PROFITABILITY AND RESOURCE USE EFFICIENCY OF GROUNDNUT PRODUCTION AT SOME SELECTED AREAS OF MYMENSINGH DISTRICT IN BANGLADESH

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DHAKA-1207

DECEMBER, 2018

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A thesis

Submitted to the Faculty of Agribusiness Management

Sher-e-Bangla Agricultural University, Dhaka

In partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE (MS)

IN

DEVELOPMENT AND POVERTY STUDIES

SEMESTER: JULY-DECEMBER, 2018

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CERTIFICATE

This is to certify that the thesis entitled **"PROFITABILITY AND RESOURCE USE EFFICIENCY OF GROUNDNUT PRODUCTION AT SOME SELECTED AREAS OF MYMENSINGH DISTRICT IN BANGLADESH"** submitted to the department of Development and Poverty Studies, Faculty of Agribusiness Management, Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka in partial fulfillment of the requirements for the degree of Master of Science (M.S.) in Development and Poverty Studies, embodies the result of a piece of bona fide research work carried out by **SHARMIN AKTER MANNA, Registration No. 12-05123** 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, as has been availed of during the course of this investigation has been duly acknowledged by the Author.

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Dhaka,Bangladesh

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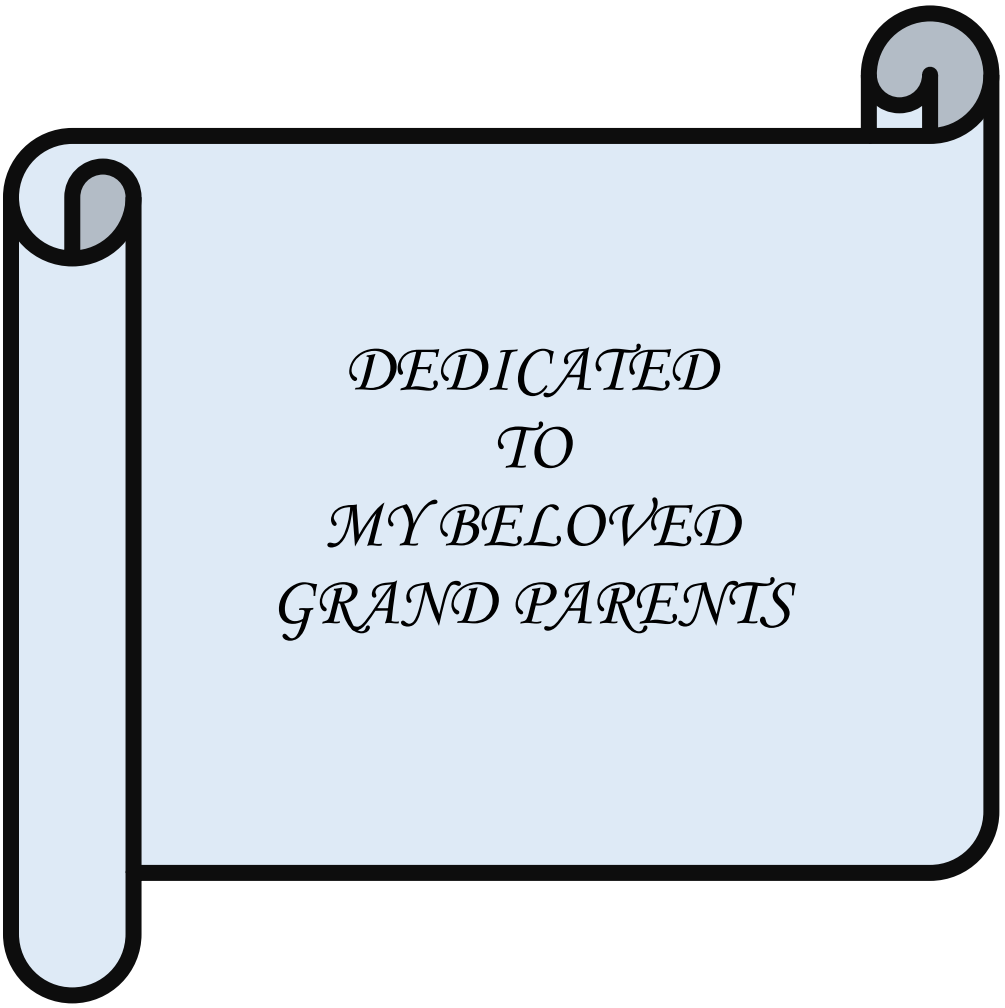
DEDICATED
TO
MY BELOVED
GRAND PARENTS

Profitability and Resource Use Efficiency of Groundnut Production at Some Selected Areas of Mymensingh District in Bangladesh

Abstract

The study was conducted in the Mymensingh district to determine the socio-economic condition, profitability and resource use efficiency of groundnut growers. To achieve the objectives of the study total 60 respondents were selected as samples for the present study from four villages. A simple random sampling technique was used for the selection of samples. Both primary and secondary data were used for the study. The amount of labour used for the production of groundnut is 107 man-days per ha where 47 man-days are family labour. The total variable cost and total fixed cost are Tk 69291.50 and Tk. 10309.70 per ha. Finally, total cost, gross returns, and net returns are Tk. 79601.20, Tk. 100400 and Tk.20798.70 per acre. It was evident from the study that the benefit-cost ratio of groundnut farming was 1.26:1. In order to assess the contribution of the major variables to the groundnut production process the Cobb-Douglas production function has been chosen. To determine the resource use efficiency of groundnut cultivation, the study revealed that only DAP is overused on the other hand Urea, irrigation, human labour, insecticide, and gypsum are underused. In the study area, farmers suffered by various constraints such as lack of money, lack of labour, lack of water for irrigation, lack of market for selling products, lack of education, poor agricultural extension service delivery, lack of knowledge, etc. About 96% of farmers mentioned the low price of groundnut. This survey depicts that 61% of farmers mentioned the lack of money. The high cost of improved varieties is noted by 78 % of farmers. The study suggested improving the storage facilities and active the organization to solve the marketing and money problem of the farmers.

ACKNOWLEDGEMENTS

First of all, I would like to thank Almighty Allah, the most merciful and compassionate, the most gracious and beneficent to Whom every praise is due and to His prophet Mohammad (SM) Who is forever a torch of knowledge and guidance for humanity as a whole with whose delighting the present and endeavor beautiful. All praises are due to the omnipotent, omnipresent and omniscient Allah, Who enabled me to pursue my higher studies in Development and Poverty Studies and to complete the research work and this thesis successfully for the degree of Master of Science in Agricultural Economics.

Let me take this opportunity to thank Dr. Fauzia Yasmin, Director, Technology Transfer and Monitoring Unit (TTMU), BARC, Farmgate, Dhaka for being a fantastic supervisor throughout my research. She has provided me with thought-provoking comments on each draft of this thesis. Without her encouragement, timely suggestions and proper guidance, it was impossible for me to complete this thesis.

I express my heartfelt gratitude to my Co-supervisor, Dr. Bazlul A.A. Mustafi, Adjunct Faculty, Department of Agricultural Economics for his productive criticism, thought-penetrating comments and innovative ideas on each draft which were really crucial to the completion of this thesis

Warm thanks go to Sonya, Farzana Munni, Rahat and Nisita who provided me unlimited inspiration and time which was really an energy to complete this thesis.

My wholehearted thanks go to Upazilla Agricultural Extension Officers and Sub Assistant Agriculture Officer of Nandail Upazilla. They cooperate me during fieldwork which was truly helpful for data collection.

Last but not least, sincere thanks to my family members. My beloved husband, Mahmudul Hasan Mamun, has sacrificed a lot for me to complete this thesis. He has really been a source of tremendous trust, confidence and encouragement for me.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Groundnut, or peanut, is commonly called the poor man's nut. Today it is an important oilseed and food crop. This plant is native to South America and has never been found uncultivated. The botanical name for groundnut, *ArachishypogaeaLinn.*, is derived from two Greek words, Arachis meaning a legume and hypogaea meaning below ground, referring to the formation of pods in the soil. Groundnut is an upright or prostrate annual plant. It is generally distributed in the tropical, sub-tropical and warm temperate zones. Ethnological studies of the major Indian tribes of South America document the widespread culture of groundnut and provide indirect evidence for its domestication long before the Spanish Conquest. When the Spaniards returned to Europe they took groundnuts with them. Later traders were responsible for spreading the groundnut to Asia and Africa where it is now is grown between the latitudes 40°N and 40°S (Pattee and Young, 1982).

Groundnuts especially those produced in the developing countries have been used traditionally since the origin of humanity. It is rich in oil and protein and has a high-energy value. Developing countries account for nearly 95 percent of world production. Asia accounts for about 70 percent of this amount where the major producers India and China together represent over two-thirds of global output. Other important producers are Nigeria, Senegal, Sudan, and Argentina. In most of the developing countries, kernels are used for oil extraction, food and as an ingredient in confectionery products. Following extraction, the residual cake is processed largely for animal feed but is also used for human consumption. The quality attributes that are important for end uses of groundnut vary among the developed and developing countries. Groundnuts are mainly processed foroil in several developing countries. Even though it is a good protein source, the cake obtained after oil extraction is not utilized to the best advantage. Production of aflatoxin due to the invasion of the fungus Aspergillus flavusto groundnut pod/kernel is a serious problem in the trade of groundnuts in the international market, which has seriously hampered the export business of the developing countries. Therefore, these countries can no longer rely on monoculture in order to support their growing economies.Under current conditions, crop dependency has made producers vulnerable to losses because of the

lower prices paid for the pods and kernels. It is, therefore, imperative for them to diversify their production and create added value through processing thereby reducing risks and opening new local and export markets. There is a necessity to investigate new opportunities for the use of groundnut as food and confectionery items. Most of the developing countries have poor drying and storage facilities. Under these conditions the seed loses its quality and viability in storage rapidly. The purpose of this publication is to discuss the importance of the post-production system in developing countries and to suggest suitable curing, drying, storage and processing technologies. Advised methods are especially meant for the smallholder farmers and the most diversified uses of groundnut in confectionery items.

1.2 Economic Importance

In 2016, world production of peanuts (reported as groundnuts in shells) was 44 million tonnes, led by China with 38% of the global total, followed by India (16%). Other significant producers were Nigeria, the United States, and Sudan. Major exporters in 2013 were India with 541,337 tonnes, which accounts for 32% of world total exports (1.7 million tonnes), and the United States with 19% of total exports. The European Union imported 52% of the world supply of shelled peanuts in 2013, with the Netherlands alone accounting for 40% of the European total (FAOSTAT 2017).

Groundnut is a very important crop in Bangladesh. It is used as edible oil, to make cake, biscuit, and bakery in the food industries. Traditionally it is eaten as fried ‘badam’ and oil cake is used as cattle feed. Bangladesh imports groundnut oil and shelled groundnut on a regular basis. The soil and climate of Bangladesh are quite suitable for groundnut production. It is cultivated mostly in sandy soils and riverbeds (Nath and Alam, 2002). In spite of its importance as an oil crop and of multifarious uses in everyday life, there is a lack of information about its production performance across different districts in Bangladesh. Information about the growth performance and variability situation in groundnut production would help the policymakers of Bangladesh to implement policy measures such as export-import policy for groundnut.

Peanut is an important oil, food and feed crop of the world. The kernels are rich in fats and protein, and 100 g of kernels provide 567 kcal of energy and 8.5 g of dietary fiber. Peanuts are source of minerals, vitamins and antioxidants and health improving bioactive compounds such as resveratrol, tocopherol, arginine etc. and hence are touted as

functional food. Consumption of peanuts can reduce risk of inflammation, diabetes, cancer, alzheimer's and gallstone disease. Peanut is cultivated in over 100 countries, with over 95% of cultivated area in Asia and Africa. Aflatoxin and allergens are major health deterrents in peanut and more research efforts are needed to develop aflatoxin and allergen free peanuts. There is a great demand for peanut and peanut-based products in the international market, especially for confectionary types. Breeding new cultivars that meet the needs of the producers, consumers and industry is an important research area with implications along the value chain. Conventional breeding approaches and phenotyping tools were widely used to breed several varieties and in the last decade, genomic tools are integrated for making selections. The advent of next-generation sequencing (NGS) tools and the availability of the draft genome sequence of the diploid progenitors of peanut *A. duranensis* and *A. ipaensis* is expected to play a key role in sequencing the genome of cultivated peanut. Transgenic peanuts with resistance to herbicide, fungus, virus, and insects; tolerance to drought and salinity and improved grain quality are under testing at different containment levels. The availability of sophisticated tools for both genotyping and phenotyping will lead to an increase in our understanding of key genes involved and their metabolic regulatory pathways (National Research Centre for Groundnut 2017).

A distinction can be drawn between raw and green peanuts. A green peanut is a term to describe farm fresh harvested peanuts that have not been dehydrated. They are available from grocery stores, food distributors and farmers markets, during the growing season. "Raw" peanuts are also uncooked but have been dried/dehydrated and must be rehydrated before boiling (usually in a bowl full of water overnight). Once rehydrated, the raw peanuts are ready to be boiled.

Peanut oil is often used in cooking, because it has a mild flavor and a relatively high smoke point. Due to its high monounsaturated content, it is considered more healthful than saturated oils, and is resistant to rancidity. The several types of peanut oil include: aromatic roasted peanut oil, refined peanut oil, extra virgin or cold-pressed peanut oil, and peanut extract Peanut butter is a food paste or spread made from grounddry roasted peanuts. It often contains additional ingredients that modify the taste or texture, such as salt, sweeteners or emulsifiers. Peanut butter is served as a spread on bread, toast or crackers, and used to make sandwiches (notably the peanut butter and jelly sandwich). It is also used in a number of confections, such as peanut-flavored granola bars or croissants

and other pastries.

Groundnut is essentially a tropical crop. It requires a long and warm growing season. The most favorable climatic conditions for groundnut are a well-distributed rainfall of at least 50 cm. during the growing season, an abundance of sunshine and relatively warm temperatures (25-28ºC). Lower temperatures are not suitable for its proper development. During ripening period it requires about a month of warm and dry weather. Groundnut thrives best in well-drained sandy and sandy loam soils, as light soil helps in easy penetration of pegs and their development and also harvesting. Clay or heavy soils are not suitable for this crop, as they interfere in the penetration of pegs and make harvesting difficult. Groundnut gives good yields in the soil with a pH between 6.0-6.5. Groundnut is raised mostly as a rain-fed Kharif crop, being sown from May to July, depending on the monsoon rains. In some areas or where the monsoon is delayed, it is sown as late as August or early September. As an irrigated crop it is grown between January and March and between May and July. There are three types of varieties in groundnut: bunch types, spreading and semi-spreading types. The bunch types have light green foliage, comparatively broad leaflets and mature early. However, they are usually susceptible to tikka disease. The spreading types usually have dark green foliage with smaller leaflets. These are usually late in maturity. The semi-spreading varieties are intermediate between the bunch and the spreading types.

Table1.1 : Total area and production of groundnut in Bangladesh

Year	Area in acres	Production in mt
2007-08	76786	44268
2008-09	77336	46533
2009-10	82997	53467
2010-11	78470	53664
2011-12	74227	53654
2012-13	70537	49791
2013-14	72600	56439
2014-15	78464	56713
2015-16	88245	62264
2016-17	91188	66060

Source: BBS

The above table 1.1 shows the total area (acres) and production (mt) of our country. The quantity of land also increasing year by year, as a result, the production is definitely increasing to cope up with the uncontrolled population growth. In 2007-08 fiscal year, the quantity of land was 76786 acres which reached 91188 acres in 2016-17; it indicates the big importance of groundnut cultivation. In 2016-2017 the production of groundnut is 66060 Mt whereas it was 44268 Mt in 2007-08, this figure shows clearly that the nation is adamant to cultivate groundnut for the necessity of itself.

1.3 Justification of the study

The total geographical area of our country is around 147570 sq kmin which 91188 acres is cultivated with groundnut and the total production is 66060 Mt (BBS 2017). Our country is around mono cropped where more than 80 percent of the area is allocated under paddy crop. The oilseeds cultivated in mymensingh district include Groundnut, Niger, Rapeseed-Mustard, Sesamum, Linseed and Sunflower. Of these oilseed crops, Groundnut, Rapeseed-Mustard, Sesamum, and Linseed are among the major oilseeds on the basis of area and production. Looking to the priorities of enhancing agricultural income through crop diversification and the need to encourage groundnut cultivation, it is imperative to investigate the growth, economics of production and marketing of groundnut. Very few studies have been conducted to investigate the economics of groundnut cultivation in the study area. Accordingly, this study was undertaken with the following specific objectives.

1.4 Specific objectives of the study

The objectives of the study are given bellow:

- To know the socioeconomic characteristics of the Groundnut producing farmers.
- To determine the profitability of the Groundnut producing farmers.
- To assess factors affecting the gross return of the Groundnut producing farmers.
- To identify the major problems associated with Groundnut production.

1.5 Presentation of the study

The study consists of seven chapters. Chapter 1 describes introduction of the study, Chapter 2 relevant of literature. Chapter 3 deals with the methodology of the study. In Chapter 4 a brief description of socio-economic characteristics of the sample farmers are presented. In Chapter 5 estimated and analysis the costs and returns of the groundnut production. The results of Cobb- Douglas production function analysis are given in

Chapter 6.. Finally, conclusion and recommendations of the study are presented in Chapter 7.

1.6 Limitations of the study

During the course of investigation several difficulties occurred in the collection of data from the collector of groundnut, as some of the details of collected, production, cost of cultivation and disposable pattern of groundnut are not properly maintained through records but on their memory basis, which may not be appropriately or absolutely correct. A low level of education and knowledge of the respondents also added to the problems. The biasness of some of the respondents were also problematic for the study as some deliberately told high expenditure and low income and capital, however, cross-checking with their literate neighbors was done to arrive at the most correct information.

CHAPTER TWO

LITERATURE REVIEW

Bakoye et al. (2019)conducted a survey of 800 farmers was conducted in 40 villages in the Maradi and Zinder regions to assess constraints and opportunities to improve groundnut production and marketing. Average land size and yield varied by region: 1.3 ha per farmer and 461.3 kg ha-1 in Maradi, and 1.7 ha per farmer and 417.2 kg ha-1 in Zinder. Insect pests (aphids) were the most important production constraint. Groundnut is typically stored for six to eight months after harvest but 91% of farmers do not take any precautions to protect the grain. Storage enables farmers to earn high-profit margins of up to 33 and 113% for unshelled and shelled groundnuts, respectively. Most farmers (71.5%) sell their groundnut in the unshelled form in local and urban markets. Traders are the main buyers according to 61.7% of farmers while processors were mentioned as purchasers by less than 20%. Sales are mostly done by individual farmers while very little is sold through cooperatives. Given that groundnut is a profitable crop adapted to the Sahelian zone, there is a need to improve its production, storage, and value addition through processing.

Rabadiya et al. (2019)carried out a study on groundnut in the Rajkot district of Gujarat state during the year 2018. Simple random sampling was used to select the samples for the study. The data were collected by personal interview method, analyzed through various appropriate statistical tools. The cost of production of Kharif groundnut was estimated by using the cost of cultivation. Seed replacement rate formula was used for seed replacement rate of groundnut. Sample size was of 120 farmers and 30 dealers from Rajkot district. From the study, it was concluded that cost of cultivation of cotton is comparatively higher than cost of cultivation of groundnut. The seed replacement rate is highest in small land holding farmers followed by medium land holding farmers.

Naidu et al. (2019)analysized of marketing cost, marketing margin marketing efficiency and price spread of groundnut. This study was based on intensive enquiry of 120 farmers, which selected randomly from 6 sampled villages. Three marketing channel were found in study area i.e. (i) producer -consumer, (ii) producer –whole seller -retailer -consumer, and (iii) producer -village trader -whole seller -retailer -consumer. Overall per farm marketed surplus was worked out 79.24 per cent. The producer s share in consumer rupee was worked out 96.70, 88.97 and 88.44 per cent in channel -I, II and III respectively. The

producers share in consumer rupee was decreased with increase in number of intermediaries. The marketing cost came to 3.22, 7.6 and 8.58 per cent inchannel -I, IIand III respectively.

Madhusudhana(2013) carried out a study to discuss the ground nut area, production and productivity. It analyzed the area, production and productivity of groundnut crop at national level, state level and district levelduring 1996-2000 to 2001-2008. The groundnut crop area, production, and productivity at the national level, state level and Anantapuram district level during 1996-2000 to 2001-2006 were collected and presented graphically. Based on the results collected some conclusions are made about improving the production of groundnut crops.

Win et al. (2017) investigated factors that influence technical efficiency in groundnut production systems among farmers in Mandalay division and Magway division, Myanmar. Primary data were used in the analysis of data. The analytical tools include descriptive statistic and stochastic frontier production function by using the maximum likelihood estimation (MLE). MLE is applied to a cross-sectional of 282 sampled farmers during 2006-07 cropping season. The result shows that the mean efficiency in groundnut production is about 0.59. It means that it can be rise the groundnut production of Myanmar in this areas about 0.41 (41%) to produce at efficiency level.

Salam et al. (2015) highlighted different socio-economic aspects of groundnut cultivation in Noakhali and Laxmipur district of Bangladesh. The issues were: cost and return of soybean and its competing crops cultivation, competitive and comparative advantage of soybean production, constraints to higher production, and farmers' attitudes towards soybean cultivation in Bangladesh. The average yield of soybean, groundnut, cowpea and grasspea were 1813kg/ha, 1473kg/ha, 871kg/ha and 1076kg/ha, respectively. The net return received from soybean, groundnut, cowpea and grasspea cultivation were estimated at Tk. 25599/ha, Tk. 17047/ha 11805 and Tk. 8825/ha, respectively. The average benefits cost ratios of soybean, groundnut, cowpea and grasspea production were 1.43, 1.26, 1.28 and 1.29 over full cost, respectively. Scarcity of chemical fertilizers with its peak price, lack of HYV seed availability, lack of technical knowledge and natural calamities were found as the barriers of soybean crop expansion in Noakhali and Laxmipur district of Bangladesh.

RAUT et al. (2015) conducteda study on 108 farmers for estimating the cost of groundnut

production. A multistage stratified random sampling technique was adopted to select the farmers. The requisite data were collected through personal interviews with the farmers with the help of pre-tested comprehensive schedules related to Kharif groundnut crop for the year 2012-13. Net income over cost-C2 was the highest for large farmers followed by medium farmers and small farmers. The total cost and gross return over cost-A, cost-B, cost-C1, and cost-C2 of small farmers was highest and decreased with an increase in the size of the holding.

Hoq et al. (2016) undertaken to examine the suitability of crop production by assessing adoption, relative profitability, marketing system, production and marketing problems of rabi season groundnut in char lands of Faridpur, Jamalpur, and Kishoreganj districts during 2013-2014. The sample size of the study was 225 including 90 groundnut farmers and 135 traders. The study revealed that the highest (56%) percent of groundnut farmers cultivated Dhaka-1 variety and only 23% of all farmers cultivated BARI chinabadam-8.The per hectare production cost of groundnut was Tk 61,547, net return was Tk.42,033 and BCR was 1.68. The partial budgeting analysis showed that if the farmers cultivated groundnut instead of its competitive crops, they would receive Tk. 24,445 additional to sesame and Tk.21,990 additional to wheat cultivation. The average estimated marketing costs was highest (Tk.1388/quintal) for Stockist and lowest (Tk.55/quintal) for Arathdar. Net marketing margin was also highest (Tk.1212/quintal) for Stockist and lowest (Tk.59/quintal) for Arathdar. The major problems identified by farmers were lack of irrigation facilities (34%), low rate of seed germination (31%), and lack of cultivable land (29%). Major marketing problems were lack of cash capital (82%), and lack of storage facilities (55%) etc.

Haque et al. (2011) conducted in three major onion growing districts to estimate the profitability of onion cultivation. A total of 150 onion farmers taking 50 farmers from each area were selected randomly. The cost of onion cultivation was found to be Tk 93517 per hectare on total cost basis. Seedling cost (41%) was the major cost item followed by human labour cost (24%). The yield of onion was found 9869 metric tons per hectare. The gross margin and net return were found to be Tk. 85308 and 79487 per hectare, respectively. The benefit-cost ratio was found 1.85. Inputs like human labour, seedling, manures, urea, TSP, irrigation, and insecticide had positive effect on the yield of onion. The profit obtained from onion cultivation was found higher than that of other competitive crops like mustard, groundnut, and cabbage.

Ahmed 2016 evaluated the impact of the adoption of improved groundnut seed on the well-being of the farmers using cross-sectional data collected from 301 sample households. To address this objective, both descriptive and econometric analysis methods were employed. In the econometric analysis, Propensity Score Matching was used to measure the impact of adoption of improved groundnut seeds on well-being measured as expenditure per adult equivalent. The results of the study have indicated that adoption of improved groundnut seeds has a positive and significant impact on the welfare of the farmers. Therefore, socioeconomic variables should be addressed to improve the adoption of improved groundnut seeds, which in turn increases the welfare of groundnut producing farmers.

Patience (2017) analyzed the costs and returns of groundnut processing. A purposive and three-stage sampling technique was adopted in selecting the data used for the study from a sample of 170 groundnut processors. Descriptive statistics, gross margin and return on investment were used to analyze the data. The study revealed that (31%) of the processors were between the age group 36-45, most of the processors (45%) were married and 95% of them were women. Majority of the processors 58% had a household size ranging from 6-10. The study also showed that the majority of the processors 58% had informal education and relied mostly on traditional tools and equipment for processing groundnut and most of them 46% had years of experience in groundnut processing between 11-20.The return on investment in the enterprise was estimated at 41%. Based on the findings, this study recommends that effort should be made to encourage groundnut processors to form cooperate societies in order to enable them to acquire equipment and funds from banks and government.

Akolgo(2014) led a study that revealed that land size, capital, labor, experience, and gender significantly influenced the output of groundnuts in the study area. The mean output per acre in Bunkpurugu-Yunyoo was 456.86kg of unshelled groundnuts whilst West-Mamprusi was 412.98kg with a mean difference of 43.89kg higher output in Bunkpurugu than West-Mamprusi at 1% significance level. A mean amount of Gh¢ 52.47 and Gh¢ 59.52 per acre were the cost of production in Bunkpurugu-Yunyoo and West-Mamprusi respectively. There was a mean difference of Gh¢7.0 higher cost of production per acre in West-Mamprusi than Bunkpurugu-Yunyoo at 1% significant level.

Deb et al.(2015) analyzed the performance of groundnut production in Bangladesh in the

1990s and 2000s, both at the district and national level. Production performance was measured in terms of growth and variability. Annual compound rate of growth was estimated to know the growth performance. An increase in groundnut yield (by 373 kg/ha or 32%) contributed towards an increase in groundnut production in the late 2000s. In the late 2000s (TE2009/10), top five groundnut producing districts (Noakhali, Dhaka, Faridpur, Kishoreganj and Pabna) accounted for 59 percent of area and 55 percent of production. In the 2000s, Bangladesh achieved high annual growth (5.0% or more) in groundnut production at the national level and in nine districts (Faridpur, Tangail, Barisal, Jessore, Kushtia, Dinajpur, Pabna, Rangpur and Chittagong H.T.). The study concludes that groundnut breeders should focus more on yield increase rather than on reduction in variability in yield. Increase in yield potential through research is expected to have higher production and profit to the farmers and thereby, encourage farmers to allocate more area under groundnut cultivation.

Reddy et al. (2017) examined the profitability analysis of groundnut production. Multistage random sampling techniques were employed to select 60 respondents. The tools for collection of primary were structured questionnaires. The data were analyzed using both descriptive such as percentage and frequency and inferential statistics. These included percentage, frequency and farm budget model. The farm budget model was used to estimate cost and returns from groundnut production in the study area.The study revealed that the average cost of production per hectare was 13,746.13 The study further revealed that the average revenue and net farm income per hectare were 44.838.05 and 44187.65 respectively. The problems encountered by the farmers included a shortage of labor and pest and diseases was major problems. The study concluded that groundnut farming is profitable in the study area. It is recommended that Government should link farmers to relevant loan agencies, extension services should be made available to farmers to get more profit and improve seed should be made available and affordable to the farmers.

Mukul et al. 2013 showed that the contribution of the agriculture sector is slowly reducing and now reached 19% share of GDP. Still, agriculture plays a vital role and is known as the most important sector of the economy Bangladesh by birth possesses very fertile land in which diversified crops grow very easily. Groundnuts are one of the major oilseed crops of Bangladesh, but yields are low when compared to the world average, with the result that Bangladesh produces only about 40% of its domestic oil consumption.

Groundnuts are mostly used as ingredients fora number of industrially processed foods and contribute little to oil production.

2.1 Research Gaps

From the above discussion it is clear that several studies were conducted in Bangladesh concerning the issue related to profitability and resource use efficiency of groundnut production. But no studies were accomplished in my study area to focus on the effects of input to the production process and on the resource use efficiency of different inputs used. Therefore, this study has attempts to analyze the profitability, input output relationship, and resource use efficiency of groundnut production in the study area. It is believe that the present study will contribute significantly to generate new knowledge in the field of groundnut cultivation.

CHAPTER THREE

RESEARCH METHODOLOGY

The detailed methodological framework and background of the area is presented in this chapter. The whole chapter is divided into four sub-section i.e. sampling procedure, data collection, analytical procedure and background of study area. Subsection 3.1 describes sampling procedure while the procedure of data collection is presented in sub-section 3.2. Sub-section 3.3 is presenting the tool and techniques to perform the analysis for the present study. Sub-section 3.4 provides the sufficient knowledge about the background of the study area. All this informationis described in this chapter as follows.

3.1 Introduction

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

3.2 Selection of the Study Area

The area of Nandail Upazilla is206.98 sq km, located in between 23°56' and 24°07' north latitudes and in between 90°38' and 90°50' east longitudes. The total population is 265177 where the male is 134255 and female is 130922. Average literacy is 46.3% where the male is 51.1% and female 47.6%.Main sources of income are agriculture 54.55%, non-agricultural labourer 2.08%, industry 3.16%, commerce 15.07%, transport and communication 4.77%, service 8.21%, construction 1.55%, religious service 0.22%, rent and remittance 2.41% and others 7.79%. Ownership of agricultural land is landowner 67.42%, landless 32.58% (BBS 2017). Main crops are rice, jute, ginger, turmeric, cauliflower, vegetable etc. Extinct or nearly extinct crops are sesame, mustard, sweet cauliflower, kawon, linseed, china, pegeon pea . Main fruits are mango, jackfruit, banana, papaya, plum, guava, shaddock, karambola.

Fig: 3.1- Maps of Nandail Upazila

Source: http://en.banglapedia.org/NandailUpazila

The reasons for selecting this study area for the present study are given below:

*Comparatively higher concentration of groundnut farming.

*These villages had some identical characteristics like homogeneous soil type, topographical and climatic condition for producing groundnut.

*Easy accessibility and good communication facilities.

*Researcher's belief about getting well co-operation from the selected respondent and

*No such study was conducted in this area.

3.3. Study population and sampling strategy

The population of this study is all farm households residing in the selected villages (Table. 3.1). Thus there are many farm households. The standard statistical formula for selecting a sample size results in a huge number which is impractical for an individual researcher because of time and funding constraints (Blaikie 2010; Gilbert 2008). Since all the farmers in the area face similar socio-economic, environmental and climate conditions in their farming activities, they make up a mostly homogeneous group which validates the use of a small sample size which can be representative of the whole population (Alam, 2016; Blaikie 2010; Gilbert 2008). Therefore, the sample size is determined purposively depending on the context rather than a statistical formula. This study aimed to survey a sample of 60 rice farming households. Respondents were selected randomly within the villages. This was expected to reflect the farming features of all farmers in the villages.

A completed list of all rice farming households in the respective villages was collected from the Sub-Assistant Agricultural Officers (SAAOs) in the study areas. The numbered list provided names and addresses of farmers with their farm sizes. Afterward, a computer-generated random number table was applied to the list to select 60 farm households. In this way, the randomness in the sampling procedure was ensured.

Table 3.1 Selected study areas for primary data collection

Upazilla	**Villages**
Nandail	1.Charsrirampur
	2. Char kamatkhali
	3. Char komorvanga
	4. Char velamari

3.4 Sources of Data

Data required for the present study were collected from primary and secondary sources. Primary data were obtained from farmers and secondary data were collected from various published sources. Secondary sources were Bangladesh Bureau of Statistics (BBS), Department Agricultural Extension (DAE), Department of Agricultural Marketing, and other related agencies in Bangladesh.

3.5 Preparation of the Survey Schedule

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

3.6 Collection of Data

To satisfy the objectives of the study, necessary data were collected by visiting each farm personally and by interviewing them with the help of a pretested interview schedule. Usually, most of the respondent does not keep records of their activities. Hence it is very difficult to collect actual data and the researcher has to rely on the memory of the respondent. Before going to an actual interview, a brief introduction to the aims and objectives of the study was given to each respondent. The question was asked systematically in a very simple manner and the information was recorded on the interview schedule. When each interview was over the interview schedule was checked and verified to be sure that information to each of the items had been properly recorded. In order to minimize errors, data were collected in local units. These were subsequently converted into an appropriate standard unit. The data collection period was 1st August to 31st August 2019. In order to obtain reliable data the researcher initially visited several times to introduces himself with the people of the study areas during the season. Secondary data were collected through literature and different publications.

3.7 Editing and Tabulation of Data

After the collection of primary data, the filled schedules were edited for analysis. These data were verified to eliminate possible errors and inconsistencies. All the collected data were summarized and scrutinized carefully. For data entry and data analysis, the

Microsoft Excel programs and SPSS and STATA programs was used. It might be observed here that information was collected initially in local units and after checking the collected data, it was converted into standard units. Finally, a few relevant tables were prepared according to necessity of analysis to meet the objectives of the study.

3.8 Analytical Techniques

Data were analyzed with the purpose of fulfilling the objectives of the study. Both descriptive and statistical analysis was used for analyzing the data.

3.8.1 Descriptive Analysis

Tabular technique of analysis was generally used to find out the socio-demographic profile of the respondent, to determine the cost, returns and profitability of groundnut farm enterprises. It is simple in calculation, widely used and easy to understand. It was used to get the simple measures like average, percentage etc.

3.8.2 Production Function Analysis

The production function represents the technological relationship between output and factor inputs. To estimate the production function, one requires development of its properties leading to specification of an explicit functional form. One of the most widely used production function for empirical estimation is the Cobb Douglas production. This function was originally used by C.W. Cobb and P.H. Douglas in twenties to estimate the marginal productivities of labor and capital in American manufacturing industries. Their main purpose was to estimate the shares of labor and capital in total product; hence they used this function with the constraint that the sum of elasticities or regression coefficients should total one. Later on, they relaxed this restraint. Cobb and Douglas originally fitted the function to time series 1930s and 1940s; the same form was used for cross section of industries. This form of the function was subsequently used in many production function studies for technical units (crops, livestock) and farm-firms in agricultures. The popularity of this function is because of the following characteristics of the function:

(i) It directly provides the elasticities of production with respect to inputs;

(ii) It allows more degrees of freedom than other algebraic forms (like quadratic function) which allow increasing or decreasing marginal productivities, and

(iii) It simplifies the calculations by reducing the number of regression to be handled in regression analysis. The original form used by Cobb and Douglas was

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

This forces sum of elasticities to one. Their later modification was

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

Where, $\boldsymbol{\alpha} + \boldsymbol{\beta}$ need not equal one. In agriculture, this form of function has not been used in its original form. Neither the sum of elasticities is kept equal to one nor is the number of variables limited to two. Even then as the basic idea of functional form was provided by Cobb and Douglas, various forms of this function have continued to be called as Cobb-Douglas production function. The Cobb–Douglas production function, in its stochastic form, may be expressed as $Yi = \beta_1 X_{2i}^{\beta 2} X_{3i}^{\beta 3} e^{ui}$ …….. (3.1)

Where,

Y = output

X_2 = labor input

X_3 = Capital input

u = stochastic disturbance term,

e = base of natural logarithm.

From Eq. (3.1) it is clear that the relationship between output and the two inputs is nonlinear. However, if we log-transform this model, we obtain:

$$\ln Y_i = \ln\beta_1 + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + u_i$$

$$= \beta_0 + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + u_i \text{…….. (3.2)}$$

Where $\beta_0 = \ln\beta_1$.

Thus written, the model is linear in the parameters β_0, β_2, and β_3

The properties of the Cobb–Douglas production function are quite well known and is therefore a linear regression model. Notice, though, it is nonlinear in the variables Y and X but linear in the logs of these variables. In short, (3.2) is a log-log, double-log, or loglinear model, the multiple regression counter part of the two-variable log-linear model.

The properties of the Cobb–Douglas production function are quite well known:

1. β_2 is the (partial) elasticity of output with respect to the labor input, that is, it measures the percentage change in output for, say, a 1 percent change in the labor input, holding the capital input constant.

2. β_3 is the (partial) elasticity of output with respect to the capital input, holding the labor input constant.

3. The sum $(\beta_2 + \beta_{3)}$ gives information about the returns to scale, that is, the response of output to a proportionate change in the inputs. If this sum is 1, then there are constant returns to scale, that is, doubling the inputs will double the output, tripling the inputs will triple the output, and so on. If the sum is less than 1, there are decreasing returns to

scale—doubling the inputs will less than double the output. Finally, if the sum is greater than 1, there are increasing returns to scale— doubling the inputs will more than double the output.

Before proceeding further, note that whenever you have a log–linear regression model involving any number of variables the coefficient of each of the X variables measures the (partial) elasticity of the dependent variable Y with respect to that variable. Thus, if you have a k-variable log-linear model:

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

Each of the (partial) regression coefficients, β_2 through β_k, is the (partial) elasticity of Y with respect to variables X_2 through X_k. Assuming that the model (3.2) satisfies the assumptions of the classical linear regression model; we obtained the regression by the OLS (Acharaya, 1988).

3.8.3 Specification of the Cobb-Douglas Production Function

The input-output relationship in groundnut farming was analyzed with the help of Cobb-Douglas production function approach. To determine the contribution of the most important variables in the production process of groundnut farming, the following specification of the model was used.

$Y = aX_1 b_1 X_2 b_2 X_3 b_3 X_4 b_4 X_5 b_5 X_6 b_6 e^{ui}$ …….. (3.4).

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

$\ln Y = \ln a + \beta_1 \text{In} X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_{6+} U_i$ ……(3.5)

Where,

Y= Yield per acre (Tk/acre)

Ina= Intercept of the function

X_1= Cost of human labor (Tk/acre)

X_2= Cost of seed (Tk/acre)

X_3= Cost of fertilizer (Tk/acre)

X_4= Cost of manure (Tk/acre)

X_5 = Cost of insecticide (Tk/acre)

X_6 = cost of irrigation (Tk/acre)

b_1, b_2. . ….. b_6 = Coefficients of the respective input to be estimated; and

U_i = Error term. Coefficient of the respective variable; i= 1, 2,…….6

3.9 Measurement of Resource Use Efficiency

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

MVP/MFC = 1.

The marginal productivity of a particular resource represents the additional to gross returns in value term caused by an additional one unit of that resource, while other inputs are held constant.

When the marginal physical product (MPP) is multiplied by the product price per unit, the MVP is obtained. The most reliable, perhaps the most useful estimate of MVP is obtained by taking resources (Xi) as well as gross return (Y) at their geometric means.

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

MPPxi*Pyi = MFC,

Where,

MPPxi *Pyi=MVP

But, MPP = bi*(Y/Xi),

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

Y = Mean output

bi = regression coefficient per resource

Xi = Mean value of inputs

Pyi= price of output

MFC = price per unit of input.

3.10 Decision Criteria:

The decision criteria for choosing efficiency will be-

*When the ratio of MVP and MFC is equal to unity indicates that the resource is efficiently used.

*When the ratio of MVP and MFC is more than unity implying the resource is underutilized.

*When the ratio of MVP and MFC is less than unity implying the resource is overused.

3.11 Profitability Analysis

Cost and return analysis is the most common method of determining and comparing the profitability of different farm household. In the present study, the profitability of groundnut farming is calculated by the following way

3.11.1 Calculation of Gross Return

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

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

3.11.2 Calculation of Gross Margin

Gross margin is defined as the difference between gross return and variable costs. Generally, farmers want maximum return over variable cost of production. The argument for using the gross margin analysis is that the farmers are interested to get returns over variable cost. Gross margin was calculated on TVC basis. Per hectare gross margin was obtained by subtracting variable costs from gross return. That is, Gross margin = Gross return – Variable cost.

3.11.3 Calculation of Net Returns

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

Net return = Total return – Total production cost.

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

Net profit, $\pi = \Sigma P_m Q_m + \Sigma P_f Q_f - \Sigma (P_{xi} X_i) - TFC.$

Where, π = Net profit/Net returns from groundnut farming (Tk/acre);

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

Q_m= Total quantity of the groundnut production (kg/acre);

Q_f = Per unit price of other relevant groundnut(Tk/kg);

P_f = Total quantity of other relevant groundnut(kg/acre);

P_{xi} = Per unit price of i-th inputs (Tk);

TFC = Total fixed cost (Tk); and

X_i = Quantity of the i-th inputs (kg/acre); i = 1, 2, 3,....., n (number of inputs).

3.11.4 Undiscounted Benefit Cost Ratio (BCR)

Average return to each taka spent on production is an important criterion for measuring profitability. Undiscounted BCR was estimated as the ratio of total return to total cost per acre. BCR= Total Return /Total Cost

3.12 Problem Faced in Collecting Data

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

i) Most of the farmers felt disturbed to answer questions since they thought that the researcher might use the information against their interest. To earn the confidence of the farmers a great deal of time was spent.

ii) The farmers do not keep records of their activities and day to day expenses. Therefore the author had to depend upon their memory.

iii) The farmers were usually busy with their filed works. So, the researcher sometimes also had to pay extra visits to meet the farmer.

CHAPTER FOUR

SOCIOECONOMIC CHARACTERISTICS

4.1 Introduction

The socio-economic characteristics of sample farmers are covered in this section. In inferring the planning of production, the socio-economic features of farmers are significant. The sample households finished by studying socio-economic aspects. These included age distribution and family size. Occupation, employment, women's participation, pattern of land ownership, etc. These aspects are discussed briefly below.

4.2 Age Distribution

The table shows that the majority of farmers in the study area are middle-aged. Out of the samples, 20% were in the 20-30-year age group, 57% belonged to the 31-50-year age group and, 23% fall into the over 45-year age group. This result suggests that the majority of sampling farmers were in the most involved 31-50-year age group suggesting that more physical efforts have been made for agriculture.

Table 4.1 Age Distribution

Age category	Percent (%)
20-30 years	20
31-50 years	57
Above 51 years	23

Source: Field Survey, 2019.

4.3. Educational status

People's effectiveness can be gear up by education. Table 4.2 indicates that 11% of the farmers were illiterate, 44% have a primary school, 23% of the farmers have a J.S.C level education, 9% were secondary school graduates and 5% were HSC and above.

Table 4.2 Educational status

Level of education	Percent (%)
Illiterate	11
Primary school certificate	44
Junior school certificate	23
Secondary School Certificate	9
Higher Secondary School Certificate and above	5

Source: Field Survey, 2019.

4.4. Occupational Status

In the study area, farmers are engaged in various occupations sided by groundnut production. It was noted that agriculture was the primary occupation groundnut as a

primary source of income. Some of them had the chance to participate in other occupations. Farmer's employment status is listed in table 4.3 below. From the figure, it is evident that 87% of income came from agriculture where 67%, 12%,3% and 5% income earned from groundnut cultivation, other agricultural crops, fisheries, and livestock respectively. Non-agricultural agricultural income was 13% that came from service, business, rickshaw-van pulling, and others.

Table 4.3 Occupational status

Types of occupation	Percent (%)
Agriculture	
T. aman	67
Others agricultural crops	12
Fisheries	3
Livestock	5
Non-agricultural	
Service	2.5
Business	4.5
Rickshaw, van pulling and others	6

Source: Field Survey, 2019.

4.5. Gender and marital status

Table 4.4 revealed that 94 percent of farmers were male and 6 percent were female. In the study area, 88 percent of the farmers were married and 12 percent were unmarried.

Table 4.4. Gender and marital status

Particulars	Percent (%)
Male	94
Female	6
Married	88
Unmarried	12

Source: Field Survey, 2019.

4.6. Farm size and ownership

The study farmers are categorized as: landless farmers (less than 49 decimal), small farmer (50-249 decimal), medium farmer (250-749 decimal) and large farmer (above 750 decimal) (GOB, 2009). The table 4.5 shows that in the sample, 35 percent were landless farmer, 49 percent were small farmer, 11 percent were medium farmer and only 5 percent were large farmer.

Table 4.5: Farm size and ownership

Types of farmers	Percentage (%)
Land less (less than 49 decimal)	35
Small Farmer (50-249 decimal)	49
Medium Farmer (250-749 decimal)	11
Large Farmer (above 750 decimal)	5

Source: Field Survey, 2019.

4.7. Income status

In the study area, the groundnut farmers incomes were divided into less than Tk.150,000, from Tk.150,000 to Tk.250,000 and more than Tk.250,000. It is evident from the table 4.6 that most of the farmer's yearly income belonged to the category of less than Tk.150,000. About 49 percent of the groundnut farmers were earned Tk. 150,000 to 250,000 per year, 41 percent of the farmers were earned Tk. less than 150,000 per year and 10 percent farmers were earned Tk. Above 250,000 per year.

Table 4.6: Income status

Level of income	Percent (%)
Less than 150,000 Tk.	41
151,000-250,000 Tk.	49
Above 251,000 Tk.	10

Source: Field Survey, 2019.

4.8 Access to medical services

Table 4.7 indicates, 29 percent farmers in the sample were given medically by the MBBS physician, 51 percent had access by the village doctor to the health service, 11 percent had access by the homeopathic gate to medical services. Very few farmers have provided quack medicine.

Table 4.7 : Access to medical services

Types of treatment	Percent
MBBS doctor	29
Village doctor	51
Homeopathic doctor	11
Quack	9

Source: Field Survey, 2019.

4.9 Sources of Credit Facilities of the Respondent

For all forms of agriculture, the funding available is an important factor. Banks, NGOs, relatives and their own funds are the source of credit facilities for groundnut farmers. The study includes numerous NGOs including BRAC, ASA, CARE, Nobolok etc. that use this fund in the groundnut growing, to provide loans to the lower farmer's groundnuts. Around 9% of the farmers were borrowing from banks, 39% were borrowing from NGOs and 13% were borrowing loans from their family members as stated by the farmers. 39% of farmers used their own money (Table 4.9).

Table 4.8 Sources of Credit Facilities of the Sample Farmers

Items No.	Percent (%)
Bank	9
NGOs	39
Relatives	13
Own	39

Source: Field Survey, 2019.

4.10 Size of Land Holdings of the Sample Farmers

The scale of the land held by groundnut farmers is listed in various categories in the present study. Size of land holdings includes homestead area, cultivated land, fellow land, leased in, leased out and mortgage in as reported by the sample farmers. It is evident from the Table 4.10that the average area 12.6 decimal, 72 decimal, 11 decimal, 18decimals, 21 decimals were homestead area, cultivated land, leased out, leased in, mortgaged respectively hold by the sample farmers on an average. Average land size of the farmers is 188.30 decimals.

Table 4.9 Size of Land Holdings of the Sample Farmers

Types of land	Average area (Decimal)
Own cultivated land	72
Rented in	17
Rented out	19
Mortgage in	21
Mortgage in	16
Leased in	18
Leased out	11
Fellow land	1.7
Homestead land	12.6

Total	188.30

Source: Field survey, 2014.

4.11 Barriers of groundnut cultivation

In the study area farmers suffered by various constraints such as lack of money, high price of labor cost, lack of market for selling products, poor agricultural extension service delivery, lack of knowledge etc (Table 4.11). About 96% farmers mentioned low price of groundnut. This survey depicts that 61% of farmers mentioned lack of money. High cost of improved varieties is noted by 78 % farmers.

Table 4.10 Major problems faced by the farmers

Nature of problems	Percentage
Lack of capital or institution credit	61
High price of labor cost	63
Lack of training	39
Non availability of quality seed	54
Low market price of product during harvesting period	96
Storage problem	52
Carrying and handling problem	32
Attack by pest and diseases	53
High price of improved varieties	78

Source: Field survey, 2019

CHAPTER FIVE

COST AND RETURN OF GROUNDNUT FARMERS

5.1 Introduction

The main purpose of this chapter is to evaluate groundnut costs and returns. In addition, the costs and returns of cultivation per ha of the groundnut have been measured. Therefore, this chapter estimates cost and return for groundnut. Cost items are divided into two categories for the cost estimation and return of groundnut production: (1) variable cost and (2) fixed cost. Variable cost included the cost of all variable factors like human labor, tillage, seed, fertilizer, manure, irrigation water, and insecticides. On the other hand, fixed cost was calculated for interest on operating capital. On the return side net return and undiscounted benefit cost ratio (BCR) were determined in this chapter.

5.2 Variable cost

5.2.1 Cost of Human Labour

Human labor The most important and mostly used input for the production of groundnut. As the groundnut production is the labor-intensive work. It reduces the unemployment problem. Group based groundnut cultivation in the selected area plays vital role for the reduction of the poverty. Human labour, including preparing ground, weeding, fertilization, using insecticides and harvesting, is required for various activities and management. In the study area, there were two sources of work for human beings, one for families and one for hired labor. The appraisal of the hired labor was made as compensation of the farmers ' marginal cash salaries. The amount of work used for the production of groundnut is 107 man days per acre from Table 5.1. Total human labor costs are equal to Tk. 37450 /acre.

The valuation of family supplied labour was done as the average wage of the hired labour was taken as the opportunity cost of the family supplied labour. It can be observed that groundnut growers used on an average 107 man-days/acre total human labour where on an average 47 man-days/acre was family supplied labour. In the study area on an average wage rate was Tk 350 per man-day. So, total cost of family supplied labor for groundnut amounted

to Tk 16450 per acre. The number of hired labor was 60 and the hired labor cost was Tk. 21000.

5.2. 2 Cost of tillage

For groundnut production the average per acre tillage cost was Tk 8200 (Table 5.1)

5.2.3 Cost of seeds

The seed cost is the main cost item for the production of groundnut. In the area under consideration, farmers were found to use both seeds supplied and bought at home. The total seed demand for groundnut was 109kg/ acre. The average price of groundnut seed was Tk. 88.50 per kg. Table 5.1 shows that the total cost of seeds for groundnut production was Tk. 9646.50. To maintain the higher production high yield verity is required for the production.

Table 5.1: Variable cost

Items of costs	**Unit**	**Quantity**	**Price per unit**	**Total value**
			(Tk)	**(Tk)**
Human (hired labor)	Man-day	60	350	21000
Human (family labor)	Man-day	47	350	16450
Tillage	Tk	N/A	N/A	8200
Seeds	Kg	109	88.5	9646.5
Urea	Kg	55	20	1100
TSP	Kg	47	25	1175
MOP	Kg	31	18	558
Gypsum	Kg	23	10	230
DAP	Kg	57	12	684
Zinc Sulphate	Kg	19	52	988
Cow dung	Kg	720	3	2160
Pesticides	Tk	N/A	-	3200
Irrigation	Tk	N/A	-	3900
Total	**Tk**	**-**	**-**	**69291.5**

Source: Field Survey, 2019

5.2.4 Cost of Urea

The cost of urea is TK 1100. It is very useful to get the bumper production.

5.2.5 Cost of TSP

The cost of TSP is TK 1175. It provides nutrient to plant to become more vigor.

5.2.6 Cost of MOP

The cost of MOP is TK 558.

5.2.7 Cost of Gypsum

The cost of Gypsum is TK 230.

5.2.8 Cost of Zinc Sulphate

The cost of Zinc Sulphate is TK 988.

5.2.9 Cost of Cow dung

In this study total manure cost is Tk 2160 per acre when per unit manure cost is 3.00 Tk (Table 5.1).

5.2.10 Cost of irrigation

Irrigation water is an important input of groundnut cultivation. Per acre cost of irrigation water was Tk 3900 for groundnut (Table 5.1).

5.2.11 Cost of pesticide

In the study area, farmers applied insecticides to protect from the attack of pests and diseases. Cost of insecticides amounted to Tk 3200 per acre for groundnut (Table 5.1).

5.2.12 Total variable cost

Summation of the costs of variable inputs gave the total variable costs which were Tk 69291.50 per acre for groundnut production.

5.3.1 Interest on operating capital

Interest on operating capital was calculated by taking into account all the operating costs incurred during the production period of groundnut. Per acre interest on operating capital was Tk 2309.70and rental value of one-acre land is Tk 8000 for groundnut production. So total fixed cost is Tk. 10309.70.

Table 5.2: Fixed cost

Items of returns/costs	Unit	Quantity	Price per unit (Tk)	Total value (Tk)
Interest on OC	Tk	69291.5	@10%	2309.70
Rental value	Tk	N/A	N/A	8000
Total	Tk	-	-	10309.70

Source: Field Survey, 2019.

5.4 Total cost

In order to estimate total cost per acre all the resources used in groundnut production has been recapture together. Per acre total cost of groundnut production was Tk. 75807.30(Tables 5.3).

Table 5.3: Total cost (Variable cost + Fixed cost)

Items of returns/costs	Unit	Variable cost	Fixed cost	Total (Tk)
Total cost	Tk	69291.5	10309.70	79601.20

Source: Field Survey, 2019

5.5: Gross returns

Here gross returns of the groundnut production is = (Main product+ By-product). Total value of by products is Tk. 5000. The quantity of main product is 2120Kg. If the groundnut per unit is Tk. 45 then it becomes the total value of groundnut main product is Tk.95400. So the gross return of the groundnut production is= (95400 + 5000) = 100400

Table 5.4: Gross return

Items of returns/cost	Unit	Quantity(Kg)	groundnut per unit (TK)	Total Value(Tk)
Main product	Kg	2120	45	95400
By-product	TK	N/A	-	5000
Gross returns	TK	-	-	100400

Source: Field Survey, 2019

5.6 Net Returns

The net return of groundnut production is depending on both gross return and total cost of the groundnut production.Net return is Tk. 19592.70

Table 5.5: Net return (Gross return – Total cost)

Items of returns/costs	Unit	Gross return	Total cost	Total value (Tk)
Net return	Tk	100400	79601.20	19592.70

Source: Field Survey, 2019

5.7 Undiscounted BCR

Benefit cost ratio was calculated by dividing gross return by gross cost or total cost. It implies return per taka invested. It helps to analyze financial efficiency of the farm. It was evident from the study that the benefit cost ratio of groundnut farming was accounted for 1.26:1 implying that Tk. 1.26 would be earned by investing Tk. 1.00 for groundnut production. So, the groundnut farming was found to be profitable for farmers (Table 5.6).

Table 5.6: Undiscounted BCR

Items of returns/cost	Gross Return	Gross cost	Ratio
Undiscounted BCR	100400	79601.20	1.26

Source: Field Survey, 2019

CHAPTER SIX

FACTORS AFFECTING OF GROUNDNUT PRODUCTION

6.1 Introduction

In this Chapter, the effects of main variables on groundnut production are identified and measured. In order to assess the contribution of the major variables to the groundnut production process the Cobb-Douglas production function has been chosen. Table 6.1 presents the estimated values of the model.

6.2 Functional Analysis for Measuring Production Efficiency

Output function is a relationship or mathematical function, which indicates the total output to be achieved with certain inputs to a certain technological level. In order to estimates the effect of the inputs on output seven explanatory variables are selected taking into account the objectives of the study and considering the effects of explainable variables on production of groundnut. Other independent variables like water quality, soil condition, time etc., which might have affected production of farm enterprises, were excluded from the model on the basis of some preliminary estimation. A brief description is presented here about the explanatory variables included in the model.

6.3 Estimated Values of the Production Function Analysis

- F-value was used to measure the goodness of fit for different types of inputs.
- The coefficient of multiple determinations (R^2) indicates the total variations of output explained by the independent variables included in the model.
- Coefficients having sufficient degrees of freedom were tested for significance level at 1 percent, 5 percent and 10 percent levels of significant.

Table 6.1: Estimated Values of Coefficients and Related Statistics of Cobb-Douglas Production Function Model for groundnut.

Explanatory variables	Coefficients	Standard Error	P-value
Intercept	12.1536	1.3201	0***
DAP	0.1689	0.0841	0.0498**
Urea	-0.0427	0.0599	0.4789
Irrigation	-0.1034	0.1008	0.3097
Human Labor	-0.0549	0.0842	0.5172
Insecticide	0.1370	0.0590	0.0010***
Gypsum	-0.0714	-0.0787	0.3690
R^2	.45656		
F-value	19.240		

Note: *p< 0.10, **p< 0.05, ***p< 0.001
Source: Authors Estimation

6.4 Interpretation of the results

DAP (X_1)

The magnitude of the DAP cost regression coefficient was 0.0498 with a positive sign. At five percent probability level, it was highly significant. This means that one percent increase in DAP costs will lead to an increase of 0.0498 percent in gross revenue for groundnut, holding other factors constant (Table 6.1).

Insecticide (X_2)

The value of insecticide for groundnut in magnitude regression was 0.1370. At 1% probability level, it was positive and significant. It indicates that an increase in insecticide value of 1% would result in a gross profit rise of 0.1370 percent and that other variables would remain constant.

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 0.45656 for groundnut. It indicates that about 45 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 19.240 for groundnut, which implies good fit

of the model. That is, all the explanatory variables included in the model were important for explaining variation of groundnut production.

6.5 Resource Use Efficiency in Groundnut Production

A ratio equal to unity indicated the optimal use of this variable, a ratio more than a unit indicated that yield might be improved through use of more resources, in determining the efficiency of resource usage. The unprofitable asset rate has been shown to be less than unit cost, which is to be decreased to minimize losses as farmers use this factor over time. The negative MVP value indicates that the resource is used indiscriminately and inefficiently.

The ratio of MVP and MFC of DAP (0.1.757) for groundnut production was positive and more than one, which indicated that in the study area DAP was overused (Table 6.2). So, farmers should increase the use of DAP to attain efficiency considerably.

The MVP and MFC Urea ratios (-6.272) were negative and less than one for groundnut production, which showed that work was being carried out in the study area. Farmers should therefore significantly decrease the use of urea in order to achieve efficiency.

The MVP and MFC Irrigation ratios (-9.441) were negative and less than one for groundnut production, which showed that work was being carried out in the study area. Farmers should therefore significantly decrease the use of irrigation in order to achieve efficiency.

Table 6.2 showed that the ratio of MVP and MFC of human labor (-1.412) for groundnut farming was negative and less than one, which indicated that in the study area human labour for groundnut production was under used. So, farmers should decrease the use of human labor to attain efficiency level.

The ratio of MVP and MFC of insecticide was found to be (.0.367) for groundnut farming was positive and less than one, which indicated that in the study area use of irrigation was under used (Table 6.2). So, farmers should increase insecticide for groundnut production to

attain efficiency considerably.

Table 6.2 Estimated Resource Use Efficiency of Groundnut Production

Variables	Geometric mean (GM)	Y(GM)/ Xi(GM)	Coefficient	MPV (Xi)	MFC	r=MVP/MFC	Comment
Yield	100400						
DAP	9646.5	10.407	0.1689	1.757	1	1.757	Over utilized
Urea	684	146.78	-0.0427	-6.271	1	-6.272	Under utilized
Irrigation	1100	91.272	-0.1034	-9.441	1	-9.441	Under utilized
Human Labor	3900	25.743	-0.0549	-1.412	1	-1.412	Under utilized
Insecticide	37450	2.6809	0.1370	0.367	1	0.367	Under utilized
Gypsum	3200	31.375	-0.0714	-2.239	1	-2.239	Under utilized

Source: Field survey, 2019

It was evident from the table 6.2 that the ratio of MVP and MFC of gypsum (-2.239) for groundnut farming was negative and less than one, which indicated that in the study area use of gypsum for groundnut farming was under used. So, farmers should decrease the use of gypsum to attain efficiency in groundnut production.

CHAPTER SEVEN

SUMMARY, CONCLUSION AND RECOMMENDATONS

7.1 Summary of the study

In the study area majority of farmers are middle-aged and where 57% belonged to the 31-50-year age. The literacy status is good in the area, about 44% have a primary school, 23% of the farmers have a J.S.C level education, 9% were secondary school graduates and 5% were HSC and above.It is revealed that 87% of income came from agriculture where 67%, 12%,3%, and 5% income earned from groundnut cultivation, other agricultural crops, fisheries, and livestock respectively.Farmers are sorted as: landless farmers (less than 49 decimal), small farmer (50-249 decimal), medium farmer (250-749 decimal) and large farmer (above 750 decimal) (GOB, 2009). 35 percent were landless farmer, 49 percent were small farmer, 11 percent were medium farmer and only 5 percent were large farmer.About 49 percent of the groundnut farmers were earned Tk. 150,000 to 250,000 per year, 41 percent of the farmers were earned Tk. less than 150,000 per year and 10 percent farmers were earned Tk. Above 250,000 per year.51 percent had access by the village doctor to the health service, 11 percent had access by the homeopathic gate to medical services.

For all forms of agriculture, the funding available is an important factor. Banks, NGOs, relatives and their own funds are the source of credit facilities for shrimp farmers. Around 9% of the farmers were borrowing from banks, 39% were borrowing from NGOs and 13% were borrowing loans from their family members as stated by the farmers. 39% of farmers used their own money. Size of land holdings includes homestead area, cultivated land, fellow land, leased in, leased out and mortgage, rented in rented out in as reported by the sample farmers. It is evident the average area 12.6 decimal, 72 decimal, 11 decimal, 18 decimals, 21 decimals were homestead area, cultivated land, leased out, leased in, mortgaged respectively hold by the sample farmers on an average. Average land size of the farmers is 188.30 decimals.

The amount of work used for the production of groundnut is 107-man days per ha where 47 man-days is family labor and thetotal human labor costs is equal to Tk. 37450 /acre.For groundnut production the average per acre tillage cost was Tk 8200 per ha.The total cost of seeds for groundnut production was Tk. 9646.50. To maintain the higher production high yield verity is required for the production.

Total variable cost and total fixed cost are Tk 69291.50 and Tk. 10309.70 per acre. Finally total cost, gross return and net return are Tk. 79601.20, Tk. 100400 and Tk. 20798.8 per acre. BCR helps to analyze financial efficiency of the farm. It was evident from the study that the benefit cost ratio of groundnut farming was 1.26.

In order to assess the contribution of the major variables to the groundnut production process the Cobb-Douglas production function has been chosen and variables like DAP and insecticide are determined as statistically significant. The value of the coefficient of multiple determinations (R^2) was 0.45656 and value of F statistics 19.240. To determine the resource use efficiency of ground nut cultivation, the study revealed that only DAP is overused on the other hand Urea, irrigation, human labor, insecticide and gypsum are under used.

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7.2 Conclusion

Following are the conclusions drawn based the findings of the body:

It is evident from the study that per acre net returns were greatly influenced by the use of human labor, seeds,fertilizers,irrigation and insecticides.

It was found that farmers got profit from groundnut production and the undiscounted BCRs was estimated at 1.26.

The mentioned factors were directly responsible for influencing per acre net returns for groundnut production.

But in the study area, farmers suffered by various constraints such as high price of labor cost, lack of training, lack of storage facilities, lack of water for irrigation, lack of market for selling products, lack of education, poor agricultural extension service delivery, lack of knowledge, etc.

In order to increase the production of groundnut ,these problems should be solved as per as possible.

7.3 Recommendations

Based on the findings of the study the following recommendations were concluded to improve the present production and marketing system.

- **Groundnut growers** /Farmers reported that they feel the high price of improved varieties. In this situation the government organization can regulate this system and they can provide good quality of seed where it is also a responsibility to monitor the seed company.
- Low price of groundnut in harvesting period is also a common phenomenon of our country. Farmers did not get fair price and every year they become looser. To ensure the fair price government should be more attentive to farmers and they must active agricultural price related institution like department of marketing (DAM), only this institution can monitor the price system of agricultural products.
- Most of the **Groundnut growers/** farmers of our country have not enough finance to continue his jobs. So, government should provide institutional credit on easy terms as a measure for solution of problem of capital shortage. There are mainly banks and other types of financial institutional such as credit unions, savings and credit cooperatives and various types of microfinance organizations.
- For storage problem farmers have pay a lot of financial damage. Modern storage facilities (such as cold storage) should be developed considering the economic feasibility, cold storage may establish at important assemble center.
- Farmer's organization should be established which might improve the bargaining power of the **Groundnut growers** /farmers, enabling them to face the intermediaries and ensuring better return for their produce.

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