PROFITABILITY ANALYSIS OF POTATO CULTIVATION: A STUDY ON SOME SELECTED AREAS OF MUNSHIGANJ DISTRICT

TASKIN AFRINA

DEPARTMENT OF MANAGEMENT AND FINANCE

SHER-E-BANGLA AGRICULTURAL UNIVERSITY

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BY

TASKIN AFRINA

Reg No: 13-05390

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APPROVED BY:

Abu Zafar Ahmed Mukul	**Dr. Md. Sadique Rahman**
Department of Management & Finance	**Department of Management & Finance**
Supervisor	**Co-supervisor**

Dr. Md. Sadique Rahman
Chairman
Examination Committee

DEPARTMENT OF MANAGEMENT AND FINANCE
Sher-e-Bangla Agricultural University
Sher-e-Bangla Nagar, Dhaka-1207

CERTIFICATE

This is to certify that the thesis entitled **"PROFITABILITY ANALYSIS OF POTATO CULTIVATION: A STUDY ON SOME SELECTED AREAS OF MUNSHIGANJ DISTRICT"** submitted to the Department of Management and Finance, Faculty of Agribusiness Management, Sher-e-Bangla Agricultural University, Dhaka in partial fulfillment of the requirements for the degree **of MASTER OF BUSINESS ADMINISTRATION in MANAGEMENT**, embodies the result of a piece of bonfire research work carried out by **TASKIN AFRINA**, Registration number: **13-05390** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

Dated:June,2020
Dhaka, Bangladesh

Abu Zafar Ahmed Mukul
Assistant Professor
Supervisor
Department of Management and Finance
Sher-e-Bangla Agricultural University

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ABSTRACT

Potato ***(Solanum tuberosum)*** is a principle vegetable crop in Bangladesh for its commercial and nutritional value. The current study was basically designed to determine the "Profitability Analysis of Potato Cultivation: A study on some selected areas of Munshiganj district." Primary data were collected random selection method from five Upazilas under Munshiganj district namely Lohajang, Sreenagar, Sirajdikhan, Tongibari and Gazaria. Descriptive statistics and Cobb-Douglas production function were applied to achieve the objectives of the study. The study found that potato production was lucrative. Total cost of potato growing was BDT 144650.24 and the gross return amount was BDT 332500.00 per hectare. The net return from potato production was BDT 187849.76 per hectare. Undiscounted Benefit Cost Ratio (BCR) was found 1.29. The outcome of the Cobb- Douglas production function showed increasing returns to scale and also exhibited that potato cultivation was highly dominated by human labor, irrigation, manure, fertilizer, insecticide etc. Efficiency analysis indicated that most of the farmers inefficiently used the inputs except human labor, MOP, TSP and insecticide. The study also revealed some constraints associated with potato cultivation. These were grouped into economic and technical, marketing and storage problems. Again, the limitation includes lack of financial capital, high cost of the input, low cost of output, inadequate quality seed, high cost of labor and lack of extension services, etc. The problems and constraints, of course, are interrelated with one another and hence, need to be removed comprehensively for the overall betterment of potato growers.

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Potato (***Solanum tuberosum***) is a leading agricultural crop in Bangladesh. It is called as "The King of Vegetable". Again, it is a dominant food crop in tropical and subtropical countries. It has emerged as the fourth most important crop in Bangladesh. The quality of carbohydrates in potato is higher than vegetables. Being one of the cheapest sources of carbohydrates, almost every family consumes potatoes throughout the year. Potato contains approximately 20% protein on weight basis. Moreover, it also contains some vitamin A, a large number of vitamin C, fiber and iron. Our soil and the climatic feature offer the high potential of potato growth. Bangladesh grows potato in about 9.47 million hectares of area with an average return of 19.93-per hectare (BBS, 2016). Potato production has been rapid commensurate to cereal crops such as wheat and rice (Azimuddin et al., 2009). Potato growing is a profitable business and institutions are giving loans for that. (Majid, 2004).

Potato is the most important food for human consumption only next to rice and wheat. Both the rich and poor consume it in Bangladesh. It has high nutritive value as per 100 gm of edible potato contains 97 k. calories, 1.6 gm protein, little amount of fat, 10.07 gm minerals and little amount of iron. It contains 74.7% moisture and 22.6% carbohydrate. (Hossain and Bose, 2000). People consume potatoes in various forms such as curry cooked food, potato crackers, and flour made bread, biscuit, chips, etc. in both home and abroad. From the nutritional requirements perspective, Bangladesh runs deficit in growing nutritional crops like tubers and vegetables. To bring remedy to malnutrition problem, stress should be put on cultivating more non-cereal crop such as potato. In Bangladesh, due to its manifold usage, potato cultivation got increased. In Indian subcontinent, potato cultivation probably started during the 17th century (Ahamed,2013). In Bangladesh, that happened in late 19th century (Siddique and Hussain,1988). But as a cash crop, potato was started to cultivate after 1920 (Hoque,2004). Now total land area under potato crop is around 12,34,871 acres with

an average yield rate of 221.63 mounds per acre (20.443 metric tons oe4 hector) with an estimated production of 102,15,957metric tons (BBS Yearbook, 2017).

1.2 Global Patterns and Trends of Potato

The potato is one of the largest and commonly cultivated crops in the world. The potato cultivation started in the Andes in South America and has spread worldwide. Potato is now produced in more countries than maize can be saved from any other food crop. As a cheap source of food for the working class, potatoes played a large part in the industrial revolution in Europe. In many parts of the world, during times of war and crop failure, potatoes have provided relief from famine. On the other hand, when the pumpkin plants failed in the 1840s, Ireland died devastatingly from famine. Due to its historical significance in Europe, potatoes are also regarded as crops with a wide output area and we. e. That's not accurate. Developing nations now produce about 25% of potatoes worldwide, and their share in world production is rising rapidly. In the sixteenth century, sailors coming back from America carried potatoes to Spain.

Potatoes spread from Spain all over Europe, first as botanical interest, later as economic crops. Potatoes in Europe were fed to the animals long before their human diets became a staple. People regarded potatoes as unclean, unsafe or even harmful. Just when potatoes became a cheap source of energy for food (mainly due to selected suitable varieties) and when other foods were scarce (mainly due to failures in crops, wars or famines), Europeans started replacing their traditional staples, including buckwheat and oats, with potatoes. In Europe, potato became a major source of food, the most essential foodstuff after grapefruit, a major feed for livestock and the main source of starch, in 1850 and about 1850.

Potatoes are now at their peak. Since then, the per capita production and consumption of potatoes has declined in Europe, with other fruit, feeds and starch and alcohol sources cheaper and consumers diversifying their diets decreasing their reliance on cheap staples. Potatoes entered much of the world, not directly from South America,

through European colonial control. First potatoes obtained from England in the 1620s via Bermuda were from North America. British missionaries in the 17th century brought potatoes to many parts of Asia, and Belgian missionaries in the 19th century introduced them to the Congo. The Dutch East Indies (now Indonesia) entered China about 1700. Northern China from Russia was also added. In the 1600s, Portuguese traders introduced the cultivation to India. Both Chinese and Indian potatoes were introduced to Tibet. Dutch merchants from Java brought them to Japan for the first time around 1600. In the late 18th century, potatoes were introduced to Persia. They arrived in Syria about 50 years later where they became known as the "stranger colocation.". Although the proof is sketchy, it appears that as in Europe, the climate for crops, evolving production systems and post-harvest systems that are adapted to particular conditions and dietary preferences and needs have strongly influenced potato production and consumption in the developing world. First, in cool and rainy regions, potato cultivation increased. Local food preferences and misconceptions have deterred the eating of potatoes well into the past. Most potatoes were consumed mostly by European colonies and not by indigenous peoples before periods of food scarcity. In hot environments for the production of potatoes such as the Indo-Gangetic plain, potatoes were limited to garden plots until very recently, when quest of adaptation varieties, seed system development, irrigation and cold storage expansion, population growth, urbanization, increasing incomes and changing food habits-led to the spread of potato production.

1.3 Importance of potato in the economy of Bangladesh

Now in Bangladesh, potato is one of the main foods. Mainly an agribusiness country is Bangladesh. It is an area of 14,48 million ha that is thickly populated, small land. The Bhuiyan et al. estimates of 2002 indicate a decrease in net cultivable soil from 8,42 to 7,89 million ha in the year 2000 and a rise in population from 127,22 to 168,96 million by 2025 in the year 2000. The cultivable per capita net will be reduced from 0.066 hectares in 2000 to 0.047 hectares in 2025 (Bhuiyan et al., 2002). Despite a decrease of the year's population growth rate from 2.26 in 1961 to 1.47 in 2004, the

population has doubled in the last 30 years. Potato is an important food in the advanced countries, comprising 37% of global production (FAO and CIP, 1995). In the future, potato is likely to play an important role in the trend of population development and consequently increased food demands in the country and declining cultivable land. In Bangladesh, potato is an important and popular crop. It is the principal crop for the whole year. In consideration of production and domestic demand in Bangladesh, potatoes are an important crop. Over the last couple of years, potato cultivation has become common. During the sowing, growing, and harvesting time of FY 2017-18, the weather conditions for potato growing were not favorable. Compared to the previous year, local varieties are declining. The farmers were found not to be interested in their prices. The seed and fertilizer system is managed and distributed individually. They thought that improper seed and fertilizer management and distribution this year leads to less production. During the growing and harvesting of potatoes, natural disasters were also recorded. This resulted in a major drop in the region and yield rate, contributing a reduction of 4,616% in the production volume (total production of potato was 97,44,412 metric tons, compared to a decrease of 102,15,957 metric tons of the last year of 4,616%) in FY 2017-2018. The total area of production of pulp in potatoes in Bangladesh was 11,79,703 acres in 2017-18, compared to 4,468% less last year's 12,34,871 acres (4,99,725 hectares). Output in FY 2017-2018 experienced negative growth. As a government statistic provider, the most widely-consumed potato plant in the world was grown on a total of 429 million hectares of land in 2017–2018, Bangladesh's Statistical Bureau (BBS), in their latest report. In FY 11, 4,6 million hectares of potato were grown. Bidhan Baral, deputy director of BBS, said to the FE that yields in the country are increasingly increasing per hectare, which for the output scenario are very positive.

On the other hand, the export of potatoes saw a quantum leap in the recent fiscal year, fueled by higher shipments from Russia and a strong supply from Pakistan and India to the global market. Exports in Bangladesh were 29,359 tons in 2017-18 FY, up three times from only 27,213 tons in the previous year, according to the Department of Agricultural Extension (DAE). Data from the Export Promotion Bureau indicate that revenue has trebled to $37.82 million in 2017-2018 compared to the previous year. In the days to come, we want to do better. Potato is one of the country's leading commercial crops. In Bangladesh, potatoes are primarily eaten as vegetables. Various

other food products (Singara, Samucha, Pick, Chips, etc.) are also made from potatoes of economic value. An adequate supply of potato stabilizes the vegetable market all-round the year (Moazzem and Fujita, 2004). Recently, the government has been trying to diversify food habits and promote the consumption of potatoes to reduce the pressure on rice. Potato is now becoming an important food for food security in Bangladesh. According to the Bangladesh Bureau of Statistics, more than 10 million tons of potatoes were grown in 2017 and 5,3 million tons were stored in 390 cold storage sites across the country in order to maintain a sustainable supply throughout the year (Khandker & Basak, 2018).

1.4 Health Benefits & Nutritional Value of Potato

Increased potato production will provide more low-cost calorie food for humans. The adoption of potatoes as a substitute for wheat flour for bread would be beneficial to the Bangladeshi economy, in particular for its nutritional value. According to the USDA, processed potatoes accounted for 64 per cent of total U.S. potato use in the 2000s, compared to 35 per cent in the 1960s. The Americans, on average, eat 55 lbs. (35 kg) frozen potatoes per year, 42 lbs. 19 kg) fresh potatoes, 17 lb. (8 kg) potato chips and 14 lbs. Dehydrated potato products (6 kg). Potatoes are low in calories — medium-sized baked potatoes contain just around 110 calories. They are a good source of C vitamins.

Here are the nutritional data for potato, according to the U.S. Food and Drug Administration, which controls the labeling of foodstuffs by means of the National Labeling and Education Act.

Nutrition of Potato

Potatoes are packed with phytonutrients which, according to the USDA, are organic components of plants that are believed to improve well-being. Potato phytonutrients include carotenoids, flavonoids, and coffee acids.

In potatoes, vitamin C is used as an antioxidant. According to the National Institutes of Health, certain forms of cell damage may be avoided or delayed by these substances. They can also help prevent digestion, heart health, blood pressure, and even cancer.

In particular, purple potatoes have good sources of phytonutrients and antioxidants. A 2012 study published in the Journal of Agriculture and Food Chemistry showed that, in over weight and hypertension, six to eight small purple potatoes two times a day helped to decrease your blood pressure and the risk of heart disease and stroke. The participants did not gain weight because of the starch content of purple potatoes.

Blood pressure

Pumpkins can help relieve blood pressure for several reasons. The fiber in potatoes could help decrease cholesterol by binding it to blood cholesterol, Jarzabkowski said. "If it's binding, we excrete it."

Also, pumpkin is a strong potassium source. Jarzabkowski said, "All the potatoes are high in potassium. She said that there is plenty of fiber in the outer pulp. "We have much more potassium than banana, and all of it's in [patato] skin," she said. Potassium, according to the United States, is a mineral that reduces blood pressure. Administration of health and drugs in Canada.

Brain functioning and nervous system health

In potatoes, B6 vitamins are important to neurological health. According to the University of Maryland Medical Centre, Vitamin B6 is used to produce useful brain chemicals such as serotonin, dopamine, and norepinephrine. This means consuming potatoes can lead to depression, stress and even attention deficit hyperactivity (ADHD) disorder. The high carbohydrate level of potatoes can have some benefits, including maintaining a good level of blood glucose, which is important to the proper functioning of the brain.

Immunity

Vitamin C helps to avoid scurvy, potatoes full of nutrients and about 45 per cent of daily consumption for medium baked pulp, and everything from scurvy to cold, according to the Board of Washington State Potato.

Heart health

Pumpkins offer a great number of reasons to swoon because of their fiber material. Vitamins C, and B6 suppress free radicals, and carotenoids keep the heart working. The fiber is associated with blood vessel clearing.

Cancer risk

A 2017 research published in the Nutritional Biochemistry Journal found a decrease for colon cancer risks by using violet potatoes. Pumpkin violets exhibit strong antioxidants and anti-inflammation properties that are associated with the growth of colon cancerous cells and reduce interleukin-6 or IL-6. Pig types, one complemented by purple potatoes, were tested in three diets. At the end of the trial, IL-6 for pigs eating purple potatoes was six times lower than in other categories. The findings of the study were not yet repeated on humans, however, because of the similarities in the pig's digestive system.

Apples are also used as a convenient food butter and acid or fried in vegetable oil. However, they can contribute to weight gain, diabetes and heart disease in preparations according to the Harvard School of Public Health. You don't have to have a bad potato, Victoria Jarzabkowski, a nutritionist at Austin University of Texas Fitness Institute in Texas, if they are prepared properly, without butters, cheeses or cream. It may even be good for you.

1.5 Objective of the Study

To achieve the following aims, this analysis was undertaken:

1. To know the socio-economic characteristics of the potato farmers;

2. To determine the profitability of potato farming;

3 To assess the resource use efficiency of sample farmers; and

4. To identify the key problems associated with potato cultivation.

1.6 Justification of the Study

Bangladesh is an agricultural country. Among all vegetables cultivated here potato stands the first position. Potato are grown as a supplementary crop with rice and relatively it has high caloric value. According to Food and Agricultural Organization's (FAO) report 2012 on potato production, Bangladesh stood seventh position in potato production all over the world (FAOSTAT,2012). The Government of Bangladesh has put a lot of emphasis on vegetable farming throughout the year to meet the food, caloric and employment needs of rising populations.

For formulating policy recommendations of national-level potato production, relevant and sufficient data on potato cultivation at farm level is very essential. Although there were some research investigations on financial profitability on potato production has been done related to our country context by different public and private organizations, but that is not adequate. More information related to financial profitability and outcome of financial support regarding potato cultivation is required by policymakers, research personnel, extension workers and farmers for the further development of potato cultivation in our country.

Day by day the potato cultivation is a promising business in the country. But potato cultivation is not so easy task without an adequate amount of capital. Farmers need to spend a lot of money in this purpose. Compared to other crops, the production cost of potato is relatively high. So it is very much difficult for all category of farmers particularly the small ones when they cultivate their land for potatoes if an external source of capital is not available. In this regard, special attention should be given to the policy makers.

This study provides the farmers and researchers with useful knowledge that will perform further studies of a like nature. Finally, planners and policy-makers are

helpful in the development of micro- and macro-level policies to extend financial aid to improve potato production in the region.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

This chapter provides an overview of current literature to clarify the works of past research applicable to this thesis. This will help to correctly minimize the problem and choose the most suitable analysis method. The size, amount, usage and reimbursement of the loan were most of these. Many studies have been performed in order to assess potato farmers' profitability and production. However, a literature review has been expanded to other countries for a more general analysis, as well as to study in Bangladesh.

In a selected Rangpur district, (Firdawsi, 2008) conducted a study on alternative rice and potato production. The study's main results showed that the alternative production of rice and potatoes was profitable. The net return on production of potatoes was therefore higher per hectare than that of rice Aman and Boro. The study showed that the overall average daily calorie consumption per capita was in larger households (2407 K. calorie) followed by marginal (1856 K. calorie).

In a selected region of the Thakurgaon District, (Yeasmin, 2008) researched the economics of potato production. The cost of production was calculated to be BDT per hectare. The gross returns per hectare were BDT 206623. The net returns were BDT 77296 and 93563, which were based respectively on total costs and cash costs. The gross returns per hectare were BDT 206623. Evidence has shown that both full-cost and cash-based potato growing is profitable. The results indicate that the majority of the variables selected have a major effect on potato production.

In a general equilibrium setting, (Mahjabeen, 2007) investigated the benefits and distribution consequences of MFIs in Bangladesh. The main results were that MFIs increased household incomes and consumptions, decreased disparity of wealth, and improved welfare. This means that microfinance is a successful development tool

with significant policy consequences for poverty reduction, revenue distribution and MDGs.

The potato loan availability and usage study was carried out by (Majid, 2004) in the district of Bogra. The results of the study showed that the cultivation of potatoes. Institutional loans were lucrative. The average potato production per acre was found to be 800, 740 and 760 kg for small, medium and large farmers. The results of the study clearly show that small-scale loan farmers, follow-up to medium and large farmers, have increased income. The loan aspects of the study show that RAKUB contributes more than other institutional sources of loans than the financial agency to potato production.

(Hossain, 2008) presumed that potato production loans will be made available, used and repayable in a particular area of the district of Mymensingh. The study revealed that potato growing is profitable under institutional credit. The average potato yield per hectare was found to be 30732, 28934 and 28043 kg for small, medium and large farmers respectively. The results of the study showed the highest benefit for small loan farmers. The results also demonstrated that the experimental use of inputs enhanced potato yield. The study also found that Sonali Bank Ltd. was more involved than any other institutional source as a potato finance agency.

The effect on income and food security of access to credit in Malawi has been examined by (Diagne et al. 2000). The key finding in this paper was that households could have a moderately positive impact on household annual income by using structured credits to minimize their borrowings from informal sources. These results, however, were minimal and did not create any substantial difference between Member and non-current members' per capita incomes, food security, and credit programs' nutritional status.

The study found that cost of land use usage, labor and miscellaneous products were decreased as farm sizes increased while seed and fertilizer / insecticide costs increased with farm sizes. Examined the relative profitability of RAKUB funded potato production. The study also showed that if the factors such as balance dosage of fertilizer, HYV seed and good management in Bangladesh might increase the

profitability of the manufacturing of potatoes. Owing to the increase in farm sizes, though loans refunded declined by the rise in farms, the credit for potato production increased.

(Nahar, 1998) recorded that farmers were very glad to get bumper potato production in 1998 in Mymensingh district. In that year, approximately twenty thousand upazilla farmers who had grown potatoes on a total of 180 hectares of land. With the exception of one hectare of investment, the grower can benefit 50 to 60 thousand Taka easily.

(Islam and Karim, 1997) performed a comparative profitability evaluation of selected winter vegetables such as cabbage, cauliflower and tomatoes. It showed that all vegetables were beneficial. Tomato BDT was the overall cost per hectare of growing cabbage, cauliflower and tomato. BDT, 51396.79. BDT and 64406.06. The related gross incomes and 61663.87 were BDT respectively. BDT 99401.44. BDT and 119165.12. 93442.24, respectivamente. The net return of the potato, cauliflower and tomato production was calculated to be BDT.48004.65 BDT. BDT and 54759.06. A total of 31778.38. Net income was therefore the highest for coolant, led by potato and tomato, in producing three alternating winter vegetables. The development of winter vegetables between various categories of farmers also showed a wide variation in yields. The highest yield per hectare for smallholder farmers, followed by small and large farmers, was in the production of potatoes and cauliflower.

In Kotwali instead of in Bolra district, (Hakim, 1993) performed a comparative economic study of the cardinal and multi-species. The average cost of production per hectare, including losses, was calculated by BDT. Thirty-nine hundred and bdt. 30819 for potato varieties of cardinal and multa. BDT was responsible for the corresponding expenses. 12702 and 115896. The average full-cost net rents for carnal multa potato varieties were BDT.28995 and 26994 and their respective average cash returns were BDT.45197 and 45112 for each hectare. respectively. Two alternative crop patterns were studied by (Sejuz, 1993): Potato + Boro + Aman and Wheat + T. Aman + T. Aus from two villages in Chandina, that is, Dumuria and Thangao, and not Comilla. He considered the gross potato return to be BDT. Net return over full cost was BDT 57533 per hectare and over full cost. The hectare is 1709. The crop pattern, i.e.

Potato+boro (HYV)+T, was also found. Aman gave higher net returns than the cropping pattern based on wheat, i.e. Wheat + T. Down. Wheat + T.

(Das, 1992) carried out a profit-making analysis on potato growing and concluded that the average potato yield per hectare was 4720 kg and the average brutal return was BDT. 33040. Again. (Basak, 1992) conducted an average return to each Taka for complete and cash expenses was 33,40 per hectare in three villages of Gabtoli thana in Bogra District. For LV and BDT, 1.53 and 3.43. 1.69 and 3.62 respectively in comparison to HYV. The farmer was primarily concerned with high returns and consumptions as a result of his choice of potato.

In two districts of Bangladesh, (Sabur, 1988) researched the surplus of potatoes that were marketed, which was shown to shift in a very positive direction to grow and sell potatoes. He noticed that the average cost per hectare of production and the net return of potato was BDT 29635.57 and 33877.82 respectively.

Research Gap:

The above review elicits that some studies have already taken place regarding potato cultivation. However, no study has so far been reported in Lohajang, Sreenagar, Sirajdikhan, Tongibari and Gazaria upazila under Munshiganj district. Moreover, no empirical study has yet been conducted specially on the financial profitability and resource use efficiency in that particular area. Therefore, through the current study a moderate attempt has been taken in this direction and be envisaged as a pioneering work in this field.

2.2 Conclusion

The debate and analysis referred to above shows that the majority of studies covered expense, return, profitability and potato productivity. Some research also evaluates the profitability variables. Most studies looked more than a decade ago at parameters that affect development. The validity of the variables to be tested again during this time changes. Very few integrated productivity and resource efficiency studies have

been conducted in Bangladesh on potato production. This analysis is therefore supposed to take these considerations into account. In order to address the shortcomings in previous studies the study of literature was useful to redefine methodological aspects. The researcher felt that, the efficiency of potato production in Bangladesh in terms of productivity and use of resources needed corrective action to the help policy makers. Again, it is expected to bring focus on some important issues regarding profitability analysis of potato in the study area with a growing concern of its profitability.

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CHAPTER 3

METHODOLOGY

3.1 Introduction

The technique used is discussed in this chapter. In large measure, the reliability of scientific study depends on the required research methodology. Research into agricultural management typically requires primary data collection from working farmers. However, the approach for collecting data depends on the purposes of the research and its goals. Methodology focuses on topics such as research preparation, preparation of samples, scheduling of the interviews, data collection, tabulation, analysis and data interpretation. The following definitions are described in sequence of the methods used for this study:

3.2: Method of Investigation

In an investigation, the data obtained by individual respondents were collected. There are three main methods for collecting agricultural survey data. The following are:

I) Direct observing,

ii) Interviewing respondents and

iii) Record kept by respondents.

Specific approach selection depends on many factors, such as the essence of the research problem, the allocation of research funds, time restrictions, etc. In this research, an investigative approach was used to obtain data from the interviewees to achieve the aims of this report. The survey approach has two main advantages: swift analysis in several cases and broader use. The failure of the survey approach is to rely entirely on the individual's memory. Normally, Bangladeshi farmers do not keep a record of their farming activities and account for them. In addition, the bulk of Bangladeshi rural citizens are also analphabets. Therefore, a survey for a scientific farm management survey is a difficult challenge. Repeated visits to collect data were made to avoid mistakes, and farmers were revisited to obtain the correct information if there were any omissions or inconsistencies.

3.3: Selection of the study area

The selection of the field of research is a big step. A preliminary survey was conducted in five Upazilas under Munshiganj district to achieve the objectives of the present report. In the report, 5 upazilas, including Lohajang, Sreenagar, Sirajdikhan, Tongibari and Gazaria, were selected based on preliminary information. The selection of the field of research was based on the following:

i) Farmers of these villages are involved in Potato cultivation.

ii) From the view point of time and available resource, this Area is suitable for the study.

iii) Accessibility to the Area is good due to developed communication system and

iv) Expectation of good co-operation from the respondents to obtain reliable data.

Selected study areas for primary data

Table 3.1 : Selected Study Area

District	Upazilas
Munshiganj	1. Lohajang
	2. Sreenagar
	3. Sirajdikhan
	4. Tongibari
	5. Gazaria

3.4 Sampling Technique

It is not possible to survey all farmers and it is not worthwhile to include too many farmers in a survey, because of requiring more time and money to complete the survey. In the present study a total of 100 Potato growers were selected randomly.

3.5 Preparation of Survey Schedule

A tentative survey schedule for the collection of data was established to achieve the objectives of the report. The researcher herself checked the draft schedule in the study

field. In view of the existing and realistic experience gained in pre-testing, some parts of the draft plan have been improved, rearranged and updated. In planning the questionnaire, the following things were taken into account:

i) Identification of the respondent and their family composition along with information on education and occupation.

ii) Land utilization pattern.

iii) Quantity of assets and their present value.

iv) Input costs including human labor cost, all fertilizer cost and miscellaneous cost.

v) Returns from Potato cultivation.

vi) Problems faced by the Potato growers

3.6 Period of Data Collection

The researcher herself collected necessary data from the respondents during the months of May to June in 2019 through personal interview.

3.7 Collection of Data

After the schedule was finalized, the selected farmers were interviewed individually by the researcher herself. Before beginning the interview, the respondents were briefed about the nature and purpose of research to ensure that information provided by them would be kept secret and be used exclusively for the study and nothing else. Then questions were asked with explanation whenever necessary. The answers of respondents were noted directly on the interview schedules. Having done the interview, each program was checked in order to ensure that the data on each of the items had been recorded correctly or not. Data found contradictory and overlooked were revised on the second visit. During the period of information collection, the author had to face the following problems:

- Most farmers in the study area were illiterate, and they had no knowledge of the research into farm management, and therefore it was difficult to justify and reassure the purpose of the study;
- The farmers hesitated always to provide precise details of their holdings,

revenues, and expenses. They think new taxes would be imposed on them or their land acquired by the Government if they provide the correct information.

- Moreover, the farmers did not maintain any written documents on their plantation, and the only source of knowledge was recollection and their memory.

3.8 Processing of Data

Before switching to the machine, all data collected were reviewed and checked. Therefore, the basic goals of the analysis were classified, tabulated and evaluated. Most of the data was presented in a tabular form, as it was very basic, commonly used and easily comprehensible. Additionally, functional analyzes were carried out to achieve predicted results on a small scale. The SPSS and MS Excel concerned have installed raw data in the device. In conjunction with the collection of goals, all qualitative and quantitative data obtained were analyzed.

3.8.1 Analytical technique

Data were analyzed with a view to achieving the objectives of the study. For this study, the following techniques were used:

I) Tabular technique

ii) Statistical analysis

Tabular technique

In order to extract concrete findings through simple statistical measurements such as means, percentage and ratios, a table technology was used to classify data.

Statistical analysis

This financial analysis aspect was designed to analyze the factors leading to the production and productivity of potatoes. To achieve this purpose, the contribution and productivity of individual inputs was evaluated with regard to the production method. Data were collected per hectare for this study.

3.8.2 Financial profitability of crops

Cost and return analysis is the most common method of determining and comparing the profitability of different farm enterprises. In estimating the level of profitability in crop production the following formula was used:

$\prod = P_1Q_1 + P_2Q_2 - \sum W_iX_i - TFC$

Where,

$\prod$ = Profit per hectare for producing the crop;

P_1 = Per unit price of the output;

Q_1 = Quantity of output obtained (per hectare);

P_2 = Per unit price of by product;

Q_2 = Quantity of by –product obtained (per hectare);

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

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

TFC = Total fixed cost

3.8.3 Calculation of BCR

BCR is the ratio of gross return and total cost. It indicates that the benefit of per unit of cost. BCR was calculated by using the following formula-

BCR = Gross Return/ Total Cost

3.8.4 Cost items

The cost of inputs is an important factor that plays an important role in financial decision making for performing and income generating activity. Respondents in the study area used purchased inputs as well as home supplied inputs. The cost of purchased inputs and home supplied inputs were not calculated separately. The cost of potato cultivation can be broadly classified under the following two heads:

a) Variable cost

b) Fixed cost

a) Variable cost

This mainly includes the following heads:

i) Cost of seed

ii) Labor cost

iii) Fertilizers cost

iv) Machinery and animal cost and

v) Interest on operating capital

b) Fixed cost

This mainly include only:

i) Land use cost

Cost of seed

Seed cost the one of the main cost items for potato farms. Cost of seed is the money value of total costs of potato seed, purchased or kept from previous year by the farmers during Potato cultivation.

Fertilizer cost

Fertilizer was one of the largest and the major cost items of potato cultivation. Cost of fertilizer included (Urea, TSP, MP, Gypsum etc.). Fertilizer costs were calculated at the prevailing local market rates. It's were estimated according to the cash price paid by the farmers per kg.

Human labor cost

Human labor cost was another most important input in the production of potato. Labor cost includes both family labor and Hired labors because there was significant use of hired labor in this cultivation. Eight adult male hours were equivalent to one man-day and the opportunity cost principle was used to estimate the wage rate of labor.

Animal labor cost

Animal were generally used for laddering in land preparation and threshing. Most of the farmers of the study areas used their own animals. Sometimes they also hired power animals on pair hour basis. Animal labor included a pair of animals and an attended. An animal pair day consisted of six hours. For calculating animal labor cost, the cost of human labor was deducted from the cost paid for the services of a pair of

with the ploughman, because the cost of attended was included in the human labor cost.

Machinery cost

The cost of machinery services was estimated based on the real costs incurred by farmers in potato. In the field of research, almost every sample farmer used electricity tiller and other land preparation and threshing machinery. They used power tiller hired mainly. An owner of power tiller provided both fuel and a driver to prepare and thresh the ground. The expense of the equipment included the service fee.

Land use cost

Depending on the location, topography and fertility of the soil, land use costs may vary for different points. Land has been used to cultivate potato for a span of four months from soil preparation to harvesting. In this analysis, cost for land use has been determined by taking into account the cash rental value of the land as the other alternative.

Operating capital interest

In this analysis, the amount of money required to cover the costs of inputs bought or leased was considered to be the operating capital. At a rate of 12 percent per year, operating capital interest has been estimated. Operating capital interest was measured with the formulation that follows (Mia *et al.,* 2013)

$$IOC = AIit$$

Where,

IOC= Interest on operating capital

I= Rate of interest

AI= Total investment / 2

t = Total time period of a cycle

3.8.5 Return items

Return items were as follows:

(i) Return from selling Potato.

(ii) Return from selling by product.

3.8.6 Procedure for Evaluation of Return

By multiplying the aggregate sum of the commodity by its respective average market price, a gross return per hectare was determined. The overall gross return per hectare was the main product value and the by-product value. Net returns is calculated by deducting from the gross return both direct and non-cash expenses.

3.8.7 Cobb-Douglas production function

Cobb-Douglas production function model was chosen to estimate the effects of key variables on production processes of potato. The double log form of the Cobb-Douglas production function model proved to be a superior alternative on theoretical and econometric grounds. Thus Cobb-Douglas model was selected for this study. The Cobb- Douglas production function model has the following characteristics:

i. The function is linear in logs;
ii. The exponents are the elasticity of production and can be used directly;
iii. Total variations in the output explained by the selected inputs are measured by co- efficient of multiple determination;
iv. The individual co-efficient represents relative factors share if there is constant returns to scale; and
v. For testing the significance level of individual co-efficient having sufficient degrees of freedom, 1 percent, 5 percent and 10 percent probabilities are used.

The Cobb–Douglas function form can be estimated as a linear relationship using the following expression:

$$\ln (Y) = a_0 + \sum a_i \ln (I_i);$$

Where,
Y= Output
I_i = Input
a_i = Model co-efficient

The specification of the Cobb-Douglas production function model was as follows:

$$Y = a\, x_1^{b1}\, x_2^{b2}\, x_3^{b3}\, x_4^{b4}\, x_5^{b5}\, x_6^{b6}\, x_7^{b7}\, x_8^{b8}\, x_9^{b9}\, e^{u_i}$$

By taking ln in both sides the Cobb-Douglas production function was transformed into the following logarithmic form, because it could be solved by the ordinary least squares (OLS) method $\ln Y = \ln a + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + \ldots\ldots + b_9 \ln x_9 + u_i$

Where,

Y = Gross return (Tk/hectare);

X_1 = Human labour cost (Tk/hectare);

X_2 = Tillage cost (Tk/hectare);

X_3= Seed cost (Tk/hectare);

X_4 = Urea cost (Tk/hectare);

X_5 = MOP cost (Tk/hectare);

X_6 = TSP cost (Tk/hectare);

X_7 =Irrigation cost (Tk/hectare);

X_8 = Insecticides cost (Tk/hectare);

X_9 = Manure and oil cake (Tk/hectare);

a = Constant or intercept term;

$b_1, b_2, ---, b_9$ = Coefficients of the respective input variables to be estimated; and

u_i = Error term.

3.8.8 Efficiency of Resource Allocation

In order to test the efficiency, the ratio of marginal value product (MVP) to the marginal factor cost (MFC) for each input was computed and tested for its equality to 1;

$$MPV / MFC=1$$

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

$$MPP_{xi} \times P_{yi} = MFC,$$

Where, $MPP_{xi} \times P_{yi} = MVP,$

But, $MPP = b_i \times (Y/xi)$,

So, $MVP = b_i \times (Y/xi) P_{yi}$

Where,

Bi = regression coefficient per resource,

Y = Mean output,

Xi = Mean value of inputs,

Pyi = price of output,

MFC = price of per unit of input

Thus, when Resource-use efficiency (RUE) = 1, resources were optimally utilized,

When RUE < 1, resources were over utilized, and
When RUE > 1, resources were underutilized

3.8.9 Problem Faced in Collection Data

The researcher faced the following problems during the data collection process.

1. Most farmers felt discouraged to answer questions because they thought the knowledge could be used against their interest. It took a lot of time of the researcher to gain the trust of the farmers.
2. The farmers do not keep track of their jobs or day-to-day costs. The researcher had to therefore depend on their memory.
3. Typically farmers worked on their fields. Often the researcher even had to contact the farmer for additional purposes.

CHAPTER 4

DESCRIPTION OF THE STUDY AREA

4.1 Introduction

This chapter focuses on a concise overview of the Area of research in which the samples farmers are based. It was necessary to know about the study areas selected to be able to understand farmers' activity, attitudes, the potential for development, and potentials, as well as their limitations. The main features of the study were the current agricultural status and the support services available in the study area.

4.2 Location of the study area

The selection of the study area is an important step. To achieve the objectives of the present study, a preliminary survey was conducted in 5 Upazilas under Munshiganj district. Based on preliminary information, 5 Upazilas, namely Lohajang, Sreenagar, Sirajdikhan, Tongibari, and Gazaria were selected.

4.3 Soil types and land topography

The soil of the selected Area is alluvial. The soil's properties vary from dry to acidic. The surface layer of the top soil is between 10 and 15 cm thick; layer color varies between gray and dark gray with a plain land surface. The land is rich in the villages.

Table 4.2: The land area based on utilization 2008 (In acre)

Upazila	Owned Area	Operated Area	Homestead Area	Temporary Crops net Area	Productivity of Crop
Gazaria	19781	19331	2211	15824	150
Lauhajang	16052	18462	2888	13430	139
Munshiganj Sadar	26860	29575	4026	23345	172
Serajdikhan	31722	35052	4802	27102	146
Sreenagar	28269	31662	4682	23529	111
Tongibari	19749	23726	3534	17032	161
Total	142433	157807	22143	120262	146

Source: Bangladesh Bureau of Statistics (BBS), 2018

4.4 Climate, temperature, and rainfall

Climate means a constant pattern of conditions in a particular location (temperature, humidity, rain, wind, fog, etc.). The research region also consisted of a warm Monsoon climate, as in the other areas of Bangladesh. No temperature recording and precipitation arrangement existed in the study area. Accurate climate information was not known as a result. However, in the other regions of Munshiganj district, the research regions' climate is similar. The Munshiganj Meteorological Office reports temperature and precipitation. Data regarding temperature, precipitation and humidity were also used in the district of Munshiganj.

Table 4.3 Temperature, rainfall, humidity during the years 2011-2018

Years	Temperature(Centigrade)		Rainfall (millimeter)	Humidity(%)
	Maximum	Minimum		
2011	22.02	10.7	694	83
2012	27.3	15.03	740	73
2013	29.9	19.7	769	73
2014	31.9	21.8	745	77
2015	31.7	23.5	741m	82
2016	32.0	25.9	784	85
2017	31.6	26.1	686	86
2018	32.3	26.2	705	86

Source: Bangladesh Bureau of Statistics (BBS), 2018

4.5 Area and population

According to the Census Report (Population census, 2011) of the study area are as follows. Based on preliminary information, 5 Based on preliminary data, 5 Upazilas, namely Lohajang, Sreenagar, Sirajdikhan, Tongibari, and Gazaria were selected.

Table 4.4 Number of household, population and density 2011

Upazila	Households	Population (adjusted)			Sex ratio(M / F)	Average size of households	Density Per sq. Km.
		Male	Female	Both Sex			
Gazaria	34994	78744	79244	157988	99	4.50	1206
Lauhajang	36554	79247	79995	159242	99	4.26	1215
Munshiganj Sadar	82060	194508	188755	383263	103	4.62	1757
Serajdikhan	59873	143559	144548	288107	99	4.74	1599
Sreenagar	57344	127374	132513	259887	96	4.47	1280
Tongibari	42433	98120	99053	197173	99	4.55	1399
Total	313258	721552	724108	1445660	100	4.55	1439

Source: Bangladesh Bureau of Statistics (BBS), 2018

4.6 Agriculture Census year and reference period

The year of the census spans a span of 12 consecutive months with the different reference periods or days of data collection for various census items. Some products have a reference span of one year or one week. Others have a particular day of reference.

In 1414 Bangla Shal (BS), from 1 Baishak to 30 Choitra, twelve months were covered in the census year. For census products, such as land use, crops, agricultural employment, animal and poultry deaths and agricultural loans, the year was the reference time. Information of property, farm size, tenure, population of farm, inventory of animals and poultry and farm equipment used a single reference day.

The various things of the census by comparison are shown below:

Agriculture holding

An agricultural holding is a techno-economic unit of single management agricultural production consisting of all livestock and all land, wholly or partially, being used for the purposes of agricultural production regardless of title, legal type or scale. Supervision may be exercised by either a holder individual or by two or more persons or by a legal body such as a company, a cooperative or a government agency. A holding may consist, provided that all individual fragmentation parcels form part of the same technical unit under one area or in one or more areas or of multiple administrative units or divisions. This description encompasses virtually any farm / household engaged in both crop and livestock farm production. There may be no agricultural land of any value in some holdings, such as farm holdings that do not make a production input indispensable for livestock, poultry and hatchery.

Farm holding

The farm is a techno-economic unit consisting of all livestock and land, in whole or part, used for agricultural produce irrespective of title, legal form or size. The agricultural holding consists of a single management agrarian production process. A holder, two or more individuals, or a legal entity like a corporation, a co-operative or a government agency may be responsible for the monitoring of this matter. An inventory can consist if all individual parcels of fragmentation form part of an ope or in one or more areas of the same technical unit or of multiple administrative units or divisions.

A farm is defined as a farm production unit having grown land equal to or above 0.05 acres of land. Three wide classes of farms are listed as follows:

(a) small: Farm holdings with 0.05 acres of land, but with more than that, but up to 2.49 acres of minimum land.

(b) medium: farms operating between 2,50 and 7,49 hectares of land.

(c) large: farm holdings running 7.50 acres or more of land.

Tiny grown area 0,04 acres or less is commonly used to grow mainly vegetables in the kitchen garden. Seeds are mostly planted in households with white spring, bucket, pumpkin and more; however, the creepers scatter over house ceilings and other constructions. For example, the minimum grown land to qualify as a farm is 0.05 acres.

Stocks of non-farm

A non-farm holding is classified as the one that does not grow, operate or cultivate less than 0,05 acres of land.

Tenancy

Owners are those who have and run their lands and who can lease land or not.

Tenant owners are those which have no land owned but which function on the basis of share farming or other words.The lands that are held by the tenant are the land owned and they may or may not lease their land to others and take land from others on the basis of share crops or other terms.

Agriculture work

Agriculture function refers to the preparation, management, and service of a holding by the holder and his staff. It involves land planning, sowing, weeding, picking up, feeding, and selection of cattle and poultry, kitchen planting, farm worker supervision, farm records & accounts, marketing planning of agricultural products (including packaging), repair of agricultural machinery, farm buildings and fences, land recovery and improvement and other related actions. Home and other household tasks are exempt.

Area under pond

For the entire year the area of the pool remains under water. Households usually use pond water to a wide variety of domestic and agricultural purposes. Fish farming often commonly includes ponds.

During the census, person and household ownership data were collected separately on the pond area.

Area under temporary crops

It's the field planted for cultures that are less than one year old or have a growing period. These include provisional plants such as paddy, wheat, jute, cotton, cigarettes, sugarcane, peas, petroleum seeds, potatoes , vegetables and other seasonal plants. In the back page of "Tally Tab" you will find a list of temporary plants for which data were gathered separately. For a temporary plant, the minimum area reported was 0.01 acre. The Area of temporary crops is equal to that of the Field Net of temporary crops.

Area under permanent crops

It is the land planted to crops which remain long-lasting after a seasonal harvest and which need not to be replanted. Mango, jackfruit, coconut, guava and lemon are all permanent crops and other forms of fruit

Current fallow

It is land brought into cultivation but left out uncultivated in census year for fertility regaining and improvement or for other reasons.

Net cultivated Area

This is land area basically cropped on the census year regardless of number of crops grown and current fallow. Consisting areas under temporary and permanent crops and also current fallow**.**

Permanent fallow

It is land not available for farming due to coming into residence and commercial & other uses. Playground, graveyard, wild shrubs and jungles, marshy land, and the like fall in this category.

Irrigated area

This is the total area of land irrigated by mechanical or manual irrigation to the production of crops. Irrigation of irrigating areas includes two classifications: (1) irrigation of surface water with primary sources of water: rivers, canals, bells, reservoirs, and water bodies; and (2) water irrigation underwater raised by low-lying tube shafts, high-lying piped wells and conventional country machinery. Electricity, diesel or gas, or manual work is used for irrigation systems.

Cattle and Buffalo

Cattle and buffalo heads owned by households on day of enumeration were counted.

Goats and Sheep

Goats and sheep owned by households on day of enumeration were counted.

Fowls, Ducks and Pigeons

Fowls, ducks and pigeons owned by households on day of enumeration were counted.

Temporary crops gross Area

Areas aggregated for all temporary crops grown in the census year have made temporary crops gross Area greater than temporary crops net Area since the latter has within it the same land cropped more than once in different seasons of a year.

4.7 Intensity of cropping

It is percentage of temporary crops gross area in comparison with temporary crops net area. It is expressed as follows:

$$\text{Intensity of cropping} = \frac{\text{Temporary crops gross area}}{\text{Temporary crops net area}} \times 100$$

Cereals

Main cereals are rice and then wheat. Other cereals are jab, barley, china, maize, kaun, bajra and joar.

Pulses

Main and common pulses are gram, mung, lentil, arhar, gari kalai, khesari and pea.

Oil seeds

Main oil seeds are rape and mustard, sesamum, linseed, groundnut, soybean, sunflower and castor.

Vegetables

Farmers grow both summer and winter vegetables. Main vegetables are potato, brinjal, raddish, arum, lady's finger, cauliflower, cabbage, bean, tomato, patal, gourd, cucumber, pumpkin, knoll- kal-turnip, dhundal, barbati, khirai, chichinga, carrot, kakrol and sak.

Cash crop

Main cash crops are jute, mesta, sunhemp, cotton, sugarcane and tobacco.

Spices

The main spices include turmeric, ginger, chillies, onion, garlic, corriander, black cumin and ani seed.

Fuel crops

Dhaincha and other smaller plants used as cooking-fuel are included in the group.

4.8 CONCLUSION

The short description stated above, provides an overview of Munshiganj district and the five Upazilas under it. It has potentiality to contribute in the national economy through potato production and cultivation. Proper management with scientific knowledge and utilization of natural resources is inevitable to increase the profitability of potato production.

CHAPTER- 5

Socio Economic Status of the Respondents

5.1 Introduction

In influencing production planning, the socioeconomic features of farmers are significant. In several ways, an individual differs from each other. An individual's behavior is primarily influenced by its features. The farmers' socio-economic features affect their decision-making on their farms. Several socioeconomic problems have been investigated for sample households. These include age distribution, family composition, education level, jobs, and dependence ratio, as well as the agricultural size and pattern of land ownership.

5.2 Age distribution of sample farmers

Table 5.1 classified all farmers' groups of the study region to various ages. In my study area age below 30 involved in farming was found quite rare. The age classes were less than 30 years, 30 to 40 years, 40 to 50 years, 50 to 60 years and 60 to 70 years, as can be seen from Table 5.1. Table 5.1 shows that out of the total potato producers 7% were under 30 years, 37% had a plurality of 30-40 years, 32% had age 40-60, 20% were between 50 and 60 years, and 4% were between 60 and 70 years. Table 5.1 reveals that the majority of potato producers had age 37%.

Table 5.1: Distribution of the Sample Farmers in Accordance with Age Groups

Variables	Frequency	Percentage
Below 30	7	7.0
30-40	37	37.0
40-50	32	32.0
50-60	20	20.0
60-70	4	4.0
Total	100	100

Source: Field Survey 2019

5.3 Education

All categories of farmers of the study area were grouped into different education level. In our finding, farmer was in most of the case illiterate and less educated. Among the total farmers, 12% response that they were completely illiterate; 26% can read and write; 23% education level up to primary; 21% were goes in the high schools; 11% were education level up to higher secondary and only 7% were showed education level that above higher secondary.

Table 5.2 Distribution of the Sample Farmers in Accordance with Education Group

Variables	Frequency	Percentage
Illiterate	12	12.0
Can Read and Write	26	26.0
Up to Primary	23	23.0
Up to High School	21	21.0
Up to Higher Secondary	11	11.0
Above Higher Secondary	7	7.0
Total	100	100

Source: Field Survey 2019

5.4 Main Profession:

In our research we asked that what was their main occupation, among the total 79% said that their main occupation was farmer, and a few said the other occupation (Business (6%), Service (8%), and (7%) Student).

Table 5.3 Distribution of the Sample Farmers in Accordance with Main Profession

	Frequency	Percentage
Farmer	79	79.0
Business	6	6.0
Service	8	8.0
Student	7	7.0
Total	100	100

Source: Field Survey 2019

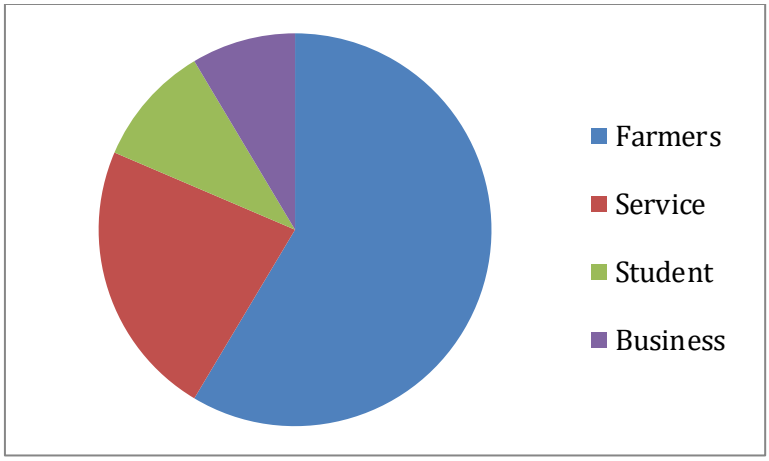

Illustration of main profession through a pie chart

5.5 Income (Individual):

Most of the farmer said their yearly individual income were in the range (67%) above 100000. On the other hand, next major (23%) category was 40000-50000 income range

Table 5.4 Distribution of the Sample Farmers in Accordance with Income (Individual)

Variables	Frequency	Percentage
40000-50000	23	23.0
50000-60000	4	4.0
70000-80000	3	3.0
90000-100000	3	3.0
Above 100000	67	67.0
Total	100	100

Source: Field Survey 2019

5.6 Total Earning Members of the Household:

In our study we found that, more than half of the household (55%) had only one earning member and a few (32%) household were 2 earning members. The other categories were not much significant.

Table 5.5 Distribution of the Sample Farmers in Accordance with Total Earning Members of the Household

Variables	Frequency	Percentage
1 Person	55	55.0
2 Persons	32	32.0
3 Persons	6	6.0
4 Persons	3	3.0
6 Persons	4	4.0
Total	100	100

Source: Field Survey 2019

5.7 Family Members:

The result of our study demonstrates that above half of the farmers (51%) had 5 members in their household, 15% households had 4 family members, 20% household were 6 members and others were so little. This indicate the population density of our country. Also show the dependency rate of the earning members.

Table 5.6 Distribution of the Sample Farmers in Accordance with Family Members

Variables	Frequency	Percentage
3 Persons	4	4.0
4 Persons	15	15.0
5 Persons	51	51.0
6 Persons	20	20.0
8 Persons	6	6.0
14 Persons	4	4.0
Total	100	100

Source: Field Survey 2019

5.8 Total Household Income

Most of the farmer said their yearly household income were in the range (70%) above 100000. On the other hand, next major (23%) category was 40000-50000 income range. Which almost replicate the individual income.

Table 5.7 Distribution of the Sample Farmers in Accordance with Total Household Income

Variables	Frequency	Percentage
40000-50000	23	23.0
50000-60000	4	4.0
70000-80000	3	3.0
Above 100000	70	70.0
Total	100	100

Source: Field Survey 2019

5.9 Respondent Land's Status

In our study respondents, 65% had between 0.61to 1.21 hectares of land including pond, home, and farming land ownership.

Table 5.8 Distribution of the Sample Farmers in Accordance with Respondent Land's Status

Variables	Frequency	Percentage
Total Land Size (Household, Garden, Pond, Own Cultivate Land)		
0.12- 0.61 hectare	16	16.0
0.61-1.21 hectare	65	65.0
1.21-1.82 hectare	16	16.0
Abovem1.82 hectare	3	3.0
Total	100	100

Source: Survey, 2019Field

5.10 Conclusion

This chapter discusses the socioeconomic attributes of potato growers. The findings clearly reveal that socio demographic characteristics differ from each other in respect of age distribution, educational status, main profession, income level, number of earning members, family members, total household income and land holding status.

CHAPTER 6

Profitability And Functional Analysis of Potato Cultivation

6.1 Introduction

In this chapter an attempt has been made to identify and measure the effects of some important variables of production on gross return of potato in the framework of production function analysis. For the purpose Cobb- Douglas production function model, has been chosen to determine the effects of selected variables on potato production.

6.2 Functional Analysis

Production function shows the relationship between the quantity of output and the different quantities of inputs used in the production process. It other words, the total output produced from the chosen quantity of various inputs.

Considering the effects of explanatory variables on yield of potato, nine explanatory variables namely human labor cost (X1), tillage cost (X2), seeds cost (X3), Urea cost (X4), MOP cost (X5), TSP cost(X6), irrigation cost (X7), insecticides cost (X8), manure and oil cake cost (X9) were chosen as key independent factors to estimate the quantitative effect of inputs on yield of potato respectively. All these variables have been estimated as per hectare monetary values. However other important variables such as management, land quality, soil type, sowing time and weather etc., were excluded in the analysis due to paucity of reliable data. To explore the input output relationships production function was fitted in all the locations. Of possible statistical forms, Cobb-Douglas production function, most popular in farm-firm analysis, was used as this algebraic model provides a compromise between (a) adequate fit of the data, (b) computation feasibility, and (c) sufficient degrees of freedom unused to allow for statistical testing. In other words, the Cobb-Douglas is a relatively "efficient user" of degrees of freedom (Heady and Dillon, 1961).

Another special advantage of using Cobb-Douglas production function model was that the regression under OLS in logarithm, yields coefficients which represents

partial elasticity of production and if all the inputs related to the production are taken into account, the sum of the elasticity indicates whether the production process as a whole yields increasing, constant or decreasing returns to scale. In fact, it is widely used by many researchers in their economic studies. The advantages of the model are that it is simple to calculate and the elasticity of production can directly be obtained from the coefficient.

The Cobb–Douglas function form can be estimated as a linear relationship using the following expression:

$$\mathbf{In\ (Y) = a_0 + \sum a_i\ ln\ (}\ I_i\ \mathbf{);}$$

Where,

Y= Output

I_i = Input

a_i = Model co-efficient

The following Cobb-Douglas production function was used in the present study:

$$Y = a\, x_1^{b1}\, x_2^{b2}\, x_3^{b3}\, x_4^{b4}\, x_5^{b5}\, x_6^{b6}\, x_7^{b7}\, x_8^{b8}\, x_9^{b9}\, e^{uI}$$

By taking ln in both sides the Cobb-Douglas production function was transformed into the following logarithmic form because it could be solved by the OLS method:

$$\ln Y = \ln a + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + \ldots\ldots + b_9 \ln x_9 + u_i$$

Where,

Y = Gross return (Tk/hectare);

x_1 = Human labor cost (Tk/hectare);

x_2 = Tillage cost (Tk/hectare);

x_3 = Seed cost (Tk/hectare);

x_4 = Urea cost (Tk/hectare);

x_5 = MOP cost (Tk/hectare);

x_6 = TSP cost (Tk/hectare);

x_7 =Irrigation cost (Tk/hectare);

x_8 = Insecticides cost (Tk/hectare);

x_9 = Compost Fertilizers (Tk/hectare);

a = Constant or intercept term

b_1, b_2, ---, b_9 = Coefficients of the respective input variables to be estimated; and u_i = Error term.

6.3 Interpretation of the results:

Estimated Values of Coefficients and Related Statistics of Cobb-Douglas Production Function Model for potato.

Table 6.1 Interpretation of the results

Explanatory variables	Values of coefficients	Standard error	t-value
Intercept/Constant	0.236	0.884	0.267
Human labor cost (X_1)	0.123***	0.036	2.861
Tillage cost (X_2)	0.098	0.064	1.542
Seed cost (X_3)	0.112*	0.062	1.778
Urea cost (X_4)	0.213**	0.088	2.421
MOP cost (X_5)	0.045	0.139	0.303
TSP cost (X_6)	0.113	0.093	1.204
Irrigation cost (X_7)	0.021*	0.012	1.688
Insecticide cost (X_8)	0.010	0.019	0.526
Compost Fertilizers (X_9)	0.043**	0.017	2.521
F-value	25.00		
R^2	0.756		
Returns to scale ($\sum b_i$)	1.01		

Source: Field Survey 2019

Note: *** = Significant at 1% level

** = Significant at 5% level

* = Significant at 10% level

The magnitude of the regression coefficient of human labor cost was 0.123 with a positive sign. It was highly significant at one percent probability level. It implies that one percent increase of human labor cost, keeping other factors constant, would lead to an increase in the gross return by 0.103 percent for potato.

Tillage cost (X_2). The regression co-efficient of tillage cost was 0.098 which was positive and statistically not significant, which pointed a positive relationship between gross return and tillage cost.

Seed cost (X_3). The magnitude regression coefficient of seed cost was 0.112 for potato. It was positive and was significant at ten percent probability level. This exhibits that an increase in one percent seed cost, remaining other factors constant, would result in an increase in the gross return by 0.112 percent.

Urea cost (X_4). It can be seen from Table 6.1 that regression coefficient of Urea cost was

0.213 for potato. It was positive and was significant at five percent probability level. This exhibits that an increase in one percent of Urea cost, remaining other factors constant, would result in an increase in the gross return by 0.213 percent.

MOP cost (X_5). The regression co-efficient of MOP cost was 0.045 which was positive and statistically not significant, which pointed a positive relationship between gross return and MOP cost.

TSP cost (X_6). The regression co-efficient of TSP cost was 0.113 which was positive and statistically not significant, which pointed a positive relationship between gross return and TSP cost.

Irrigation water cost (X_7). It can be seen from Table 6.1 that the magnitude of the regression coefficient of irrigation water cost 0.021 for potato. It was positive and was statistically significant at ten percent probability level. This exhibits that an increase in one percent of Irrigation water cost, remaining other factors constant, would result in an increase in the gross return by 0.021 percent.

Insecticides Cost (X_8). The regression co-efficient of insecticides cost was 0.010 which was positive and statistically not significant, which pointed a positive relationship between gross return and insecticides cost.

Compost Fertilizers (X_9). It can be seen from Table 6.1 that the magnitude of the regression coefficient of Manure and oil cake cost was 0.043 for potato. It was positive and was statistically significant at five percent probability level. This exhibits

that an increase in one percent of Manure and oil cake cost, remaining other factors constant, would result in an increase in the gross return by 0.043 percent.

Coefficient of multiple determinations (R^2). It is evident from Table 6.1 that the value of the coefficient of multiple determinations (R^2) was 0.756 for potato. It exhibits that about 76 percent of the total of the gross returns are explained by the explanatory variables included in the model.

Goodness of fit (F - value). The F-value was 25.00 for potato, which implies good fit of the model. That is, all the explanatory variables included in the model were important for explaining variation of potato production.

Returns to scale ($\sum b_i$): The summation of all the regression coefficients or production elasticities of the estimated model gives information about the returns to scale that is in response of output to a proportionate change in all inputs. The sum of all the production coefficients of the equations for potato production was 1.01.

6.4 Efficacy of Resource Allocations

Resource use efficiency is very important to measure how properly the resources are used for getting effective result of the production process. To attain the objectives of profit maximization for efficient allocation of resources, one should use more of the variable resource as long as the value of the added product is greater than the cost of the added amount of the resource used in producing it.

Table 6.2 Estimated resource-use efficiency in Potato production.

Variables	Value of $\bar{Y}$=GM $\bar{Y}$ x Pyi	Geometric mean (X_i)	MVP=bi($\bar{Y}$÷$\ddot{X}$i)	MFC	MVP/MFC	Comment
Human labor cost (X1)	346751.9	49.85	50.12	330.2	0.16	Over utilized
Tillage cost (X2)		13.66	477.92	70.1	6.82	Under utilized
Seed cost (X3)		238.29	58.51	16	3.66	Under utilized
Urea cost (X4)		139.58	199.21	22	9.06	Under utilized
MOP cost (X5)		102.64	3.14	15.03	0.21	Over utilized
TSP cost (X6)		140.89	4.64	23.70	0.806	Over utilized
Irrigation cost (X7)		128.15	5.98	34.21	2.78	Under utilized
Insecticide cost (X8)		113.57	4.21	17.39	0.659	Over utilized
Compost Fertilizers (X9)		103.93	55.89	11.03	5.43	Under utilized

Source: Field Survey 2019

The ratio of MVP and MFC of Human labor was positive and less than one indicating over use of the resources. It indicates that farmers in the study areas using this input inefficiently. Human labor use in Potato production should reduce considerably to reduce the cost of production and increase profit. Again, the ratio of MVP and MFC of tillage cost was positive and more than one indicating the fact that it was underutilized. It should be reduced to make profit. In addition to that, The ratio of MVP and MFC of seed was positive and greater than one indicates under use of the resources. Use of seed should increase considerably to attain efficiency and to increase the yield. The ratio of MVP and MFC of Urea was positive but more than

one 3.66. It indicates under use of the resources. Farmers in the study area using this input inefficiently. Furthermore, The ratio of MVP and MFC of Mop was less than one. It indicates that farmers in the study area over using this input. Mop use in Potato production should reduce to attain efficiency in resource use. Moreover, The ratio of MVP and MFC of TSP was greater than one indicates under use of the resources. There is ample scope to increase the use of TSP for higher yield. Again, it is evident from the table that, the ratio of MVP and MFC of irrigation cost was positive and more than one which conveys that it was underutilized. So farmers should use it in an efficient manner to make more profit. In addition to that, the ratio of MVP and MFC insecticide cost was positive and less than one indicating over use of it. Insecticide cost should be minimized to increase profit. Finally, the ratio of MVP and MFC of compost fertilizer was positive and more than one which suggests under use of the resources.

6.5 Variable cost:

Table 6.3: Variable Cost

6.3.1Human Labor Cost

Human Labor									
Particulars	**Family**			**Hired**			**Total**		
	No	Wage	Cost (Tk./ hectare)	No	Wage	Cost (Tk./ hectare)	No	Wage	Cost (Tk./ hectare)
Land Cleaning	3.9	300.7	1174.5	3.3	290.6	952.1	7.2	295.7	2123.4
Land Preparation	3.4	308.8	1050.7	2.3	304.6	690.9	5.7	306.7	1739.2
Ladder	4.7	312.0	1474.2	2.9	306.7	888.9	7.6	309.3	2358.2
First Time Applying Fertilizer	3.9	310.0	1210.9	1.1	343.3	389.3	5.0	326.7	1646.4
Applying Cow dung	2.4	356.0	852.3	12.1	340.6	4120	14.5	348.3	5046.9
Making Peet	4.9	326.0	1588.3	5.9	333.9	1977.5	10.8	330.0	3561.7
Making Bead	2.5	359.4	887.7	13.3	353.8	4687.9	15.7	356.6	5605.8
Seedlings	3.1	320.9	993.9	4.1	306.9	1242.9	7.1	313.9	2243.5
Second Time Applying Fertilizer	3.7	331.3	1235.7	1.4	325.0	451.8	5.1	328.2	1680.1
To lift the soil	4.5	344.2	1542.0	7.0	348.6	2433.0	11.5	346.4	3969.6
Third Time Applying Fertilizer	4.0	327.5	1303.5	1.9	326.7	617.5	5.9	327.1	1920.1
Weeding	3.4	323.8	1084.7	0.9	337.5	297.0	4.2	330.7	1398.6
Irrigation	3.5	325.6	1149.4	2.3	333.3	756.7	5.8	329.5	1910.9
Making Fence	1.9	340.0	642.6	0	0	0	1.9	340.0	642.6
Pesticides	4.4	331.1	1460.2	6.6	360.0	2376.0	11.0	345.6	3804.5
Lift and carry	4.0	327.5	1303.5	1.9	326.7	617.5	5.9	327.1	1920.1
Drying and Warehousing	3.9	310.0	1210.9	1.1	343.3	389.3	5.0	326.7	1646.4
Carrying cost on local market	2.4	356.0	852.3	12.1	340.6	4120	14.5	348.3	5046.9
Total	**64.5**	**5910.8**	**21017.3**	**80.2**	**5622.1**	**27008.3**	**144.4**	**5936.8**	**48264.9**

Source: Field Survey 2019

6.3.2 Other Variable Cost

Items of returns/costs	Unit	Quantity	Price per unit (Tk)	Total value (Tk)	% of total
Tillage	Tk	3 times	1729	5187	6%
Seeds	Kg	1200	48	57600	61%
Urea	Kg	300	22	6600	7%
TSP	Kg	150	25	3750	4%
MOP	Kg	200	15	3000	3%
Gypsum	Kg	25	8	200	0%
Manure and oil cake	Kg	7000	1	7000	7%
Insecticides	Tk	n.a	-	3550	4%
Irrigation	Tk	n.a	-	7000	7%
Total	Tk	-	-	93887	100%

Source: Field Survey 2019

6.6 Fixed cost:

Table 6.4 Fixed Cost

Items of returns/costs	Unit	Quantity	Price per unit (Tk)	Total value (Tk)	% of total
Interest on OC	Tk	24983.41	@10%	2498.34	1.24
Total	Tk	-	-	2498.34	1.24

Source: Field Survey 2019

6.7 Total cost: Total cost (Variable cost + Fixed cost)

Table 6.5 Total Cost

Items of returns/costs	Unit	Variable cost	Fixed cost	Total (Tk)	% of total
Total cost	Tk	142151.90	2498.34	144650.24	100

Source: Field Survey 2019

In order to estimate total cost per hectare all the resources used in potato production has been recapture together. Per hectare total cost of potato production was 1,44,650.24

6.8 Gross returns

Table 6.6 Gross Return

Items of returns/cost	Unit	Quantity	Priceper unit(TK)	Total value (Tk)	%of Total
Main product	Kg	21500.00	15.00	322500.00	96.99
By-product	TK	N/A	-	10,000.00	3.01
Total returns	TK	-	-	332500.00	100.00

Source: Field Survey 2019

Here gross returns of the potato production are= (Main product+ By-product).

In the case of potato production, the return of by-products is very difficult. But potato chips are one of the most popular food items in our local area. There is very little valuation of the by-product of potatoes. The total value of the by-products is 10,000.00 tk, which is 3.01 percent of the total value. The quantity of the main product shall be 21500.00 kg. If the price of the potato per unit is 15.00, the total value of the main product of the potato will be 3,22,500.00. It is considered to be 96.9 per cent. Thus, the gross return on potato production is= (3,22,500.00+ 10,000.00) = 3,32,500.00.

If the gross return of the potato production is increased and the production cost of potato decrease, then we will get highest rate of return through potato cultivation

6.9 Net Return (Gross return – Total cost)

Table 6.7 Net return

Items of returns/costs	Unit	Quantity	Price per unit (Tk)	Total value (Tk)
Net return	Tk	-	-	187849.76

Source: Field Survey 2019

Here

Net return= Gross return – Total cost

So the net return of potato production is depending on both gross return and total cost of the potato production.

6.10 Undiscounted BCR

Table 6.8 Undiscounted BCR

Items of returns/costs	Total Benefit	Total cost	Ratio
Undiscounted BCR	187849.76	144650.24	1.29

Source: Field Survey 2019

The undiscounted benefit cost ratio (BCR) is a relative measure which is used to compare benefits per unit of cost. It is evident from the table that BCR was 1.29 which indicates that farmers get higher profit. The result clearly suggests that potato production was profitable for farmers.

6.11 Conclusion

From the above discussion and functional analysis, it is clear that Potato production is a profitable business. Appropriate level of input, scientific management and timely operation are crucial for achieving higher profit through it. In their opinion, sample farmers said that higher yield and income encouraged them to cultivate potato.

CHAPTER 7

PROBLEMS AND CONSTRAINTS OF POTATO PRODUCTION

7.1 Introduction

Potato production in Bangladesh faces many constraints like other crop production. Farmers in Bangladesh do not have the sufficient knowledge and adequate number of seeds, fertilizers, pesticides, technical supports and finally the desirable market prices of their products. They are economically not very sound due to low capital base. Farmers generally accused that they are not getting sufficient support from governmental agencies as well as from extension offices. It is also claimed that farmers do not get necessary technical and financial support from the government. In this chapter, steps have been taken to point out the constraints associated with potato production faced by the farmers. For the sake of analytical convenience constraints were broadly classified under three categories such as-

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

A. Economic and technical problems

Table 7.1 Major constraints faced by the farmers in producing and marketing of potato

Nature of problems	No of potato farmers	Percentage
Lack of capital or institution credit	18	36
Lack of scientific knowledge	20	40
Insufficient irrigation	13	26
High prices fertilizer and insecticides	19	38
Lack of human labor availability	15	30
Non availability of quality seed	9	18

Source: Field survey, 2019

B. Marketing problems

Table 7.2 Marketing Problem

Nature of problems	No of potato Farmers	Percentage
Low market price of product during harvesting period	25	50
Packaging problem	22	44
Carrying and handling problem	14	28

Source: Field survey, 2019

C. Storage Problems

Table 7.3 Storage Problem

Nature of problems	No of potato Farmers	Percentage
Attack by pest and diseases	18	36
Damage by domestic animal	12	24
Loss of product due to theft	16	32

Source: Field survey, 2019

7.1 Economic and technical problems

It was noticed that farmers mostly faced economic and technical problems relating to the production of potato. The major economic and technical problems faced by the farmers in potato production are discussed below:

7.1.1 Lack of financial capital or institutional credit

As winter vegetables needs proper doses of fertilizer, irrigation water and insecticides in addition to special agronomic care so potato cultivators need enough capital to buy the necessary inputs. In the study area about 36.00 percent of total growers reported

that they did not have adequate amount of operating capital (Table 7.1). Most of the growers still lacks institutional credit and the credit sanction process is so lengthy that they had to borrow capital from relatives, neighbors, moneylenders at a high rate of interest for immediate crisis.

7.1.2 Lack of scientific knowledge and technology

Poor scientific knowledge and practice regarding production of potato is a serious problem. It was found in the study area that, most of the potato producers were illiterate and they followed traditional methods and most importantly they do not have any idea about the scientific knowledge. Due to lack of scientific knowledge and cultural practices about 40 percent of the selected potato growers reported that the productivity of potato was low (Table 7.1).

7.1.3 Insufficient irrigation

Water is a vital input for any crop production and it is not different in case of potato. In the study area about 26 percent potato growers had gone through this problem (Table 7.1). Lack of irrigation facilities was a major constraint for potato production claimed the farmers in the study area.

7.1.4 High price of fertilizers and insecticides

Fertilizer and insecticides are very important for the production of potato. The prices of fertilizers and insecticides got high during cultivation period because of the profit making motive of both retail and wholesale dealers. It was found from the study that about 38 percent potato growers complained that price rate of fertilizers and insecticides was too high to afford (Table 7.1).

7.1.5 Lack of human labor availability

As potato cultivation was labor intensive so lack of availability of human labor was one of the major problems faced by the potato growers. It was evident from Table 7.1 that about 30 percent of the selected potato growers faced acute shortage of human labor during the production season.

7.1.6 Non-availability of quality seeds and high price of seed/seedlings

Lack of quality seeds was another limiting factor in producing potato. About 18 percent farmers reported this problem (Table 7.1) claiming that in local market HYV seeds were not available. Most of the growers had to purchase seeds at a very high price but ironically they were not of good quality and as a result productivity was low.

7.2 Marketing problems

Another serious problem faced by potato producers was the marketing related issues. Most of the farmers used to sell their product to the "Farias" at home in the study area. Only a few farmers sold their products at the village `hat'. Low market price during the harvesting period accounted for almost 50 percent for lower productivity of potato production (Table 7.2). Furthermore, packaging (44 percent) was another constraint that hindered farmers from earning high profit (Table 7.2). It was observed that carrying and handling problem which accounted for 28 percent (Table 7.2) was another major reason for low profitability of potato.

7.3 Storage problems

Lack of proper storage facilities was one of the most crucial problems regarding selected potato marketing. It was observed from the table 7.3 that 36 percent of potato were lost due to pest and disease attack despite preserving in cold storage. Therefore, due to lack of proper storage facilities the farmers did not get fair prices of their selected winter vegetables. Following that, damage caused by domestic animals accounted for 24 percent (Table 7.3). Again, stealing of potato was a common phenomenon during the harvesting season which discouraged the growers. In the study area, about 32 percent of selected potato growers complained that their products were stolen (Table 7.3).

7.4 Conclusion

Undoubtedly, potato plays a prominent role in earing profit both locally and globally. As potato has huge domestic demand for their nutritional and economic value, its production should be expanded. Though farmers were facing some acute problems such as low market prices of potato and high input prices, it would not hinder the expansion of potato production due to its huge demand. Despite of the constraints in potato production, the farmers are still engaged in this enterprise in the study area because of its easy cultivation method and high profitability.

CHAPTER 8

SUMMARY, CONCLUSION AND RECOMMENDATION

8.1 Introduction

This chapter attempts to discuss the summary, conclusion and policy recommendation of the current study. This chapter summaries on Introduction (Chapter 1), Review of literature (Chapter 2), Methodology (Chapter 3), Description of the study area (Chapter 4), Socioeconomic characters of the farmers (Chapter 5), Profitability and Functional Analysis of Potato cultivation (Chapter 6), Problems and Constraints of Potato production (Chapter 7) and finally (Chapter 8) draws termination through summary, conclusion and policy recommendation.

8.2 Summary

Bangladesh is principally an agricultural country. Agriculture sector cannot be overlooked because still 38.58 percent (measure: percent; source: The World Bank) of people are engaged in it. Furthermore, as it works as the backbone, economic development cannot be imagined without agricultural development. Among many sub- sectors, potato plays a prominent role in agricultural sector due to its availability and nutritional value. Again, potato production has been recognized as a dominant sector for its remarkable exploitation in raising foreign exchange earnings and has grab a significant position among the items exported from Bangladesh. For instance, recently Bangladesh has earned US$ 8974.13 Million by exporting potato and potato products in the FY 2018-2019.The prime advantage of potato is that it provides a low cost nutrition source. In addition to that, potato has different varieties which can be grown easily and requires a production season. In winter season the largest number of potatoes are produced. Furthermore, it increases employment opportunities as it is a labor intensive crop. Bangladesh is very much preferable for potato production because of its fertile soil and climate. Besides rice, potato should also be provided special attention in the five-year plan (FYP) as an enriched source of carbohydrate and further profitability. Production and commercialization of potato should be emphasized keeping in mind its nutritional value, local and export demand.

The overall objectives of the study will be to determine the profitability of potato growers and to point out the socioeconomic characteristics of the farmers in the study area. The specific objectives are stated below:

1. To know the socio-economic characteristics of the potato farmers;
2. To determine the profitability of potato farming;
3. To assess the resource use efficiency of potato growers
4. To identify the major problems associated with potato production;

The area of the study was five Upazilas namely Lohajang, Sreenagar, Sirajdikhan, Tongibari and Gazaria under Munshiganj district and preliminary survey was conducted there. To select the data systematic sampling method was followed and hundred samples were selected in total. The researcher collected the data by comprehensive interview schedules. In this study, Cobb-Douglas production function was used to process and analyze the data. In analyzing socioeconomic characteristics age formation, educational status, main profession, income of the respondents, number of earners in the household, family members, total household income and respondent land's status were considered. The findings revealed that age group of 30 to 40 years was the largest group among all. In the case of education level, 26 percent is dominant who can both read and write following that 23 percent had only primary education. In the study area about 79 percent people were engaged in agriculture as their prime occupation which was followed by service and business at 8 percent and 6 percent respectively. Again, in the case of income, the range 67 percent above 100000 was the majority and the next major category was 40000- 50000 income range. The study also found that more than half of the household 55 percent had only one earning member and following that 32 percent household had 2 earning members. The study also manifests that, about half of the farmers 51 percent had five members in their households. Moreover, most of the farmer claimed that their yearly household income was above 100000 which was 70 percent of total. In case of the land's status, the respondents had 65 percent land ranging between 0.61 to 1.81 hectaresincluding pond but most of the respondents around 67 percent did not own any land. The study also reveals that, human labor was the most important factor in the production process. They used maximum number of hired labor during the time of harvesting. Among fertilizers Urea, TSP, MOP were mostly used.

To determine the profitability of potato growers both inputs and outputs were valued at market price. Cost items for the study included human labor, tillage cost, seed cost, Urea, TSP, MOP, irrigation cost, insecticide cost and fertilizer cost. Per hectare total cost, gross return and net return of the potato production were Tk. 1,44,650.24, Tk.3,32,500.00 and Tk. 1,87,849.76 respectively.

In the study, Cobb- Douglas production function model was used to measure the effects of key variable inputs. The most important nine explanatory variables were included in the model to explain the gross yield of the potato production. Among them, most of the variables in the production function were significant except the insignificant impact of tillage cost, MOP, TSP and insecticide cost. The value of the co efficient of multiple determination of potato production was .756 which implied that about 76 percent of the total variation in the gross yield could be explained by the included explanatory variables of the model. Production function for potato cultivation exhibits increasing returns to scale 1.01. This implied that, if all the variables specified in the model were increased by 1 percent, gross yield would also increase by 0.01 percent. The F- value for the potato production was 25 which were highly significant at 1 percent level. Resource use efficiency suggested that, tillage, seed cost, Urea, irrigation, compost fertilizers were under used and human labor, MOP, TSP, insecticide were over utilized for potato production. So there was a positive effect of key factors in the production process. In the study area several problems and constraints were identified association with potato production. These common problems were categorized in to three major groups such as, economic and technical, marketing and storage problems. Economic and technical problems include lack of capital, high price of fertilizers and insecticides, lack of scientific knowledge and method, insufficient irrigation, scarcity of good quality seeds. Marketing problems were lack of adequate transport facilities, lack of packaging facilities, lack of quality seeds. Storage problems were loss of production due to theft, wastage and damage by wild or domestic animals and pests. In order to increase the profitability of potato production, these problems should be taken into account as soon as possible.

8.3 Conclusion

From the results of the current study, it may be concluded that there are ample scopes which needs to be taken into account to increase the productivity of potato and to rise income, employment rate and nutritional status of the farmers. The management practices of potato production in the study area were not found productive enough. Farmers were still ignorant about the application of inputs in right time with right doses. As a result, they misuse the inputs either by overdose or insufficient dose. Thus well planned management structure with skillful trainer aligned with solving farmer's problems, fulfilling their needs, achieving goals and utilizing resource effectively can lead to enduring production practices and sustainable income earnings from potato.

8.4 Policy Recommendation

(a) First of all, farmers should be encouraged to keep records so that they can evaluate their own progress between the previous and the current year.

(b) According to actual field survey and experience gained so far, it can be concluded that farmers should be provided with proper training through extension services, NGO's and Government facilities in case of using inputs as they overuse or misuse it.

(c) Availability of adequate human labor in time of need and is another major factor behind the growth and profitability of potato as it is a perishable product. So necessary measures should be taken to address it.

(d) Farmers could not get reasonable prices for potato. Marketing costs are high because of insufficient and misleading information, poor infrastructure, high price risks, etc. To stop this, measures should be taken to ensure; (I) fair price by Government intervention; (ii) accurate information; (iii) quality of products; (iv) stability of production; and (v)floor price so that farmers do not get deprived by the middlemen.

(e) For enhancing production, quality seeds of improved varieties in sufficient quantity should be collected and stored. Emphasis should be given on creating facilities and solid structural support for hybrid seed production, marketing and development.

(f) Finally, establishment of cold storage and food processing industries at the potato growing area can be helpful to the farmers to preserve and process potato during peak period.

8.5 Limitation of the Study

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

i. Inadequate fund and time availability for the study was an important limitation. Due to the lack of time and fund support the study could not cover wide areas for collection of essential information from the farmers; 100 farmers were selected for the purpose of the study.

ii. The researcher was dependent on the memory of the farmers for collecting necessary information because many of them did not keep any written record or kept record partially.

Despite a few limitations, the current study may provide some valuable knowledge and information for the farmers, extension workers and researchers.

8.6: Scopes for Further Research

Although the present study provides some useful information for researchers, policy makers as well as farmers, it is not free from criticisms. The weaknesses of the present study, of course, open up scopes for further research which are outlined below:

i. It could be mentioned here that the future researchers could take up a broad - based study with large samples;

ii. A further study can be undertaken by taking into account different farm sizes to assess the impacts on income generation through other vegetable cultivation.

REFERENCES

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

Hossain M and Bose M L. 2000. Growth and Structural Changes in Bangladesh Agriculture; Implication of Strategies and Policies for Sustainable Development in M. A. S. Mandal ed. Changing Rural Economy of Bangladesh, Bangladesh Economic Association, Dhaka, 1-20

Ahmed, M. K. 2013. Seed potato production systems in Bangladesh. A country report presented at international training program on seed potato technology, certification and supply systems at CDI, WUR, The Netherlands (3 June-28 June,2013).

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

BBS (2018), Yearbook of Agricultural Statistics of Bangladesh, Bangladesh Bureau of Statistics, Statistical Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

Basak (1992), A study for potato production in three villages of Gabtoli thana in Bogradistrict, MS Ag Econ thesis, Bangladesh Agricultural University, Mymensingh.

FAO and CIP. 1995. Potatoes in the 1990s: Situation and prospects of the world potato economy. FAO, Rome (Italy), 39pp

Khandker S, Basak A. Scope for potato processing industry in Bangladesh. Daily Sun. 2018; 3:5.

FAOSTAT, 2012. Food and Agricultural commodities production:

Potatoes. Food and Agriculture Organization of the United Nations, FAO Statistics Division

Firdawsi, J. 2008. An economic study of alternative rice and potato production in selected area of Rangpur district.

Mahjabeen, R., 2008. Microfinancing in Bangladesh: impact on households, consumption and welfare. J. Policy Model. [online] 30, 1083–1092.

Yasmin. M.S. (2008). An Economic Analysis of Potato Production in a Selected Area of Thakurgoan District. M.S. Thesis, Department of Agricultural Economics, Bangladesh Agricultural University, 3-176.

Majid M A. 2004. An Economic Analysis of the Availability and Utilization of Potato Credit in Some Selected Areas of Bogra District. Unpublished thesis. Thesis, Submitted to the Department of Agricultural Finance, Bangladesh Agricultural University, Mymensingh.

Hossian, M.M. (2008). Prospects of potato in Bangladesh. In: Bangladesh potato Campaign 2008. MOA, FAO & CSD, Dhaka, Bangladesh.

Diagne, Al., Zeller, M. and Sharma, M. (2000) Empirical measurement of households' access to credit and credit constraints in developing countries: methodological issues and evidence. Food Consumption and Nutrition Division (FCND) discussion paper 90, IFPRI, Washington.

Haque (1993), The comparative profitability of sweet potato and groundnut with particular reference to small farmers in six villages under Kuliachar thana of Kishoreganj district, MS Ag Econ thesis, Bangladesh Agricultural University, Mymensingh.

Hakim, M. A. (1993). A comparative economic analysis of cardinal and malta varieties of potato in kotwali thana of Bogra District. Journal of Advanced Statistics, 1(4)

Das, S. C. (1992). An Economic Analysis of potato growing Farmers with respect to production and resource use efficiency. M.S. Ag. Econ. Thesis Submitted to the department of Agricultural Economics, Bangladesh Agricultural University, Mymensing.

Sabur, S. A. (1988). A study on factors Influences the Market Surplus of potatoes in the selected areas of Bangladesh. An unpublished Research Report.

Submitted to Bangladesh Research Council, Dhaka.

BBS (2012), Yearbook of Agricultural Statistics of Bangladesh, Bangladesh Bureau of Statistics, Statistical Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BBS (2011), Yearbook of Agricultural Statistics of Bangladesh, Bangladesh Bureau of Statistics, Statistical Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

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

BBS (2009), Yearbook of Agricultural Statistics of Bangladesh, Bangladesh Bureau of Statistics, Statistical Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BBS (2006), Yearbook of Agricultural Statistics of Bangladesh, Bangladesh Bureau of Statistics, Statistical Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka. 88

BER (2015), Bangladesh Economic Review, Economic Advisory Section, Department of Finance, Ministry of Finance, Bangladesh.

BER (2012), Bangladesh Economic Review, Economic Advisory Section, Department of Finance, Ministry of Finance, Bangladesh.

BER (2011), Bangladesh Economic Review, Economic Advisory Section, Department of Finance, Ministry of Finance, Bangladesh

Bishop,C.E.and Toussaint, W.D. (1996), Introduction to Agricultural Economic Analysis.Willy, New York.

Dillon, J.L. and Hardaker, J.B. (1993), Farm Management Research for Small Farmers Development, Food and Agriculture Organization of United Nations, Rome, Italy.

EPB, (2005), Annual Report, Information Division, Export Promotion Bureau, Bangladesh, Dhaka.

Fahmida, A. (2006), Some selected winter vegetables production in Area of TrishalUpazila in Mymensingh District, MS Ag Econ thesis Bangladesh Agricultural University, Mymensingh.

FAO (2010), State of Food Insecurity in the World 2010, Rome, Italy.

FAO, (1997), Production Yearbook, Food and Agriculture Organization of United Nations, Rome, Italy.

GOB, (2007), Bangladesh Economic Review, Economic Division, Ministry of Finance, Government of the People's Republic of Bangladesh, Dhaka. 89

Haque, S. (2001), An economic study of crops and vegetables production activities on the marginal land in selected Area of Mymensingh District. MS Ag Econ thesis, Bangladesh Agricultural University, Mymensingh.

Hossafin, (2004), A comparative economic analysis of some selected high yielding varities of winter vegetables in an area of Bangladesh. MS Ag Econ thesis, Bangladesh Agricultural University, Mymensingh.

HIES (2005), Report of the Household Income and Expenditure Survey, Bangladesh Bureau of Statistics, Government of the People's Republic of Bangladesh, Dhaka

HIES (2006), Report of the Household Income and Expenditure Survey, Bangladesh Bureau of Statistics, Government of the People's Republic of Bangladesh, Dhaka.

Heady,E.O.and Dillion, J.L.(1961), Agricultural Production Function, Lowa State University Press, Ames, I,ow

IRRI (International Rice Research Institute), (2007), World Rice Statistics,

2005-2006, IRRI, Manila, Philippine.

Islam, S.M.F. and Karim, M.R. (1997), Assess the comparative profitability of selected winter vegetables like potato, cauliflower and tomato, *Bangladesh Journal of Agricultural Research, 20 (1): 85-90.*

Krishi Dairy, (2011), Agricultural Information Service, Ministry of Agriculture, Khamarbari, Dhaka, Bangladesh.

Miah, M.T.H. (1987) Assess the Performance of Crops and Potato Producing on the Marginal land and Resource Efficiency of the Farmers, M Ec dissertation, University of New England, Armidale, Australia.

Nahar, S. (1998), An economic analysis of vegetables production in a selected area of Mymensingh district, MS Ag Econ thesis, Bangladesh

Agricultural University, Mymensingh

Population Census Report (2011), Bangladesh Bureau of Statistics, Statistical Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

Rahman, M.M. (1993), A Cooperative `study of HYV potato and wheat production in some area of Jamalpur District. MS Ag Econ thesis, BAU, Mymensingh.

Rahman, S. (2000), Women's employment in Bangladesh agriculture: composition determinants and scope, Journal of Rural Studies 16 (2), 497-507.

Roy, A. (1993), Relative profitability of potato-based cropping patterns in Bangladesh. MS AgEcon. thesis, Bangladesh Agricultural University, Mymensingh.

Samuelson, P. A. and Nardhaus, W. D. (1995), Economics, 18th edn, Tata McGraw-Hill Publishing Company Limited, New Delhi.

Shaikh, M.A.Q. (1997), Agricultural Research and Development in Bangladesh: Present and Future, Agribusiness Bulletin, July 2006, 1997, Dhaka, Bangladesh.

Suraiya, Z. (2008), An economic analysis of some selected summer vegetables in purbadhalaUpazila of Netrokona District. MS Ag Econ thesis, Bangladesh Agricultural University, Mymensingh.

Mawla (1998), Some selected winter vegetables in a selected area of NorshingdiDistrict, MS Ag Econ thesis, Bangladesh Agricultural University, Mymensingh.

Badiuzzaman(1993), Identification and evaluation of optimal patterns for an irrigated area in Madhupur Thana in Tangail district, MS Ag Econ thesis, Bangladesh Agricultural University, Mymensingh.

Haque (1993), The comparative profitability of sweet potato and groundnut with particular reference to small farmers in six villages under Kuliachar thana of Kishoreganj district, MS Ag Econ thesis, Bangladesh Agricultural University, Mymensingh.

Sejuty (1993), A study on two alternative cropping patterns: Potato+Boro (HYV) + Aman and Wheat +T.Aman +T.Aus in two villages namely Dumuria and Thangao in Chandina thana of Comilla district, MS Ag Econ thesis, Bangladesh Agricultural University, Mymensingh.

Yang, W.Y. (1965), Method of Farm Management Investigation, Food and Agriculture, Organization of the United Nations, Rome. examination Committee.

APPENDIX INTERVIEW SCHEDULE FOR

PROFITABILITY ANALYSIS OF POTATO CULTIVATION: A STUDY ON SOME SELECTED AREAS OF MUNSHIGANJ DISTRICT

1) Identification of the respondent Sample ID NO:……..

Name: Father's Name:

Village:

2.1) Family and demographic composition of the farmer

SL NO	Age	Education	Main Profession	Income (Individual)	Remarks
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

2.2) Family and demographic composition of the farmer

SL No	Earning Member	Family Member	Total House hold Income	Remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

3) Pattern of land ownership

Land utilization	Own land (ha)	Leased in (ha)	Leased out (ha)	Total area (ha)
Homestead area				
Area under Potato				
Area under pond				
Fallow land (if any)				
Others (specify)				

3) Variable cost:

4.1 Human labor cost

Human Labor									
Particulars	Family			Hired			Total		
	No	Wage	Cost (Tk./ ha)	No	Wage	Cost (Tk./ha)	No	Wage	Cost (Tk./ha)
Land Cleaning									
Land Preparation									
Ladder									
First Time Applying Fertilizer									
Applying Cow Dung									
Making Peet									
Making Bead									
Seedlings									
Second Time Applying Fertilizer									
To lift the soil									
Third Time Applying Fertilizer									
Weeding									
Irrigation									
Making Fence									
Pesticides									
Lift and carry									
Drying and Warehousing									
Carrying cost on local market									
Total									

4.2 Other Variable Cost

Items of returns/costs	Unit	Quantity	Price per unit (Tk)	Total value (Tk)	% of total
Tillage					
Seeds					
Urea					
TSP					
MOP					
Gypsum					
Manure and oil cake					
Insecticides					
Irrigation					
Total					

5. Fixed cost:

Items of returns/costs	Unit	Quantity	Price per unit (Tk)	Total value (Tk)	% of total
Interest on OC					
Total		-	-		

6.Total cost (Variable cost + Fixed cost)

Items of returns/costs	Unit	Variable cost	Fixed cost	Total (Tk)	% of total
Total cost					

7.Gross returns

Items of returns/cost	Unit	Quantity	Price/ Unit(TK)	Total value (Tk)	% of Total
Main product					
By-product					
Total returns					

4) Plot size …….. H
5) Name of variety ……
6) Date of sowing ……..
7) Date of harvesting……

8) What are the major problems/ constrains you are facing during the Potato cultivation?

A) Financial and Technical Problems

_____
_____
_____

B) Marketing Problems

_____
_____
_____

C) Storage Problems

_____
_____
_____

9) What are the approximate solution according to your opinion?

_____
_____
_____

Signature of the interviewer…..…… Date.....…