to 17 percent jumping since last year but production has declined sharply due to many threats including pest and disease outbreaks, lack of improved varieties and quality bulbs and compliance with the high cost of all purchased inputs. The main reasons for the reduction in yields were low quality bulbs, pests and diseases and disease, water stress, marketing, and expensive inputs (Urea, DAP) to be prioritized. All of these factors have a negative impact on the quality and profitability of onions because Pakistan can earn significant foreign exchange and utilize full export capacity.

Baree (2012) conducted a study measuring the technical efficiency of onion farms (Allium cepa L.) in Bangladesh. Product exposure in relation to land, labor, and capital costs is estimated to be 0.3026, 0.0718, and 0.0442, respectively, and significant. In the case of bulb and irrigation, it was found to be insignificant with negative values of 0.0045 and 0.0007. Coefficients of age, experience, and size of the farm were significant for negatively anticipated traits, meaning that the effects of onion production decreased with age, experience, and farm size. The technical efficiency of onion farms varied from 58 percent to 99 percent with an average value of 83 percent. It shows that there is a way to increase production per hectare of onion farm by 17 percent by making better use of production technology without incurring additional costs.

The above review indicates that several studies have been conducted on the effectiveness of onion production technology. The outcome of these studies varies widely for a variety of reasons. The current study aims to gather information about the benefits of onion production and the level of technical efficiency and inefficiency of onion growers. The results of the current study will assist researchers, related farmers and policy makers in taking the necessary steps to increase onion production in our country.

CHAPTER-3

METHODOLOGY

CHAPTER-3

METHODOLOGY

3.1 Introduction

Methodology is an indispensable and integral part of any study. The reliability of a specific study finding depends to a great extent on the appropriate methodology used in the study. Improper methodology very often leads to misleading result. So, careful considerations are needed by an author to follow a scientific and logical methodology for carrying out the study. The author has great responsibility in describing clearly what sorts of method and procedure is to be followed in selecting the study areas, the sources of data and the analyses as well as interpretations to arrive at a meaningful conclusion. This study was carried out by using a primary data collection from selected onion producers in selected areas of Bangladesh for estimation of technical efficiency and profitability of onion production. The methodological framework is presented in this chapter, which consists of three main sub-sections. The first section describes sampling procedure, sample frame, sample size and survey design. Second section describes data collection procedure, formal and informal survey, and primary and secondary data. Data analysis techniques are described in detail in the third section.

3.2 Description of the study area

3.2.1 Location

The selected sample farmers are located in three areas namely Sadarpur, Charvadrasha, and Saltha under Faridpur district respectively.These three areas are located from 20 to 30 km of the district headquarters. The locations of the upazilla are presented in the Map 3.1, 3.2, and 3.3 respectively.

Figure-3.1: Map of Sadarpur Upazila.

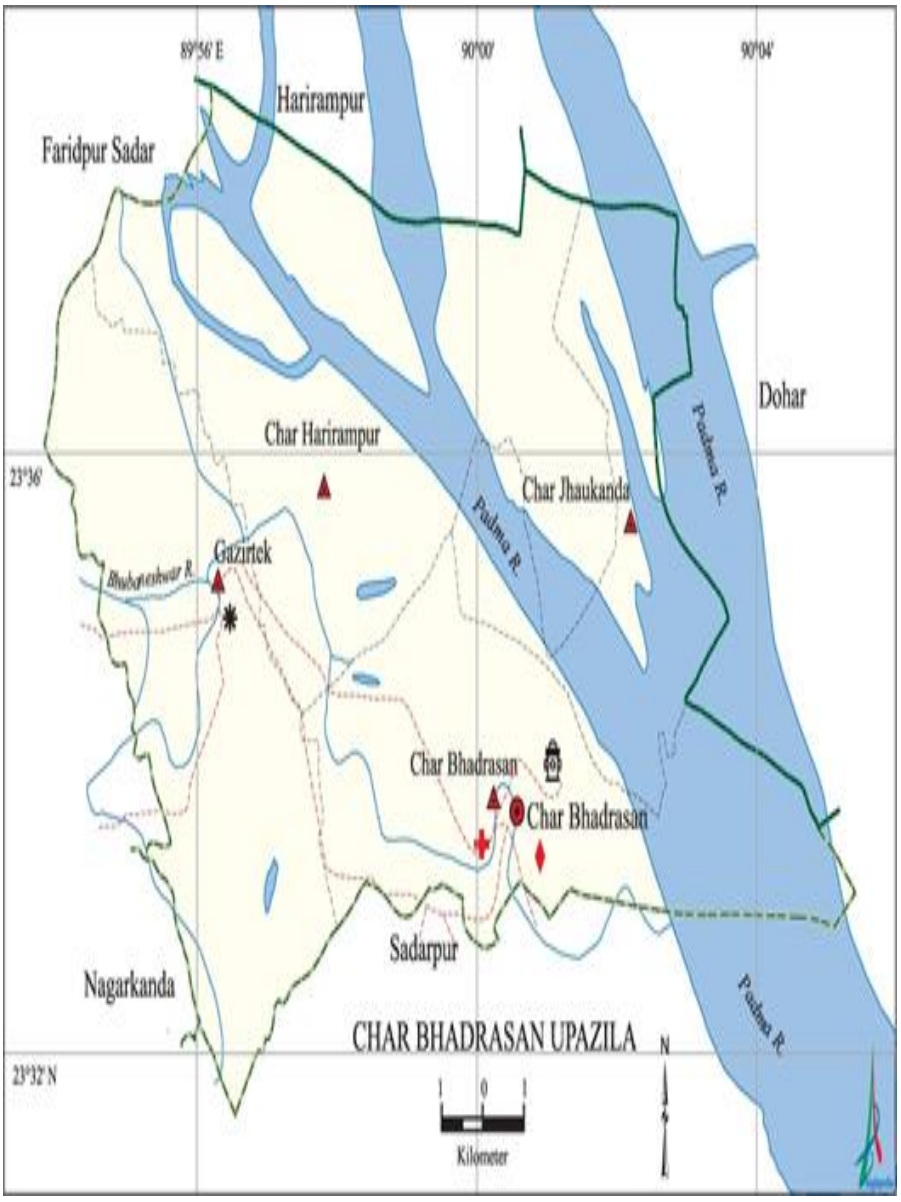


Figure-3.2: Map of Charvadrashan Upazila.

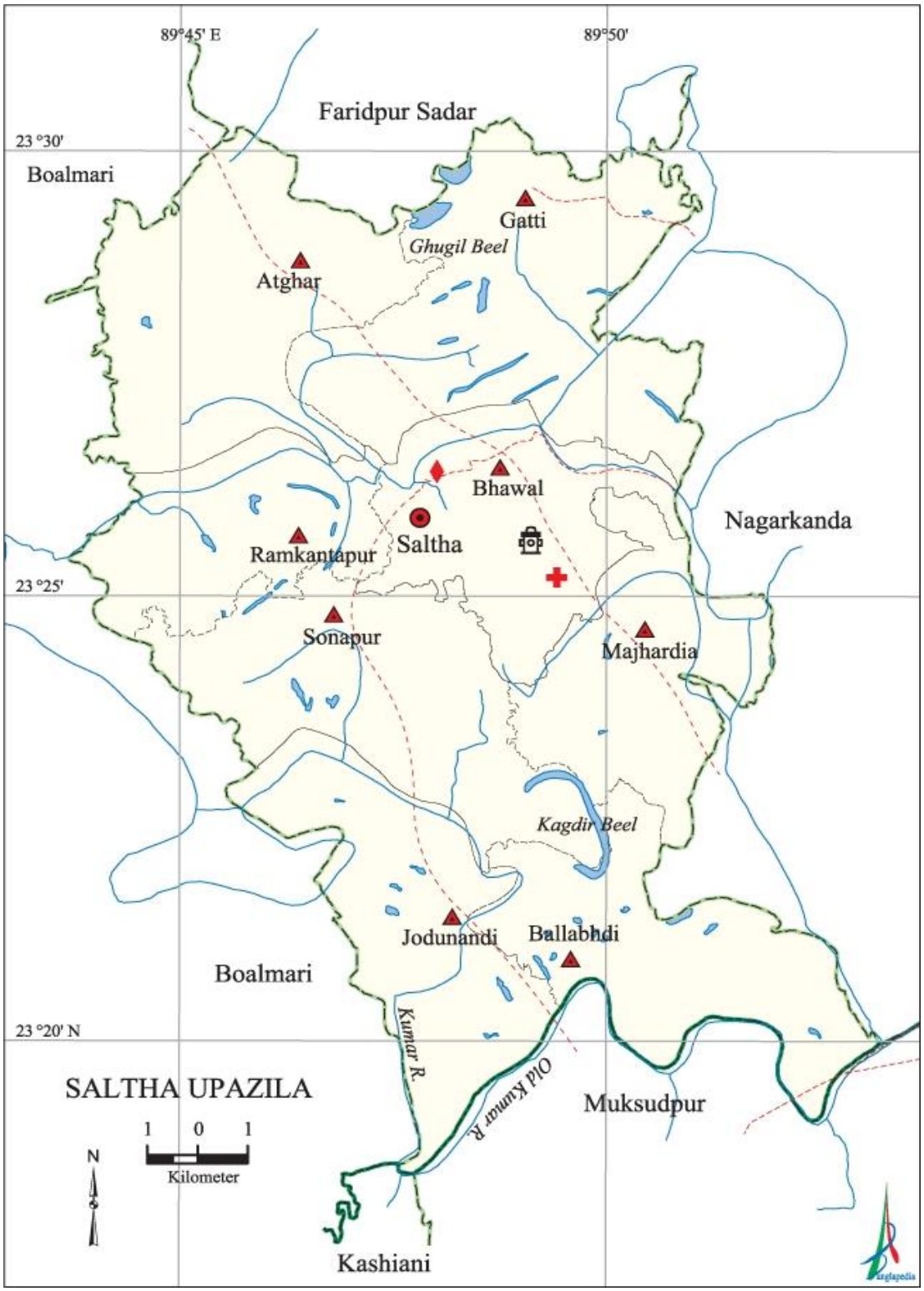


Figure-3.3: Map of Saltha Upazila.

3.2.2 Area and Population

The total area and population of selected areas is shown in Table 3.1. The highest population (796 per sq.km) is Saltha, Then the medium population (650 per sq.km) is Sadarpur and the lowest population density (572 sq. Km) is in Charvadrashan Upazila.

Table 3.1: Area and Population of the Study Area.

Upazila	Area (sq.km)	Population	Male	Female	Population density
Sadarpur	290.2	188757	94982	93775	650
Charvadrashan	133.59	76366	38069	38297	572
Saltha	182.96	145710	74224	71486	796

Source: Banglapedia,2019.

3.2.3 Educational and Occupational Status

Average literacy rate of Faridpur district is 40.90 percent, 44.60 percent for men and 37.00 percent for women. 13 colleges, 44 high schools, 03 high schools, 120 madrasas, 160 primary schools, 2 technical schools, 10 libraries, 4 centers and one women's organization are the main educational institutions. Main occupation of faridpur area is agriculture 58.60 percent, non-agricultural workers 2.88 percent, industry workers 1.07 percent, commercial and another 10.26 percent (Banglapedia, 2019).

3.2.4 Physical Features, Topography and Soil Type

The Faridpur region includes the High Ganges River Floodplain region and the Lower Ganges River Floodplain region. The High Ganges River Floodplain (13205 sq km) covers the western part of the Ganges River, which is covered with mountains and central highlands. Common soil types include mainly calcareous gray floodplain soils and calcareous brown floodplain soils. The content of organic matter in brown ridge soils is low but high in dark brown soils. The soil is slightly alkaline by reaction. The average fertility rate is low. The Lower Ganges River Floodplain (7968 sq km) covers the eastern part of the mighty Ganges River. The soil of this region is made up of mud and iron mounds in the hills as well as sandy loam and heavy clay in the lowlands.

Common soil types include mainly dark gray calcareous soils and brown calcareous floodplains. The content of organic matter is small with ridges and in the middle of the vessels. The average fertility rate is moderate. Onions can be grown in any type of soil, from sandy loam to hard clay. It became clear in the study that the high middle ground with clay soils and the high clay soils of Pabna and Faridpur were widely used in the production of onion lamps (Table 4.1). The texture of the soil and the composition of the study areas are almost identical to other parts of the region. The soil is calcareous at depths of 1.2 m below the ground. Clay is very fragile when it is dry, dry, hard and very volatile. The soil in the study area is very fertile and suitable for growing a variety of plants.

3.2.5 Transport, Communication and Marketing Facilities

Transportation and communications are a prerequisite for the development of a particular region or country. Selected research sites are well connected to different areas of Bangladesh. The local road network helps local people to market agricultural and other products in nearby and remote markets. Many of the roads in the study areas are paved and some are muddy. Because of their good connections with different markets, farmers often do not cheat by having good prices for their produce. Routes for the area by rickshaw, pickup truck, bulldozer, truck, roundabout, cars, and boats. There are many hats, which last more than one day a week and local bazars are held every morning and afternoon.

3.2.6 Climate, Temperature and Rainfall

The climate of Faridpur district is humid in summer and pleasant in winter. It has an average annual temperature of 28.5 ° C: a maximum of 35.6 ° C in May and a minimum of 11.6 ° C in January. Humidity is 63.8 percent on average. The average annual rainfall of Faridpur is 1310 millimeters. About 87 percent of mid-year rainfall occurs between May and October (BBS, 2020).

3.3 Sampling Procedure

In an empirical investigation it is impossible to collect information from the whole population. Therefore, researchers are often forced to make inferences based on information derived from a representative sample of the population. The size of the sample, and amount of variation, usually affect the quantity and quality of information

obtained from the survey. Using appropriate sampling methods, both factors can be controlled (Scheaffer, 1979). The aim is to devise a sampling scheme, which is economical and easy to operate, and provides unbiased estimates with small variance (Barnett, 1991). The main characteristics of sampling theory applied in this study are discussed below.

3.3.1 Sampling Method

The selection of a sample from the population is commonly used in economics, marketing and other disciplines because of limitations of covering the whole population (Barnett, 1991; Kinnear and Taylor, 1987). The authors consider that cost is the main constraint to carrying out interview of the whole population. Given limitations in terms of money, time, efforts and data management, a sample is a more appropriate method. They argue that sampling not only saves cost and time but can also give more accurate results than a census. In a census survey more staff is required to carry out the task, therefore, supervision of staff and management problems will arise. Sampling theory provides an opportunity to minimize cost and to achieve acceptable results (Casley and Kumar, 1988; Kinnear and Taylor, 1987). However, a sampling procedure involves the following steps: defining the population, sample frame, sample size and sample selection procedure.

3.3.2 Defining the Population

Separation of people is the first step in the process of sampling, that is, the category or feature under investigation, the sample unit, the location or level of the investigation, and the time of the investigation (Kinnear and Taylor, 1987). The field under investigation was onion. The sample units were onion farmer in Faridpur district.

3.3.3 Sampling Frame

Farm management research requires certain important information regarding research objectives. The sample framework for the current study was selected for the purpose of selecting an area where onion cultivation was intensive. On the basis of high onion crop production, the focus of selecting research sites was the following-

i. A large number of onion growers are available, and onions are growing well, and farmers are using a good portion of their land to produce onions in this research areas.

ii. These areas had similar characteristics such as topography, soil, and onion-producing climates.

iii. Easy access and good communication services in these villages.

iv. The researcher was familiar with the local language and other socio-economic aspects of the farmers in selected districts and the expected response of respondents was high indicating the chances of obtaining a more accurate data set.

v. Conducting social and economic research in these research areas.

3.3.4 Sample Size

In a sample survey, a first question that commonly arises is "how large should the sample be?" Casley and Kumar (1988) and Kinnear and Tayler (1987) suggested that a good survey sample should have both a small sampling error and minimum standard error. This can be obtained if one has unlimited resources. However, given constraints, such as finance, time and data management, compromises have to be made in selecting the sample size.

As a rule, the larger the sample size the higher the reliability, the lower the error and the greater the confidence one can place on the findings reflecting the characteristics of the population as a whole. But, faced with the inevitable constraints of time and money, the researcher invariably has to compromise between optimum and acceptable levels of confidence, reliability and error. Simple guidelines to determine the sample size provided by Poate and Daplyn (1993) were considered for selecting a representative sample size of onion producers. For this study, A total of 120 farmers (40 per upazila at Sadarpur, Charvadrashan & Saltha) who grew same varieties of onions in selected areas were selected as samples.

3.3.5 Sample Selection Procedure

The investigator wishes to avoid bias in the sample selection process to achieve accuracy in the estimates, which is to have a small standard error (Kinnear and Taylor, 1987). The best way to avoid bias in the sample selection process is use of simple random sampling in which each unit of the population has an equal chance for selection (Scheaffer, 1979). Either increasing the sample size or imposing various restrictions and modifications on the simple random sampling procedure can achieve an increase in precision of the sampling procedure. At first, onion dominated upazila was selected purposively from each district. Then two villages were selected from each of the upazila by simple random sampling method and the ultimate sampling units (Households) were

selected by random sampling method. The procedure was comprehensive and representative of the whole population.

3.4 Data Collection Procedure

Primary data has been collected by conducting survey of onion producers from the selected areas. The fieldwork also involved gathering data on onion production practices, input use, labor utilization, natural and socio-economic constraints, prices and market activities. The methodology consisted of field survey, review of previous studies, and interviews with knowledgeable onion producers, and also direct observation by the researchers. In the direct observation, emphasis was placed to assess the existing management practices, input use and marketing system of onion producers.

3.4.1 Informal Survey

An informal survey was carried out to achieve the stated objectives. The purpose of this survey was to gather quick information on various aspects of the study, organize fieldwork plan, testing the validity of the questionnaire and estimating the various cost components such as financial costs, travel time, interview time etc. This preliminary survey provided an opportunity to understand the existing labour use, input and output costs. During the informal survey, interviews were held with a farmer or group of farmers on one or more aspects of the study and field notes prepared. Based on this preliminary information the investigator developed the questionnaire for further in-depth investigations.

3.4.2 Formal Sample Survey

Gaining the farmers' confidence and obtaining accurate information was a key during the fieldwork. To achieve these objectives, producers were assured absolute privacy, interviews were held in places of their choice and they were assured that the researchers are not related to any government tax agency and information would be used for academic purposes. Most of the interviews were held at the farm or in the farmer's house. The interview usually started with an introduction about the background of the researcher, the objectives of the study and the way in which the respondent was chosen. The discussion started with general topics of interest of the farmers, such as social life, family and the onion production and contracting system etc. This method has been found useful in establishing confidence with producers; its only disadvantage was increasing the time of the interview. Gradually, the researcher converted the discussion

to the related issues of onion production practices and problems. Then specific questions from the questionnaire were asked and the answers were recorded.

3.4.3 Design of Questionnaire

Design of questionnaire is a difficult exercise at the planning stage of a survey (Casely and Lury, 1981). During the development of a questionnaire, two main problems are commonly noted:

a) the questionnaire tends to be long or too many topics are covered
b) the sequence of question has not been well organized.

Thus, time and money are wasted for collecting, checking and entering data in a computer, which are not required. The poor sequences of questions also make it difficult at the time of data analysis. As the survey mainly depends upon the preparation of the survey schedule, therefore, a draft schedule was prepared for pre-testing to verify the relevancy of the questions and nature of response of the farmers. After making necessary correction, modification and adjustment, a final survey schedule was developed.

In this study the questionnaires were designed with the following heads-

i. General information of the sample farmers;
ii. Family composition of the sample farmers;
iii. Occupational and educational status of sample farmers;
iv. Information about land;
v. Production cost of onion;
vi. Source of capital;
vii. Amount of yield obtained from onion and
viii. Problem faced by the farmers in producing onion.

The questionnaires were in English but questions were asked in the local languages from the respondents.

3.4.4 Data Collection Techniques

Primary data was collected through conducting field survey, while secondary data was gathered from publications and statistical bulletins. Due to the absence of producers' records regarding farm activities, data collection depended on a combination of methods, which rely on memory recall for basic information such as labor use, wages, input costs.

3.4.4.1 Primary Data Collection

Since farming is one-season, the farm business research should cover the entire crop year in order to have a complete crop sequence. The researcher must determine how well the information in a particular year represents the standard or average conditions, especially in crop yields, annual production, and price level. Farmers usually plant onions from mid-December to January and harvest after three months. Data for this current study collected during the period March to April 2021. Basic information was collected from farmers. Selected respondents were interviewed in person with the help of pre-tested questions. Farmers' fields were also visited to gain a clearer understanding, perception and ideas about production and marketing programs in the research area. Major, higher, and higher markets were also visited for basic data collection, location recognition and surveillance. The main data collected from the manufacturers was used to estimate production activity.

3.4.4.2 Secondary Data Collection

Secondary data were collected from various research documents and similar papers-

- Bangladesh Statistical Yearbook,
- Agricultural Statistical Yearbook of Bangladesh
- Bangladesh Economic Review
- National and international journals, articles, and books as well
- The Internet

3.5 Accuracy of the Data

Adequate measures were taken during the data collection process to minimize potential errors. The steps taken were

- Built-in assessment system;
- Site exploration; and
- Respondents' independent interviews.

In the event of a collision and collapse, neighboring farmers were asked for the necessary verification and the data was checked and corrected for repeated visits. To ensure compliance with the reliability of the data generated data, follow-up visits were also conducted in the field for further information.

3.6 Processing, Editing and Tabulation of Data

The data collected was analyzed and verified for the purpose of compliance and completeness. Editing and coding are done before entering data into a computer. All data collected was summarized and carefully reviewed to eliminate any possible errors. Data was presented in the form of a table because it was simple, widely used, and easy to understand. In addition, performance analysis was also adopted to a lesser extent in order to achieve the expected outcomes. Data entry is done on a computer and analysis is done using the relevant Microsoft Excel software.

3.7 Analytical Techniques

Data were analyzed with a view to achieving the objectives of the study. Several analytical methods were employed in the present study. Tabular method was used for a substantial part of data analysis. This technique is intensively used for its inherent quality of purporting the true picture of the farm economy in the simplest form. Relatively simple statistical techniques such as percentage and arithmetic mean or average were employed to analyze data and to describe socioeconomic characteristics of onion growers, input use, costs and returns of onion production and to calculate undiscounted benefit cost ratio (BCR). In order to estimate the level of technical efficiency in a manner consistent with the theory of production function, Cobb-Douglas type stochastic frontier production function will be used in the present study.

3.7.1 Economic Profitability Analysis

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

- Land preparation
- Human labor
- Bulb
- Urea
- TSP
- Mop

- Insecticide
- Irrigation
- Interest on operating capital
- Land use

DAP fertilizer is not used in the study area, That's why I didn't include DAP.

Profit = Total Returns – Total Costs

Profits from plants are estimated based on the number of key products. In this study variable costs, fixed costs and total costs are defined. Total variable costs (TVC) included land preparation, human labor, bulb, organic fertilizer, urea, TSP, MoP, pesticides, irrigation, and interest on operating costs. Fixed costs (FC) included only the rental amount of land. Total Cost (TC) includes total variable costs and fixed costs.

3.7.1.1 Cost of Land Preparation

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

3.7.1.2 Cost of Human Labor

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

3.7.1.3 Cost of bulb

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

3.7.1.4 Cost of Urea

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

3.7.1.5 Cost of TSP

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

3.7.1.6 Cost of MoP

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

3.7.1.7 Cost of Pesticides

Farmers use 2-3 different types of pesticides to keep their crops free of pests and diseases. The cost of pesticides is calculated based on the market value of the pesticides used in the study areas per hectare.

3.7.1.8 Irrigation cost

Water management helps increase onion production. Irrigation costs vary from farmer to farmer. It was calculated by considering the frequency of irrigation and how much it cost.

3.7.1.9 Interest on Operating Capital

Operating interest rates were determined on the basis of the cost of opportunity. The operating cost represents the average operating cost during that period because all costs were not incurred initially or at any time. Costs have occurred throughout the production period; therefore, at an average of 9 percent per annum interest rate for four months was calculated on onions. Interest on operating expenses is calculated using the following formula:

The Formula is,

IOC = AIit

There,

IOC = Interest rate on operating capital

i = Interest Rate

AI = Total Investment / 3

t = Total cycle time

3.7.1.10 Cobb Douglas production function

The production function represents the technical relationship between the output and the input element. In order to balance production work, one needs to develop its structures that lead to the clarity of a clear functional form.

One of the most widely used production functions is the Cobb Douglas production. This work was originally used by C.W. Cobb and P.H. Douglas in his twenties measuring labor production and finance in the American manufacturing industry. Their main purpose was to balance employee shares and funds into a complete product; therefore, use this function by compression that the amount of elasticity or coefficients of degradation should include one. Later, they released the practice. Cobb and Douglas originally included work in the 1930s and 1940s series; the same form was used for various parts of the industry.

This form of work was then used in many production workshops in technical units (crops, livestock) and farm firms in agriculture. The popularity of this work is due to the following aspects of the project:

(i) Provides direct expansion of production in relation to inputs;

(ii) Allows more degrees of freedom than other algebraic forms (such as quadratic activity) that allow for an increase or decrease in background products, and

(iii) Simplify the calculations by reducing the number of reversals to be handled in retrospective analysis.

The first form used by Cobb and Douglas was

$$\mathbf{Q = aL^{\beta}K^{1-\beta}U}$$

This forces the expansion amount to one. Their later conversion was

$$\mathbf{Q = aL^{\alpha}K^{\beta}U}$$

Where, **α+β** it does not have to be equal to one.

In agriculture, this method of operation has not been implemented in its original form. The amount of flexibility is not kept equal to one and the number of variables is not limited to both. Even at the time when the basic concept of working form was given to Cobb and Douglas, different types of work have continued to be called Cobb-Douglas production work.

Cobb-Douglas production work, in its stochastic form, can be described as

$$Y_i = \beta_1 X_{2i}^{\beta 2} X_{3i}^{\beta 3} e^{ui} \quad \ldots\ldots\ldots\ldots\ldots . (3.1)$$

There, Y = output

X2 = labor input

X3 = capital input

u = the name of the stochastic disorder, e = the basis of the natural logarithm.

From Eq. (3.1) it is clear that the relationship between the output and that of both inputs is not linear. However, if we change this model, we get:

$$\ln Y_i = \ln\beta_1 + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + u_i$$
$$= \beta_0 + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + u_i \ldots\ldots\ldots\ldots \ldots (3.2)$$

Where, $\beta_0 = \ln\beta_1$.

Written as such, the model is linear in parameters β_0, β_2, and β_3 and is therefore a vertical line model. Note, however, that it is not a line in the Y and X variations but a line in the logs of these variables. In short, (3.2) a log model, a double log, or a linear line, the opposite part of the multiple retrospective log two-line log model.

The Cobb-Douglas production function is well known:

1. β_2 is the (partial) expansion of output in relation to employee inputs, i.e., measures the percentage change in output, say, a 1 percent change in employee inputs, holding a fixed investment amount.

2. Similarly, β_3 is the extension (in part) of the output in relation to inputs, which holds fixed inputs for employees.

3. The sum ($\sum\beta_i$) provides information about the returns on the scale, that is, the output of the output in a limited input change. If this amount is 1, then there is a continuous return on the scale, i.e., double the input will double the output, triple input will triple the output, and so on. If the amount is less than 1, there is a reduction in the scale — double the input will be less than double output. Finally, if the amount is greater than 1, there is an increasing return on the scale — double the input will be more than double the output.

Before proceeding, note that whenever you have a log-regression model that includes any number of variables the coefficient of each X variable measures the expansion (partial) of the Y-dependent variance with respect to that variance. So, if I have a flexible log-linear model:

$$\ln Y_i = \beta_0 + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + \ldots\ldots + \beta_k \ln X_{ki} + u_i \ldots\ldots\ldots\ldots .. (3.3)$$

Each of the coefficients (partially) of the regression, β_2 to β_k, is the Y's extension (partially) with respect to the X_2 to X_k variable. Assuming that the model (3.2) satisfies the consideration of the retrospective model; found retarded by OLS. (Acharaya, 1988).

3.7.1.11 Specification of the Cobb-Douglas Production Function

The input and output relationship in onion cultivation was analyzed with the help of the Cobb-Douglas production method. In order to determine the contribution of the most important changes in the production of onion cultivation, the following model specifications were used.

$$Y = aX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}X_6^{b6}e^{ui} \qquad \ldots\ldots\ldots(3.4)$$

The Cobb-Douglas production function has been converted into the next logarithmic form so that it can be solved in the normal small square (OLS) format.

Where, Y = Total annual Return (Tk / ha);

X1 = Cost of onion Bulb (Tk./ha);

X2 = Total Labor Cost (Tk / ha);

X3 =Land Preparation Cost (Tk / ha);

X4 =Irrigation Cost (Tk / ha);

X5 = Cost of Pesticide (Tk / ha);

X6 = Total Cost of Fertilizer (Tk / ha);

a = Disconnect;

b1… .b6 = Coefficient of corresponding fluctuations;

Ui = Error Time;

i = 1, 2, …… .6.

3.8 Measurement of Resource Use Efficiency

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.

In this study the MPP and the corresponding values of MVP were obtained as follows:

MPPxi*Pyi = MFC,

Where, MPPxi *Pyi = MVP,

But, MPP = bi*(Y/Xi)

So, MVP = bi* (Y/Xi) Pyi

Where,

bi = regression coefficient per resource

Y = Mean output

Xi = Mean value of inputs

Pyi = price of output

MFC = price per unit of input.

Decision Criteria: The decision criteria for choosing efficiency will be-

- When the ratio of MVP and MFC is equal to unity indicates that the resource is efficiently used.
- When the ratio of MVP and MFC is more than unity implying the resource is underutilized.
- When the ratio of MVP and MFC is less than unity implying the resource is overused.

CHAPTER-4

SOCIO-DEMOGRAPHIC PROFILE OF ONION PRODUCING FARMERS

CHAPTER-4

SOCIO-DEMOGRAPHIC PROFILE OF ONION PRODUCING FARMERS

4.1 Introduction

This chapter discusses the socio-economic characteristics of sample farmers. The socio-economic indicators of farmers are important in holding production planning. People differ in many ways. A person's conduct is largely determined by the quality of his life. There are many related and basic attributes that reflect the individual and have a profound effect on the development of his or her character and personality. Therefore, it was assumed that the business combination, method of use, purchase pattern, and employment patterns of different farm families would be influenced by its various characteristics. In the current study 40 (33.33 percent), 40 (33.33 percent), and 40 (33.33 percent) farmers were recruited from Sadarpur, Charvadrashan, and Saltha Upazila respectively. Finally, the economic aspects of the sample families were assessed. This was family size and composition, age distribution. Occupation, level of education, women's participation, land ownership pattern etc. A brief discussion of these components is provided below.

4.2 Age Distribution and Family Size of the Sample Farmers

The age of the farmers contributes to the production and better management of the farming system. Some researchers think that older farmers are more knowledgeable and more efficient in using resources. Some researchers note that young farmers are more likely to use advanced technology than older ones. (Source: M. I. Nazrul-2006)

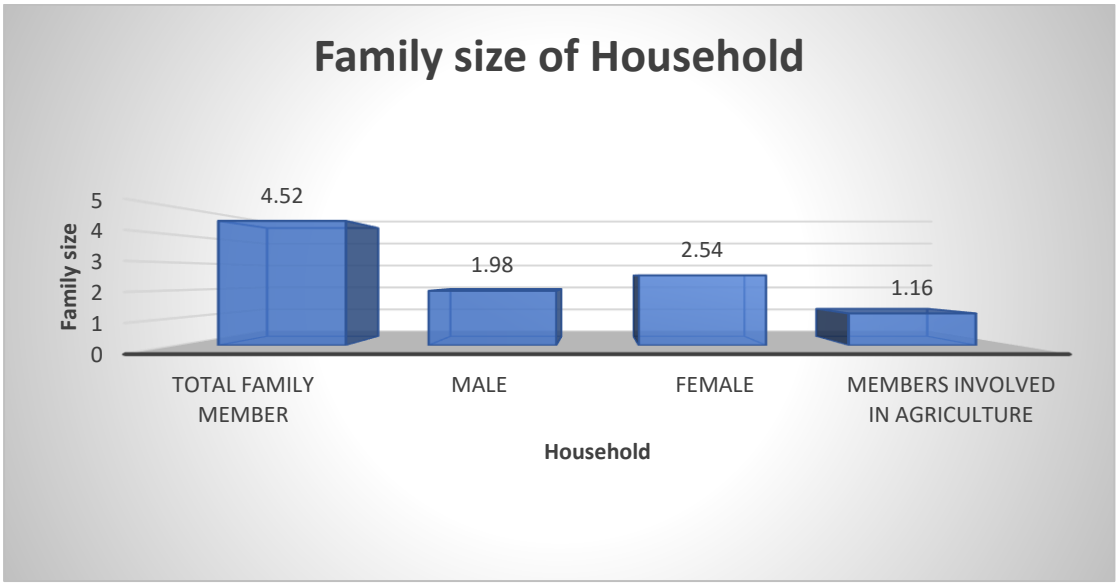
Table 4.1 Age Distribution of the Respondent

Age category	No.	Percent (%)
20-30 years	14	11.67
31-45 years	56	46.67
Above 45 years	50	41.66
Total	120	100

Source: Field survey, 2020.

In the present study, all categories of farmers in the study area were divided into different age groups as shown in Table 4.1. It is clear from the table that most farmers were middle-aged in the study area. Growers who grow onions are divided into three categories: 20-30 years, 31-45 years and over 45 years. Of these sample farmers 11.67% were between the ages of 20-30, 46.67 percent were students. 31-45 years of age and 41.66 percent fall into the age group over 45 years. The average family size of our country was estimated at 4.40 (BBS, 2020).

Fig-4.1: Family size of Household



The average size of a family of onion producers was found to be 4.52 which was slightly higher than the average family size of the country. The average number of male, female and members involved in agriculture are 1.98,2.54 and 1.16 respectively. These findings mean that the majority of sample farmers were in the active age group of 31-45 years indicating that they provided additional farming efforts. This age group should have great strength and risk-taking ability.

4.3 Educational Status of the Respondents

Education is often regarded as an indicator of social development. It plays a very important role in reducing poverty and inequality, improving health, and making use of information. Education means efficiency. Farmer education helps to increase skills and productivity. Education plays a vital role in accelerating agricultural development and contributes greatly to new technologies and scientific knowledge about agriculture. It is clear from Table 5.2 that of the 120 sample farmers, 21.67% farmers have no

education, 30.00% can do Sign only, 30.83% have completed Primary Level, 13.33% farmers have completed their Secondary Level, and eventually only 4.17 percent of farmers completed their higher-level education.

Table 4.2 Educational Status of the Onion Producing Farmers

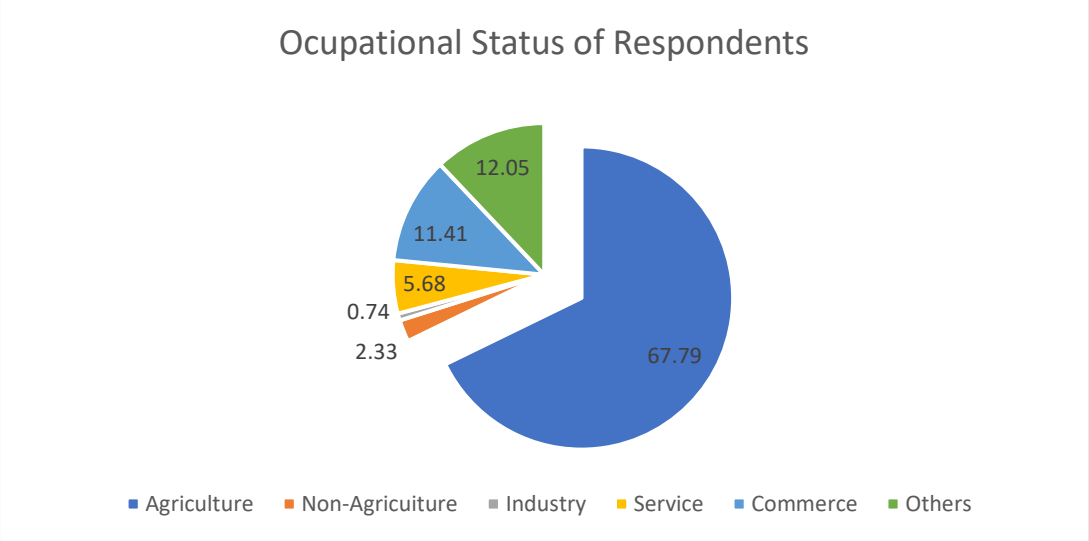
Level of Education	No.	Percent (%)
Illiterate	26	21.67
Sign Only	36	30.00
Primary Level	37	30.83
Secondary Level	16	13.33
Higher Level	5	4.17
Total	120	100

Source: Field survey, 2020.

4.4 Occupational Status of the Onion Producing Farmers

In this study area farmers were working on different types of activities and onion cultivation. It was noted that, as a major source of income, onion cultivation was the main activity of onion growers. Some of them had the opportunity to participate in other activities. It is clear from the statistics that 67.79 percent of farmers and 23 percent are involved in onion cultivation as a primary and support function. After that non-agriculture, Industry, Service, Commerce, and others are 2.33,0.74,5.68,11.41,12.05 percent respectively.

Figure-4.2: Occupational Status of the Onion Farmers

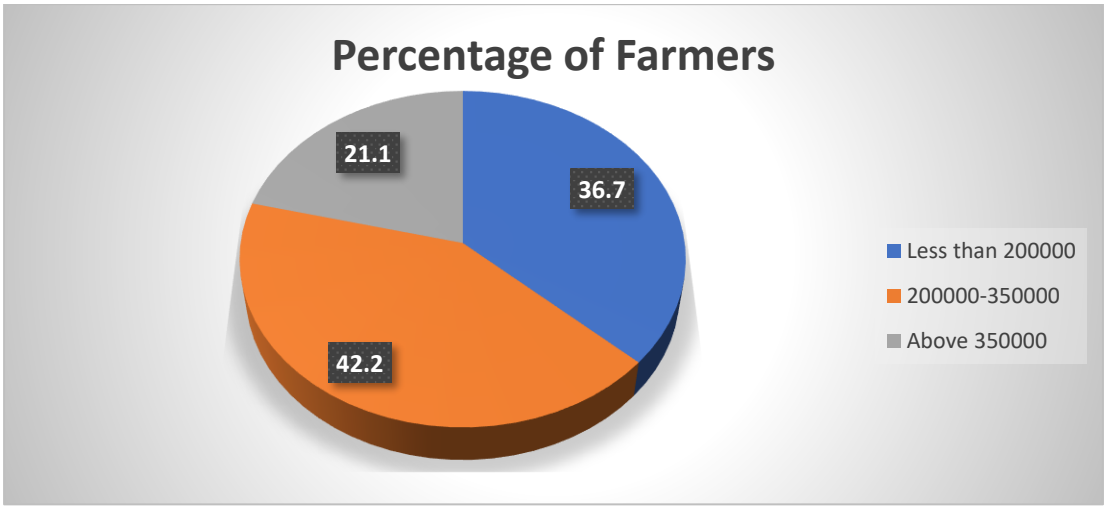


Source: Field Survey-2020

4.5 Income Distribution of the Respondent

The yearly income of onion farmers differs from one another. In the present study, the incomes of onion farmers were categorized as follows: less than TK. 200000, from TK. 200000 to TK. 350000 and above TK. 350000. It is evident from the figure 5.3 that most of the farmer's yearly income belonged to the category of TK. 200000 to TK. 350000. About 42.2 percent of the onion producing farmers were earned Tk. 200000 to TK. 350000 per year, 36.7 percent of the farmers were earned Tk. less than TK. 200000 per year and 21.1 percent farmers were earned above Tk. 350000 per year.

Figure 4.3: Income Distribution of the Respondent



Source: Field survey, 2020

4.6 Sources of Credit Facilities of the Respondent

The cash flow is an important factor in any type of farming. Sources of loans for onion-producing farmers include Banks, NGOs, relatives and their sponsors. In the research sector various NGOs such as BRAC, ASA, CARE, Nobolok etc. run their own lending services to poor farmers, so that they can use the fund in the Onion Cultivation business. About 15.00% of farmers are loaned out to banks, 8.33% of farmers have taken out loans from the private sector and 25.00% of farmers have taken out loans from their relatives as reported by farmers. And 51.67 percent of farmers spend their money (Table 4.3).

Table-4.3: Sources of Funds

Items	**No.**	**Percent (%)**
Own Capital	48	40.00
Credits & It's Sources		
Banks	22	18.33
NGOs	20	16.67
Relatives	30	25.00
Total	120	100

Source: Field survey, 2020.

4.7 Concluding Remarks

This chapter analyzes aspects of the economic well-being of sample farmers. The findings of the analysis clearly show the socio-economic aspects of each other in terms of age distribution, education, occupation, farm size, ownership pattern, women's involvement etc.

CHAPTER-5

PROFITABILITY OF ONION CULTIVATION

CHAPTER-5

PROFITABILITY OF ONION CULTIVATION

5.1 Introduction

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

5.2 Profitability of Onion Production

5.2.1 Variable Costs

5.2.1.1 Land Preparation Cost

Land preparation is the most important components in the production process. Land preparation included ploughing, laddering and other activities needed to make the soil suitable for onion cultivation. For land preparation in onion production, no. of tiller was required 3 with Tk. 3235.00 per tiller. Thus, the total land preparation cost of onion production was found to be Tk. 9715.00 per hectare, which was 3.75 percent of total cost (Table 5.1).

5.2.1.2 Human Labor Cost

Human labour cost is one of the major cost components in the production process. It is one of the most important and largely used inputs for producing onion. The quantity of hired human labour used in onion production was found to be about 120 man-days per hectare and average price of human labour was Tk. 400 per man-day. Therefore, the total cost of hired human labour was found to be Tk. 48000.00 representing 18.58 percent of total cost. There are 30 Family labor was found and the price was also 400. The total cost of house hold labor was 12000 representing 4.65 percent of total cost. (Table 5.1).

5.2.2 Cost of Bulb

Cost of bulb varied widely depending on its quality and availability. Per hectare total cost of bulb for onion production were estimated to be Tk. 128265.00, which constituted 49.66 percent of the total cost (Table 5.1).

Table 5.1 Per Hectare Variable Costs of Onion Cultivation

Items of Cost	Quantity	Rate	Cost (Tk./ha)	%of Total Cost
Land preparation	3.00 Times	3235 Tk/time	9715	3.75
Human labor	120Man-days	400 Tk/day	48000	18.58
Bulb	1973 Kg/ha	65 Tk/Kg	128265	49.66
Urea	154 Kg/ha	16 Tk/Kg	2464	0.95
TSP	118 Kg/ha	22 Tk/Kg	2596	1.00
MoP	125 Kg/ha	16 Tk/Kg	2000	0.77
Cost of Insecticides	3.00 Times	1012 TK/times	3036	1.18
Cost of Irrigation	3.00 Times	1655 TK/times	4965	1.92
A. Total Operating Cost (TOC)			**201050**	**77.63**
Interest on operating capital @ of 9% for months			6031.00	2.33
B. Total Variable Cost (TVC)			**207081**	**77.85**
Rental value of land			39560	15.31
Family Labor	30 man-days	400 Tk/day	12000	4.65
C. Total Fixed Cost (TFC)			**51500**	**19.94**
D. Total cost (B+C)			**258581**	**100.00**

Source: Field survey, 2020

Note: Quantity and rate for land preparation are expressed in no. of tiller per hectare and Tk. per tiller units, respectively. Quantity and rate of human labor are expressed in man-days per hectare and Tk. per man-days units, respectively.

5.2.2.1 Cost of Urea

In the study area, farmers used different types of fertilizers. On an average, farmers used urea 154 kg per hectare. Per hectare cost of urea was Tk. 2464.00, which represents 0.95 percent of the total cost (Table 5.1).

5.2.2.2 Cost of TSP

Among the different kinds of fertilizers used, the rate of application of TSP (118 kg) was similar to urea fertilizers. The average cost of TSP was Tk. 2596.00 which representing 1.00 percent of the total cost (Table 5.1).

5.2.2.3 Cost of MoP

The application of MoP per hectare (125 kg) was found lower than other fertilizers. Per hectare cost of MoP was Tk. 2000.00, which represents 0.77 percent of the total cost (Table 5.1).

5.2.2.4 Cost of Insecticides

Farmers used different kinds of insecticides to keep their crop free from pests and diseases. The average cost of insecticides for onion production was found to be Tk. 3036.00 which was 1.18 percent of the total cost (Table 5.1).

5.2.2.5 Cost of Irrigation

Cost of irrigation is one of the most important costs for onion production. Production of onion largely depends on irrigation. Properly application of irrigation water help to increase bulb diameter, number of cloves, number of leaves and plant height. As a result yield per hectare is being increased. The average cost of irrigation was found to be Tk. 4965.00 per hectare, which represents 1.92% of the total cost (Table 5.1).

5.2.2.6 Interest on Operating Capital

It may be noted that the interest on operating capital was calculated by taking in to account all the operating costs incurred during the production period of onion. Interest on operating capital for onion production was estimated at Tk. 6031.00 per hectare, which represents 2.33 percent of the total cost (Table 5.1).

5.2.2.7 Total Variable Cost

Therefore, from the above different cost items it was clear that the total variable cost of onion production was Tk. 207081.00 per hectare, which was 77.85 percent of the total cost (Table 5.1).

5.3 Fixed Cost

5.3.1 Rental Value of Land

Rental value of land was calculated on the basis of opportunity cost of the use of land per hectare for the cropping period of three months. Cash rental value of land has been used as cost of land use. On the basis of the data collected from the onion farmers the land use cost was found to be Tk. 39560.00 per hectare, and it was 15.31 percent of the total cost (Table 5.1).

5.3.2 Family Labor

The quantity of family labour used in onion production was found to be about 30 man-days per hectare and average price of family labour was Tk. 400 per man-day. Therefore, the total cost of family labour was found to be Tk. 12000.00 representing 4.65 percent of total cost. (Table 5.1).

5.4 Total Cost (TC) of Onion Production

Total cost was calculated by adding all the cost of variable and fixed inputs. In the present study per hectare total cost of producing onion was found to be Tk. 258581.00 (Table 5.1).

5.5 Return of Onion Production

5.5.1 Gross Return

Return per hectare of onion cultivation is shown in table 5.2. Per hectare gross return was calculated by multiplying the total amount of product with respective per unit price. It is evident from table that the average yield of onion per hectare was 12804.00 kg and the average price of onion was Tk. 40.00. Therefore, the gross return was found to be Tk. 512160.00 per hectare (Table 5.2).

5.5.2 Gross Margin

Gross margin is the gross return over variable cost. Gross margin was calculated by deducting the total variable cost from the gross return. On the basis of the data, gross margin was found to be Tk. 305079.00 per hectare (Table 5.2).

5.5.3 Net Return

Net return or profit was calculated by deducting the total production cost from the gross return. On the basis of the data the net return was estimated as Tk. 253579.00 per hectare (Table 5.2).

Table 5.2: Per hectare cost and return of onion production

Measuring Criteria	**Quantity (kg/ha)**	**Rate (Tk./kg)**	**Cost (Tk./ha)**
Main Product Value	12804	40	512160
Gross Return (GR)			512160
Total Variable Cost (TVC)			207081
Total Cost (TC)			258581
Gross Margin (GR-TVC)			305079
Net Return (GR-TC)			253579
BCR (undiscounted)(GR/TC)			**1.98**

Source: Field survey, 2020.

5.6 Benefit Cost Ratio (Undiscounted)

Benefit Cost Ratio (BCR) is a relative measure, which is used to compare benefit per unit of cost. Benefit Cost Ratio (BCR) was found to be 1.98 which implies that one taka investment in onion production generated Tk. 1.98 (Table 5.2). From the above calculation it was found that onion cultivation is profitable in the study area.

5.7 Concluding Remarks

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

CHAPER-6

RESOURCE USE EFFICIENCY OF ONION CULTIVATION

CHAPER-6

RESOURCE USE EFFICIENCY OF ONION CULTIVATION

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

6.1 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 onion cultivation, six 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. Other independent variables like water quality, 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.

6.2 Estimated Values of the Production Function Analysis

i. F-value was used to measure the goodness of fit for different types of inputs.
ii. The coefficient of multiple determinations (R^2) indicates the total variations of output explained by the independent variables included in the model.
iii. Coefficients having sufficient degrees of freedom were tested for significance level at 1 percent and 5 percent levels of significant.
iv. 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 onion production are shown in Table 6.1.

Table 6.1 Estimated Co-efficient and Their Related Statistics of Production Function of Onion Cultivation.

Explanatory Variable	Co-efficient	Sd. Error	t-values	p-values
Intercept	1.95**	0.61	3.19	0.002
Cost of bulb(X_1)	0.19**	0.09	2.11	0.014
Total labor cost(X_2)	0.24***	0.08	3.00	0.003
Land preparation cost(X_3)	-0.13	0.10	-1.30	0.001
Irrigation cost(X_4)	0.63**	0.26	2.42	0.014
Cost of pesticides(X_5)	-0.04	0.27	-0.15	0.899
Total cost of fertilizer(X_6)	0.51	0.40	1.27	0.206
R^2	81.19			
Adjusted R^2	79.98			
F-value	81.28***			
Return to scale	1.40			

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

The co-efficient for human labor was positive and significant at 1% level.

The co-efficient of Irrigation cost and cost of bulb were also positive and significant at 5% level.

Cost of pesticides, land preparation cost and total fertilizer cost were not significant.

6.3 Interpretation of the production function

Cost of bulb (X1)

The estimated coefficient of cost of bulb was 0.19 and significant at 5 percent level for onion cultivation. It implies that 1 percent increase in the cost of bulb, keeping other factors constant, would increase gross returns by 0.19 percent (Table 6.1).

Total labor cost (X2)

The estimated coefficient of total labor cost was 0.24 and significant at 1 percent level for onion cultivation. It implies that 1 percent increase in the total labor cost, keeping other factors constant, would increase gross returns by 0.24 percent (Table 6.1).

Land preparation Cost (X3)

The estimated coefficient of land preparation cost was -0.13 but it was not significant at the required degrees of freedom. (Table-6.1)

Irrigation cost (X4)

The estimated coefficient of Irrigation cost for onion cultivation was 0.63 and significant at 5 percent level. It indicates that 1 percent increase in the cost of Irrigation cost for onion cultivation, remaining other factors constant, would increase gross returns by 0.63 percent (Table 6.1).

Cost of pesticides (X5)

The efficiency of the reversal of the Cost of Pesticides to -0.04 but is not significant at the required degrees of freedom. (Table 6.1).

Total cost of fertilizer (X6)

The estimated coefficient of total cost of fertilizer was 0.51 but it was not significant at the required degrees of freedom. (Table-6.1)

Coefficient of multiple determinations (R^2)

The values of the coefficient of multiple determination of onion cultivation was found to be 0.8119 which implied that about 81.19 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 onion cultivation was found to be 0.7998 which indicated that about 79.98 percent of the variations of the output were explained by the explanatory variables included in the model (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 onion cultivation was estimated at 81.28 which were highly significant at 1 percent level. It means that the explanatory variables included in the model were important for explaining the variation in gross return of onion production (Table 6.1).

Returns to scale:

Returns to scale of onion cultivation was computed by adding all the coefficients. The sum of all the production coefficients of the equation was 1.40 (Table 6.1). It indicated that the production function showed increasing returns to scale.

6.4 Findings of the resource use efficiency of onion cultivation

In order to identify the status of resource use efficiency, it was considered that a ratio equal to unity indicated the optimum use of that factor, a ratio more than unity indicated that the yield could be increased by using more of the resources. A value of less than unity indicated 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 indicates the indiscriminate and inefficient use of resource.

The ratio of MVP and MFC of bulb (0.011) for onion production was positive and less than one, which indicated that in the study area of bulb was over used (Table 6.2). So, farmers should decrease the use of bulb to attain efficiency considerably.

Table 6.2 showed that the ratio of MVP and MFC of total labor (0.005) for onion cultivation was positive and less than one, which indicated that in the study area of total labor for onion growth was over used. So, farmers should decrease the use of total labor to attain efficiency level.

The ratio of MVP and MFC of land preparation was found to be (-0.008) for onion cultivation was negative and less than one, which indicated that in the study area use of land preparation for onion production was over used (Table 6.2). So, farmers should decrease the use of land preparation for onion production to attain efficiency considerably.

The ratio of MVP and MFC of irrigation was found to be (0.050) for onion cultivation was positive and less than one, which indicated that in the study area use of irrigation for onion production was over used (Table 6.2). So, farmers should decrease the use of irrigation for onion production to attain efficiency considerably.

The ratio of MVP and MFC of pesticide was found to be (-0.049) for onion cultivation was negative and less than one, which indicated that in the study area use of pesticide for onion production was over used (Table 6.2). So, farmers should decrease the use of pesticide for onion production to attain efficiency considerably.

Table 6.2 Resource Use Efficiency of Onion Cultivation

Variables	GM	MVP	MFC	MVP/MFC	Comment
Bulb	121856.2	0.76	65	0.011	Overutilized
Total Labor	57000	2.05	400	0.005	Overutilized
Land Preparation	9228.899	-25.99	3200	-0.008	Overutilized
Irrigation	4721.94	65.95	1300	0.050	Overutilized
Pesticides	2883.41	-5.91	120	-0.049	Overutilized
Fertilizer	6707	36.99	18	2.055	Underutilized

The ratio of MVP and MFC of fertilizer (2.055) for onion cultivation was positive and more than one, which indicated that in the study areas use of pesticide for onion production was under used (Table 6.2). So, farmers should increase the use pesticide to attain efficiency considerably.

6.5 Concluding Remarks

Among the studies of total cost of fertilizer have been identified as factors that have a significant influence on the onion cultivation basic concepts of such practices as total cost of fertilizer has not been fully utilized. Onion cultivation has had the opportunity to increase their productivity and profitability by making the best use of these resources.

CHAPTER-7

PROBLEMS & CONSTRAINS OF ONION CULTIVATION

CHAPTER-7

PROBLEMS & CONSTRAINS OF ONION CULTIVATION

7.1 Introduction

This chapter focuses on identifying the level of problems that onion growers face. Farmers face many challenges in producing onions. The problems were social and cultural, financial, and technical. This chapter aims to represent some of the social and economic problems and barriers to onion production. The problems and challenges that farmers face is identified in terms of their ideas. The main problems and issues related to onion planting are discussed below:

7.2 Lack of Quality Bulb

Lack of quality bulbs was one of the most important limitations of onion production in the study area. It is clear that approximately 51.00 per cent of onion growers in Sadarpur upazila reported this as a major problem, approximately 52.00 percent onion grower in saltha and approximately 54.80 per cent of onion growers in Charvadrashan upazila reported this as a major problem. Farmers in three Upazilas have reported being deceived into buying hybrid bulbs from local markets and bulb sellers. About 52.60 percent of farmers in three Upazilas reported this problem. (Table-7.1)

7.3 Inadequate Extension Service

During the investigation some farmers complained that they did not receive the advice on how to grow onions developed by the relevant officials of the Department of Agricultural Extension (DAE). As directors of agricultural buildings, a great technical knowledge consultant to farmers about their farming problems. But in Sadarpur upazila about 42.00 percent of onion growers reported this as a major problem, about 43.00 percent onion grower in saltha upazila and about 43.20 percent of onion growers in Charvadrashan upazila reported this as a major problem. Farmers in three areas have noted that they have not received any assistance from the bricklayer and the Agricultural Extension Officer. Approximately 42.40 percent of farmers in three Upazilas reported this problem. (Table-7.1)

7.4 Lack of Scientific knowledge of Farming

Although modern agricultural technology has been used in the research field, many farmers do not have sufficient knowledge of the right quantities and techniques to use modern materials and technologies to produce their businesses. In Sadarpur upazila approximately 40.00 percent of onion growers experienced this problem extensively, approximately 41.00 percent onion grower in Saltha and approximately 40.29 percent of onion growers in Charvadrashan upazila noted this as a high problem. About 40.83 percent of farmers in three Upazilas reported this problem. (Table-7.1)

7.5 High Cost of Irrigation Water

Irrigation is the key to crop production. The yield of onion varies with the use of irrigation water. Most farmers did not have a shallow water source or deep well in their research facilities and as a result had to pay a high price to the water supplier. But farmers have reported paying for irrigation. Statistics shows that approximately 49.00% of onion growers in Sadarpur upazila reported this as a major problem and this was reported as a major problem by 51.00 percent of Charvadrashan upazila and 50.00 percent of Saltha Upazila farmers. About 50.00 percent of farmers in three Upazilas reported this problem (Table-7.1).

7.6 Attack of Pest and Disease

Onion growers are also affected by pest and disease. Pest and disease attacks reduce yields and increase production costs. In Sadarpur upazila about 45 percent of onion growers reported this as a major problem while 43.51 percent of Charvadrashan upazila & 44percent of Saltha Upazila farmers marked this as a major problem. Approximately 44.17 percent of farmers in three Upazilas reported this problem (Table-7.1).

7.7 Lack of Operating Capital

Farmers in the study area had financial problems. To grow onions, we needed a lot of money to buy raw materials, bulbs, fertilizers, pesticides and more. Sadarpur upazila About 52.00 percent of onion growers report that they do not have enough money to buy. the required number of inputs from the right companies and this was noted as a major problem and approximately 49.00 percent of onion growers in Charvadrashan upazila and 56.80 percent of Saltha farmers reported this as a major problem. About 52.60 percent of farmers in three Upazilas reported this problem (Table-7.1).

7.8 Lack Quality Bulb

The high price of high-quality bulb was also one of the most important limitations of onion production in the study area. Approximately 48.00% of onion growers in Sadarpur upazila reported this as a major problem, 47.00 percent of onion grower in Saltha and in Charvadrashan upazila approximately 50.66% of farmers had a major problem with this. About 48.33% of farmers in three Upazilas reported this problem (Table-7.1).

Table 7.1 Problems and Constraints of Onion Production by no. of Farmers

Type of Problems	No. of farmers	Percentage of farmers	Rank
Lack of operating capital	64	52.60	1
High price of quality bulb	62	51.66	2
High cost of irrigation water	60	50.00	3
Lack of quality bulb	58	48.33	4
Attack of pest and disease	53	44.17	5
Inadequate extension service	51	42.50	6
Lack of scientific knowledge of farming	49	40.83	7
Natural calamities	47	39.17	8
Shortage of human labor	44	36.67	9
Low price of output	41	34.17	10
Adulteration of fertilizer, insecticide, and Pesticide	38	31.67	11
Poor storage facilities in house	34	28.33	13

Source: Field Survey, 2020

7.9 Natural Calamities

It was found that onion farmers were facing serious environmental problems in their production. Natural disasters such as droughts, hailstorms, heavy rains, caused severe damage to crop in the field. Farmers say heavy rainfall during the harvest reduces onion and storage capacity. Statistics indicates that about 36.00 percent of onion growers in Sadarpur report this as a major problem, approximately 43.00 percent of onion grower of Saltha and in Charvadrashan upazila approximately 39.13 percent of onion growers report this as a major problem. Approximately 39.17 percent of farmers in three Upazilas reported this problem (Table-7.1).

7.10 Low price of Output

Most farmers had to sell most of their produce at harvest time to meet various obligations such as household expenses and repayment. But at harvest time the price of onions remained low due to insufficient availability. So, they could not get a fair return for their products. It is evident in that 30.00 per cent of onion growers in Sadarpur upazila reported this as a major problem and in Charvadrashan Upazila nearly 39.00 per cent of onion growers and 35.00 percent of onion grower in Saltha reported this as a major problem. About 34.17% of farmers in three Upazilas reported this problem (Table-7.1).

7.11 Adulteration of Fertilizer, Insecticide & Pesticide

Chemical fertilizers, pesticides, and pesticides are essential for the production of onions. They were widely used in the production of onions in the study area. Many farmers are reported to have been deceived into putting dirty manure and pesticides in their field. It is evident from Table-7.1 that approximately 29.00% of onion growers in Sadarpur upazila suffer from this problem, in Saltha 39.00 percent and in Charvadrashan About 19.00% of onion growers report this as a major problem. Approximately 31.67 percent of farmers in three Upazilas reported this problem (Table-7.1).

7.12 Poor Storage Facilities in House

Many fans often kept their onions in their houses. Lack of trained workers was a major deterrent to onions during harvest and harvest time. Because of this, they had to deal with certain losses such as weight loss and onion rot. It appears that only 15.00 percent of the sample farmers in Sadarpur upazila faced the problem of poor storage areas,32.00 percent Saltha Upazila and about 29.00 per cent of onion growers cited this as a major problem in Charvadrashan upazila. Approximately 28.33 percent of farmers in three Upazilas reported this problem (Table-7.1).

7.13 Concluding remarks

The above mentioned interviews and results presented indicate that onion growers in the study area are currently facing serious problems in their onion cultivation. These are major issues for onion producers in the research area. Public and private measures must be taken to reduce or eliminate these problems in order to produce better onions.

CHAPTER-8

SUMMARY, CONCLUSION AND RECOMMENDATIONS

CHAPTER-8

SUMMARY, CONCLUSION AND RECOMMENDATIONS

8.1 Introduction

This chapter focuses on the summary in the light of the discussions made in the earlier chapters. Conclusion has been made on the basis of empirical result. Policy recommendations are drawn for improvement of the existing inefficiency of onion production in Bangladesh. Section 8.2 presents a summary of the major findings ofthe study, conclusion, policy recommendations, limitation of the study and scope for further study are given in Section 8.3, 8.4, 8.5 and 8.6, respectively.

8.2 Summary

Agriculture is the key driver of the growth of Bangladesh economy. The economic development is inextricably linked with the performance of this sector. The performance of this sector has an overwhelming impact on major macroeconomic objectives like employment generation, poverty alleviation, human resources development and food security. Agriculture provides employment almost 40.36 percent of its total workforce (BER, 2021). Agriculture occupies a significant role in the global economy in terms of its contribution to Gross Domestic Product (GDP). The broad-based agricultural sector, which includes crops, livestock, fisheries, and forestry, contributes 12.52 percent of the total GDP (GDP) to FY 2019-20 (BER, 2020). Tasting food and making it fun by adding portions of different vegetables during cooking or making dough or salad is a very common practice everywhere. Many spices are expensive plants. The great advantage of large spices is also beneficial. It can play an important role in raising farmers' income, creating jobs, eradicating poverty, ensuring food security, empowering women, and enhancing Bangladesh's social development. At FY 2019-20, the total area under the spice is 3.25 hectares of lakh and total production of about 17.55 lakh metric tons in our country (BBS, 2020). Spices comprise about 2.16 percent of the total cut in Bangladesh (BBS, 2020). Traditionally, onions are grown in winter. The Spices Research Center of Bangladesh Agricultural Research Center (BARI) recently released two new varieties of onions, which are grown in the summer. Released onion varieties are not yet widely available in the farmers' field. Bangladesh needs about 2.3 million tons of onions per year to fulfill his request. But Bangladesh produces only 1.9 million tons of onions and imports 0.50 million tons of

onions (Alam, 2015). Therefore, we should increase the production of onions a year. Local winter varieties are most common in Faridpur, Pabna, Rajshahi, Manikganj, Narshingdi, Bogra and the great Rangpur, during the period December to May. The total area under onion production in our country is 1.35 lakh hectares and a total production of 11.59 lakh metric tons in the 2019-20 planting year. In all Bangladesh prefectures, Faridpur covers the highest land use area for onion production (37163.90 hectares), the highest production (3.2 lakh metric tons) in the 2019-20 planting year (BBS, 2020). The sample framework for the current study was selected for the purpose of selecting an area where onion cultivation was intensive. On the basis of high onion crop production, three upazila namely Sadarpur, Charvadrashan and Saltha were selected for the study. The 40 size sample is generally considered to be a small population requirement that will provide sufficient level of confidence in decision-making (Poate and Daplyn, 1993). A total of 120 farmers (40 per region) who grew different varieties of onions in selected areas were selected as samples. Farmers usually plant onions from mid-December to January and harvest after three months. Data for this current study collected during the period March to April 2021. Basic information was collected from key manufacturers. Selected respondents were interviewed in person with the help of pre-tested questions. The data collected was analyzed and verified for the purpose of compliance and completeness. Editing and coding are done before entering data into a computer. All data collected was summarized and carefully reviewed to eliminate any possible errors. Data entry is done on a computer and analysis is done using the relevant Microsoft Excel software (Coelli, 1996). The socioeconomic status of the sample family considering the size of the family and family members, the educational status, employment status, and income sources of the sample farmers. A sample of 40 families in each study area contained a total of 390 people and 394 people in Sadarpur, Charvadrashan and Saltha respectively. In Sadarpur parasites, 52.30 percent of the population was male, and 47.70 percent were female. The average sex ratio in Sadarpur, Charvadrashan and Saltha was 110,102 and 105 men out of 100 women, respectively, was significantly higher than the national average (105) (BBS, 2021a), possibly due to the sample structure used in the survey. The dependence estimates of the study population were estimated at 48.52,44.34 and 46.21 which were significantly lower than those reported in the HIES-2010 study (65.30) (BBS, 2020). In Sadarpur, about 19 percent of the study population aged 5 or over was found to be

illiterate and / or literate and only 3.53 percent of people found to have obtained / completed a degree. At Charvadrashan, about 17 percent of the population who are 5 years of age or older are found to be illiterate and / or literate and only 2.85 percent of people found to have obtained / completed a degree. The work of researchers 16 years of age or older indicated that, in Sadarpur, approximately 38 percent (255) engaged in agricultural work as primary occupants and approximately 34 percent (74) undertaken agricultural work as auxiliary work. On the other hand, in Charvadrashan, about 35 percent (out of 246) worked in agriculture as a major occupant and about 38 percent (out of 79) worked in agriculture as a subsidiary. Economic profitability is a major factor in making a decision to produce any crop at the farm level. It can be measured based on profit margin, total limit, and the rate of return on total costs. The estimated cost of land preparation for onion production was obtained by Tk. 9715.00 per hectare. The human labor force used for the production of onions was found to be about 150 days per person per hectare and the average human labor intake was Tk. 400 per person day. Therefore, the total cost of human labor was found to be Tk. 60000.00 representing 22.93 percent of the total cost. The cost of bulb per hectare of onion production is estimated at Tk. 128265.00 On average, farmers use Urea, TSP, MoP 154 kg, 118 kg and 125 kg respectively, per hectare. The estimated cost of onion-producing pesticides was obtained by Tk. 3035.00 while the average cost of irrigation is obtained by Tk. 4970.00 per hectare. the total variable cost of producing onions was Tk. 207081.00 per hectare, which was 77.85 percent of the total cost. The average onion per hectare was 12804.00 kg and the average onion price was Tk. 40.00. Gross return, gross margin, and net return were obtained in Tk. 512160, Tk. 305079.00, and Tk. 253579.00 per hectare. The Benefit Cost Ratio (BCR) was rated at 1.98 which means that one take on investment in onion production makes Tk. 1.98.

In this study, Cobb-Douglas production function model was used to determine the effects of key variable inputs. The most important six explanatory variables were included in the model to explain the gross income or return of onion cultivation. Half of the variables in the production function were significant in explaining the gross return except the negative and insignificant effect of land preparation cost and cost of pesticide. The coefficient with expected sign indicates the selected inputs contributed positively to the gross return. The values of the coefficient of multiple determination of onion cultivation was 0.8119 which implied that about 81.19 percent of the total

variation in the gross return could be explained by the included explanatory variables of the model. Production function for onion cultivation exhibits increasing returns to scale (1.40). This means that, if all the variables specified in the model were increased by 1 percent, gross return would also increase by 1.40 percent. The F-value for the onion cultivation was 81.28 which were highly significant at 1 percent level. Multicollinearity test indicated that there were no severe correlations among the explanatory variables. Resource use efficiency indicated that all of the resources were under used for onion production except overutilization of lime. So, there was a positive effect of key factors in the production process of year-round onion cultivation. This study also identified some of the problems and constraints associated with onion cultivation. Lack of operating capital, High price of quality bulb, Lack of quality bulb, Attack of pest and disease, Inadequate extension service, Lack of scientific knowledge of farming, Natural calamities, Shortage of human labor, Low price of output, Adulteration of fertilizer, insecticide, and pesticide, Poor storage facilities in warehouse are the major obstacle which stand in the way of onion cultivation in the study area.

8.3 Conclusion

Onions are one of the most important spices grown by farmers, especially for market purposes. The research sites have great potential for onion cultivation. The findings of the present study show that onion production is highly profitable and could help improve the socio-economic status of sample farmers in the study areas. Since onions are a crop that needs a lot of labor, it can help create jobs. In Bangladesh, it is difficult to increase onion production by increasing the area of cultivation due to land restrictions. However, there is an opportunity to increase onion production by improving existing production technologies. Farmers fail to function properly due to soil dispersal, limited experience, illiteracy, etc. Current research indicates that farmers are technically skilled, which means that there are potential for increased productivity through the use of available agricultural inputs, agricultural extension services. and available technology. If farmers can access modern resources in advance, the production of this crop may increase which could help reduce poverty in many rural areas. Onions are produced only in winter. But now BARI has introduced some onion facts for the summer. However, farmers in the research areas, to some extent, began producing summer onions. Farmers were not aware of the timely and effective use of inputs. Therefore, well-organized management training in line with their problems,

needs, objectives and resource base leads to effective production practices and continuous income from onion cultivation.

8.4 Recommendations

Based on the findings of the study it became clear that the onion was a profitable business and could generate income and employment opportunities for the people of rural Bangladesh. But some problems and obstacles have been prevented in achieving the goals mentioned above. Therefore, policymakers must take appropriate action. According to research findings, some policy recommendations may be developed that may be helpful in policy formulation. Based on the results of the research, the following recommendations can be made to improve the onion industry.

- As onion are profitable enterprise, government and concern institutions should provide adequate extension programme to expand their area and production.
- Government should take necessary measures to control the adulteration of fertilizers & insecticides which have positive significant impact on yield. It will increase the net benefit of onion producers.
- Adequate training on recommended fertilizer dose, insecticides, use of good bulb, intercultural operations, etc., should be provided to the onion farmers which will enhance production.
- Onion farmers had to sell their product at low price during harvesting or just after harvest. An appropriate storage scheme should be developed by Government so that the farmers are not forced to sell their product at low price in harvest period.

8.5 Research Limits

There are some restrictions on research as well as research done on farmers around the country through interview programs.

a) Most of the information was collected in consultation with the farmers so they sometimes did not get along well with the interviewer.

b) Information collected mainly from farmers' reminders that were always wrong.

c) In resources and time constraints, extensive and in-depth research has been partially disrupted.

8.6 Scope for Further Research

Although current research is intended to provide useful information for farmers, extension workers, policy makers and researchers, it is not free to criticize. Due to time and resources limitations this study was unable to combine some important areas. The weakness of the current research, however, opens up additional research methods provided below:

a) Extensive research based on this line can be done to better understand not only the related benefits of onions but also other crops.

b) Further research can be done by looking at the different farm sizes to assess the impact of onion profit on income and job opportunities.

c) Research into other types of onions can be done individually to evaluate their comparative benefits.

d) The response to acreage, onion growth and instability of onions can be studied in relation to Bangladesh.

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