PROFITABILITY AND RESOURCE USE EFFICIENCY OF ONION CULTIVATION IN FARIDPUR DISTRICT

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DHAKA – 1207

DECEMBER, 2018

PROFITABILITY AND RESOURCE USE EFFICIENCY OF ONION CULTIVATION IN FARIDPUR DISTRICT

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A Thesis
Submitted to the Faculty of Agribusiness Management
Sher-e-Bangla Agricultural University, Dhaka
in partial fulfillment of the requirement
for the degree of

MASTER OF SCIENCE
IN
AGRICULTURAL ECONOMICS

SEMESTER: JULY-DECEMBER, 2018

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This is to certify that thesis entitled, "**PROFITABILITY AND RESOURCE USE EFFICIENCY OF ONION CULTIVATION IN FARIDPUR DISTRICT"** 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 IN AGRICULTURAL ECONOMICS**, embodies the result of a piece of bona-fide research work carried by **SUMAIYA JANNAT** bearing Registration No. **12-05223** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

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PROFITABILITY AND RESOURCE USE EFFICIENCY OF ONION CULTIVATION IN FARIDPUR DISTRICT

ABSTRACT

The present study was conducted to find out the profitability and resource use efficiency of onion cultivation in Faridpur district. A total of 90 farmers were selected randomly from three upazila of Faridpur namely Bhanga, Nagarkanda and Sadarpur. Data were collected from the sample farmers through face to face interview. Majority of the sample farmers were engaged in agriculture. Overall literacy status of the farmers was good in the study areas. Cobb-Douglas production function had been used to achieve the objectives. The average total cost of onion cultivation was estimated Tk. 185979 per hectare. The average yield per hectare was 11833 kg and average per unit onion price was Tk. 28. On an average gross return, gross margin and net return per hectare were Tk. 335173, Tk. 161191 and Tk. 149194 respectively. On an average BCR on full cost basis was 1.80 which implies that one taka investment generated 1.80 Tk. The coefficient of multiple determination, R^2 and F-value were 89% and 87.95 which indicated good fit of a model. The ratio of MVP and MFC of human labor, land preparation, seed, urea, TSP, MOP, irrigation and insecticides was 1.82, 6.51, 4.32, -5.73, 1.08, -5.38, 3.57 and -11.00 respectively. It indicated that farmers in the study areas were over utilizing urea, MOP and insecticides. On the other hand human labor, land preparation, seed, TSP and irrigation were underutilized. Farmers faced many problems in the study areas during the period of onion cultivation. Among them output price fluctuation, high wage rate of labor, lack of human labor were major problems of onion cultivation. Supply of inputs at reasonable price and improvement of market facilities can play an important role in increasing onion production.

ACKNOWLEDGEMENT

First of all thanks to the Almighty Allah, the omnipotent, who enabled me to complete this thesis paper successfully for the degree of Master of Science in Agricultural Economics.

Now, I would like to pay my gratitude to my supervisor Dr. Md. Abdur Rashid, Chief Scientific Officer, Agricultural Economics Division, Bangladesh Agricultural Research Institute, Gazipur for his guidance, scholarly comments and suggestions throughout the research work and preparation of thesis. He has always been generous in giving his time and assistance. His valuable advice, constructive comments make this paper come to life.

I am deeply indebted to my respected co-supervisor, Dr. Bazlul A.A. Mustafi, Adjunct Faculty, Department of Agricultural Economics, Sher-e-Bangla Agricultural University, Dhaka for his proper guidance, sincere co-operation and suggestions in the completion of the study.

I am also grateful to all of my honorable teachers of Sher-e-Bangla Agricultural University, for their valuable teaching, direct and indirect advice and co-operation throughout the whole study period.

I would like to express my gratitude to all the farmers who participate in this survey and help me to get information regarding onion farming.

I would like to say thanks to all my friends for their help, support and encouragement to complete this study.

I am deeply indebted to my parents, brother and relatives for their support and help throughout the study.

The Author

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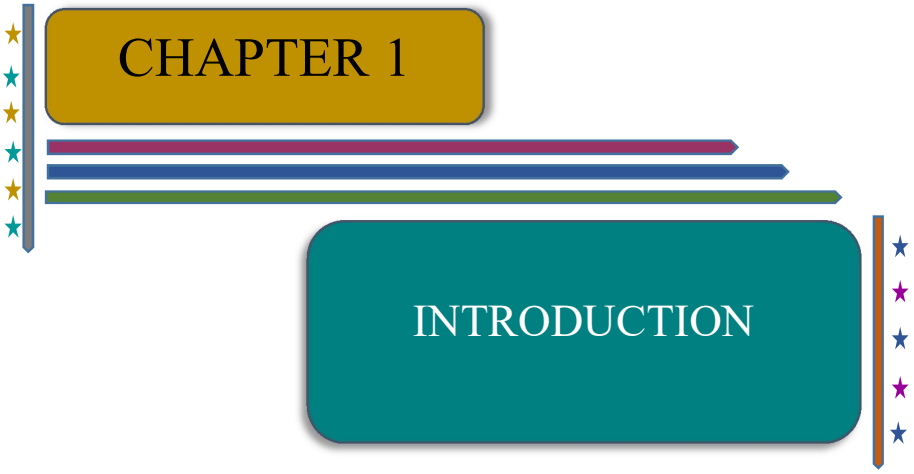
ABBREVIATION AND ACRONYMS

ASA	: Association of Social Advancement
BARI	: Bangladesh Agriculture Research Institute
BBS	: Bangladesh Bureau of Statistics
BCR	: Benefit Cost Ratio
BRAC	: Bangladesh Rural Advancement Committee
DAP	: Di Ammonium Phosphate
et al.	: And Others
FAO	: Food and Agriculture Organization
GM	: Gross Margin
gm	: Gram
GR	: Gross Return
ha	: Hectare
HYV	: High Yielding Varieties
IOC	: Interest on Operating Capital
Kg	: Kilogram
Km	: Kilometer
ln	: Natural Log
MoF	: Ministry of Finance
MOP	: Muriate of Potash
MT	: Metric Ton
NOA	: National Onion Association, USA
NR	: Net Return
PASDACP	: Productivity Assessment Survey of Different Agricultural Crops Program
Rs.	: Rupee, Indian and Pakistani Currency
sq	: Square
Tk.	: Taka
t	: Ton
TSP	: Triple Super Phosphate
TVC	: Total Variable Cost
TC	: Total Cost
USDA	: United States Department of Agriculture
%	: Percentage


CHAPTER 1
INTRODUCTION

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INTRODUCTION

1.1 Background of the Study

Bangladesh is predominantly an agricultural country because of its agro climatic weather. Economy of Bangladesh is greatly influenced by this sector. The performance of this sector has an impact on macroeconomic objectives like employment generation, poverty alleviation and food security. It contributes about 13.60% in national GDP (MoF, 2019). Due to gradual transformation of the economy from agriculture to industry and service sectors, this sector decreases gradually around 50% in 1970 to 13.60% in 2019. Still most of the people in our country are engaged in this sector. Despite increase in the shares of fisheries, livestock and forestry, crop sub-sector alone accounts for 51.84% share of agricultural GDP in FY 2017-18 (MoF, 2019).

Bangladesh has very fertile land in which diversified crops grow very easily. Various types of crops are produced in the country but paddy cultivation dominates huge portion of cultivated land. As a result land under spices crops has declined and price of spices has gone up. Therefore, government has given priority to the agricultural sector to increase the production of spices by giving subsidy to the farmers on different inputs like fertilizers, irrigation, credit facilities etc. To meet the nutrition of huge number of people different types of crops are need to be cultivated. Table 1.1 presents the percentage contribution of agricultural subsectors at total GDP of agriculture.

Table 1.1: Percentage of GDP contribution at agricultural subsectors

Agricultural Subsectors	Percentage of GDP Contribution
Crops & Vegetables	7.05
Livestock	1.47
Fisheries	3.50
Forestry	1.58
Total	**13.60**

Source: MoF, 2019.

Spices are the symbol for health, tonic, immunity and vigor. The people of Bangladesh cannot think a meal without using of it. Most of the spices are high value crops. It can impact on the net return of farmer's income. The widely used spices are onion, garlic, ginger, turmeric, chili pepper, cinnamon, cardamom etc.

Onion is one of the major spice crops in Bangladesh. It ranks first in production among spices crop (BBS, 2019). Onion is one of the main ingredients which has been used in every food. There are many different varieties of onion. Each has its own unique flavor.

The production of onion largely depends on the use of seeds, fertilizers, irrigation, pesticides etc. The production of onion is increasing in some areas but it fails to meet the demand of the people. That's why every year, Bangladesh has to import onion from neighboring country like India, Myanmar, China, Pakistan, Turkey etc. In the previous year price of onion went up at off season which made government to take necessary steps to increase the production of onion.

1.2 Present Status of Spices in Bangladesh

Spices crops are characterized by adding flavor to the food. People of south Asian country like Bangladesh cannot think of food without adding spices. Spices have a great demand in Bangladesh. The major crops grown and consumed in Bangladesh are onion, garlic, ginger, coriander, turmeric, chili etc. In FY 2017-18, total area under spices is 408 thousand hectares with the total production of 2196 thousand metric tons in our country (BBS, 2019). The production of spices cannot meet up the domestic demand. That's why every year huge amount of spices have to import from other spices producing country.

In FY 2017-18, total area under spices cultivation and total production of spices have decreased. In that year government has to face many problems for rising prices of spices specially onion. Nowadays they are valuable trade crops in the world. Due to huge population demand for cereals, land area under spices is also decreasing that creating gap between demand and supply of spices.

Table 1.2: Area, production and yield of spices & condiments in Bangladesh

Year	Area ('000' ha)	Production ('000' MT)	Yield (Ton/ha)
2008-09	275	1213	4.41
2009-10	287	1351	4.71
2010-11	314	1617	5.16
2011-12	325	1756	5.40
2012-13	317	1721	5.43
2013-14	346	2042	5.90
2014-15	374	2408	6.44
2015-16	396	2488	6.28
2016-17	412	2674	6.49
2017-18	408	2196	5.39

Source: BBS, 2011, 2012, 2014, 2016, 2018, 2019.

1.3 Origin and Status of Onion

Onion is one of the earliest cultivated crops because they were less perishable than other foods of the time. Most of the researchers agree that onion has been cultivated for 5000 years or more. Onion grew in Chinese gardens 5000 years ago. In Egypt, onions can be traced back to 3500 B.C. There is evidence that the Sumerians were growing onions as early as 2500 B.C. In Egypt, onions were considered to be an object of worship (NOA, 2011).

Onion is used as a vegetable in most parts of the world. It is commonly used for salad, soups, curry and other savory dishes. There are many different varieties of onions. Each one has unique flavor and taste. Among red, white and yellow, yellow onion has more Sulfur compounds.

The total world area under onion cultivation is 5202 thousand hectares with the total production of onion is 97.86 million MT (FAOSTAT, 2018). China, India, Egypt, Turkey, Pakistan, USA are some major onion producing countries. Average productivity across the world is 18.81 ton/ha.

Table 1.3: Area, production and yield of onion producing country in 2017

Country	Area ('000' ha)	Production (million MT)	Yield (Ton/ha)
China	1105	24.37	22.05
India	1306	22.43	17.17
Unites States of America	61.31	3.74	60.95
Egypt	81.43	2.97	36.41
Iran	61.54	2.38	38.62
Turkey	67.68	2.18	32.15
Pakistan	138	1.83	13.23
Russia	61.36	1.79	29.24
Netherlands	34.36	1.78	51.80
Brazil	51.68	1.62	31.25

Source: FAOSTAT, 2018.

Figure 1.1 presents total area and production of onion in Bangladesh from 2010-11 to 2017-18. It indicates that area and production of onion in Bangladesh are increasing over the period. But during 2017-2018 production of onion decreased all over the country.

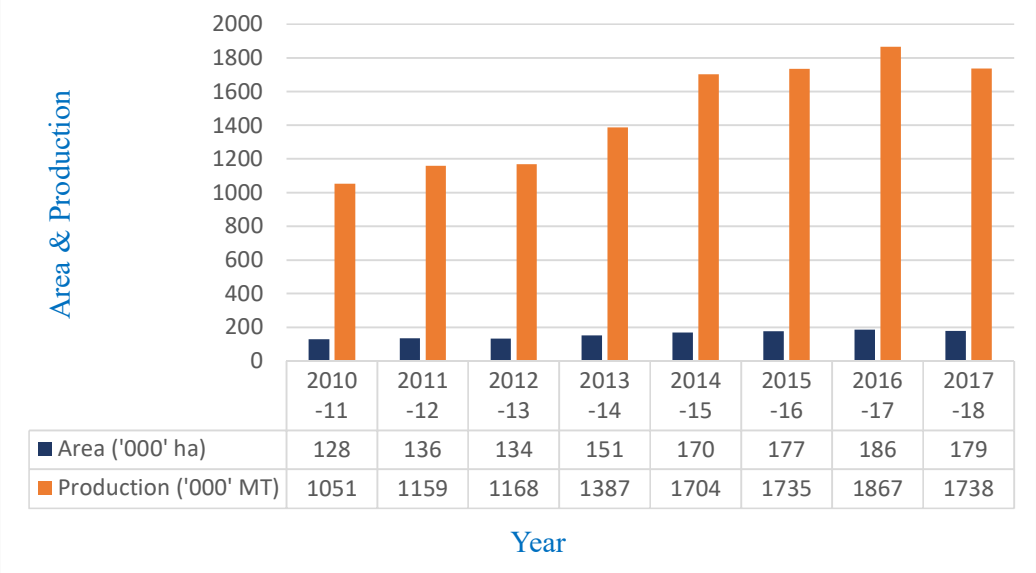


Figure 1.1: Area and production of onion in Bangladesh from 2010-11 to 2017-18

Source: BBS, 2012, 2013, 2014, 2016, 2019.

Onion is the most widely used spices crop in Bangladesh. It is grown much in fertile land where no water logging exists. It is generally grown from seeds or from sets. Agro-ecological conditions also effect on its seeds production. At present, total production of onion in Bangladesh cannot meet the country requirement. As a result, Bangladesh has to import onion every year.

Table 1.4: Area and production of onion by regions from 2015-16 to 2017-18

Region	2015-16		2016-17		2017-18	
	Area (ha)	Prod. (MT)	Area (ha)	Prod. (MT)	Area (ha)	Prod. (MT)
Patuakhali	42.51	89	42.91	82	41.30	118
Bandarban	47.77	175	47.37	174	48.18	179
Bhola	724.29	3209	575.30	2560	555.47	2648
Gopalganj	2046.49	14723	2050.95	14808	2012.91	14478
Pabna	42906.88	415372	42476.11	431091	42365.99	432046
Rajshahi	11018.62	142095	11162.45	160873	10728.74	123750
Rangpur	1817.41	14690	1833.60	14952	1936.44	15980
Dhaka	528.74	6446	512.55	6405	503.24	4168
Naogaon	3144.53	28647	2840.49	26430	2677.32	24775
Magura	5526.51	54327	5626.32	55454	5643.32	55612
Dinajpur	2481.38	20904	2289.47	18931	2218.62	17257
Jhenaidah	5271.66	53701	6573.28	84176	6509.31	83520
Kustia	10269.30	109645	10410.94	127547	10274.56	128084
Manikganj	7311.05	48146	7206.64	48103	7330.88	48014
Rajbari	21579.86	227368	26158.07	169417	26628.31	221339
Meherpur	3002.76	68720	2940.04	73473	1760.38	50621
Panchagarh	1216.08	9816	1221.34	9857	1230.24	10011
Jashore	1307.13	13307	1314.42	13475	1303.89	13481
Bangladesh	**177492.31**	**1735334**	**185817.41**	**1866502**	**178585.02**	**1737714**

Source: BBS, 2019.

In Bangladesh, onion is cultivated in winter season. Time of sowing is at the beginning of October to early December. BARI has released three new varieties which can be grown in summer season (Haque, 2013). But most of the farmers cultivate onion during winter season. Farmers, in our country still follow indigenous methods during onion cultivation which result in poor yield rate. The main reasons behind such low yield rate occur due to lack of high yielding varieties and improper production practices. It is grown more or less in every district of Bangladesh. But onion is commercially cultivated in Faridpur, Pabna, Rajshahi, Dinajpur, Rangpur and Dhaka (BBS, 2016).

Table 1.5 shows that a large number of farmers in Faridpur district are engaged in onion cultivation because cultivation of onion is profitable compared to the other spices crops. But this table indicates that area, production and yield of onion are fluctuating over the period.

Table 1.5: Area, production and yield of onion in Faridpur district

Year	Area (ha)	Production (MT)	Yield (Ton/ha)
2013-14	21614.66	214508	9.92
2014-15	31931.93	376651	11.79
2015-16	29429.14	290417	9.87
2016-17	33172.08	385669	11.63
2017-18	27461.56	265501	9.67

Source: BBS, 2015, 2016, 2018, 2019.

The yield of onion is 9.7 ton/ha which is very low compared to the other onion producing countries (BBS, 2019). In each year, Bangladesh has a shortfall around 6-7 lakh metric ton (PASDACP, 2015). Therefore, she has to import a large amount of onion every year to meet the domestic demand.

Table 1.6 shows that import quantity is increasing with the passage of time. So, government need to focus on providing HYV of onion at lower prices and improving management practices.

Table 1.6: Import quantity and value of onion from 2012-13 to 2017-18

Year	Quantity ('000' MT)	Value (Million Tk.)
2012-13	47.74	1785
2013-14	43	733
2014-15	423	10667
2015-16	576	15352
2016-17	1098	14625
2017-18	1064	34123

Source: BBS, 2014, 2016, 2018, 2019.

1.4 Nutritive and Medicinal Value of Onion

Onions are root vegetable with a variety of benefits. They are not only used as flavoring agents for cooking food but also have many medicinal properties. In ancient time onion was used for mummification. Onion paste actively works against dandruff. It is very rich spices because it contains various nutrients which are very good for human body.

Table 1.7: Nutrients values and weights of onion (100 gm.)

Nutrients	Quantities
Water	89.11 gm
Energy	40 kcal
Protein	1.10 gm
Total lipid (fat)	0.10 gm
carbohydrate	9.34 gm
Fiber	1.7 gm
Sugar	4.24 gm
Calcium, Ca	0.023 gm
Potassium, K	0.146 gm
Iron, Fe	0.00021 gm
Vitamin C	0.0074 gm
Vitamin B1	0.000046 gm
Vitamin B2	0.000027 gm

Source: USDA, 2019.

Onions have several health benefits due to high content of anti-oxidants and sulfur containing compounds. It contains decent amount of vitamin C, B and potassium which are needed for immune function, maintenance of skin and hair (Barakade *et al.* 2011). It also reduces blood sugar levels. Onions contain 89% water but are also composed of sugar, protein, fiber and little amount of fat. The main nutrients in 100 grams of raw onions are showed in Table 1.7.

1.5 Objectives of the Study

The objectives of the study are as follows:

I. To know the socio-economic profile of the sample farmers.
II. To estimate the profitability and resource use efficiency of onion cultivation.
III. To determine the effects of factors on gross return of onion cultivation.
IV. To find out the problems faced by the farmers in onion cultivation.

1.6 Justification of the Study

Bangladesh is an agro-based country having low productivity, food shortage, poverty, unemployment etc. In this cases agriculture plays a vital role by employment generation, poverty alleviation, food security enhancement etc. As most of the people in our country are dependent on agriculture, it is essential to diversify crops for the increasing production. Among the spices crop, onion plays an important role in the economy of Bangladesh.

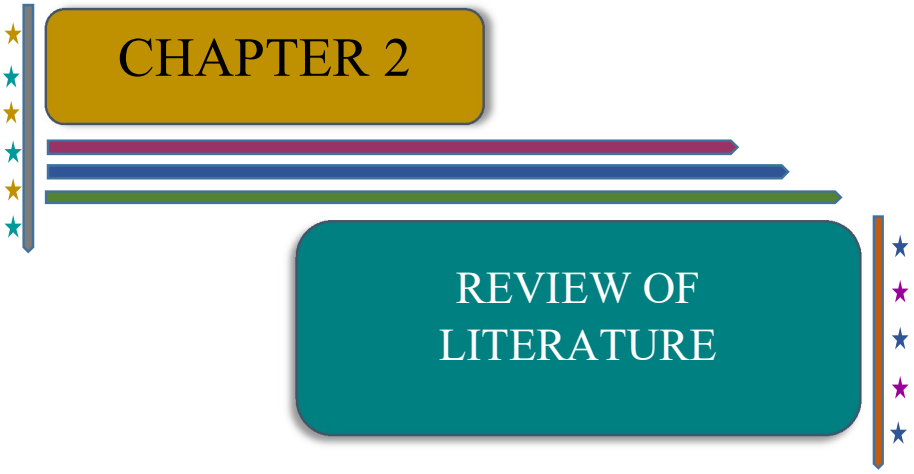
The climate of Bangladesh is also suitable for onion cultivation. There are various reasons for the poor yield rate onion in Bangladesh which force government to support onion farmers by providing subsidy on inputs. Most of the onion farmers are afraid of investing in onion cultivation due to insufficient information on onion farming, credit facilities and marketing techniques. While making production decision, they consider cost of production against the yield of the crop.

Area, production and yield of onion in Faridpur district are fluctuating over the period. One of the main reasons is farmers do not get good price for their products. Even they can’t make stable decision whether they should continue onion cultivation in the following year or not. A few studies has been conducted in Bangladesh to determine

financial profitability and resource use efficiency of onion cultivation. This type of study has not conducted much in the selected areas. So, this study will help the policy makers in forming appropriate policies.

1.7 Organization of the Thesis

This thesis paper consists of 9 chapters. Chapter 1 deals with the introduction including background, objectives and justification of the study. Review of literature and research methodology are presented in chapter 2 and 3 respectively. Chapter 4 provides a brief description of the study area. Chapter 5 deals with the socio-economic characteristics of onion farmers. Chapter 6 presents profitability of onion cultivation. Effects and resource use efficiency of inputs used are determined in chapter 7. Chapter 8 presents problems of onion cultivation. Chapter 9 represents the summary, conclusion and recommendations of the study.


CHAPTER 2
REVIEW OF
LITERATURE

CHAPTER 2
REVIEW OF LITERATURE

The review of literature in any research is necessary because it provides knowledge and information relevant to the proposed study. By reviewing past research paper, it gives a guideline on how to design the future research paper properly. Some of the studies may not entirely relevant to the present study, but their findings, methodology of analysis and suggestions have a great impact on the present study. Review of some research works relevant to the present study, have been discussed below.

Mahmood (1995) conducted a study on selected spices in Comilla district of Bangladesh. In his study he showed that onion was the most profitable crop. The net return per hectare of onion was Tk. 26673.7 which was highest compared to the other crops.

Rahman (1998) conducted an economic study of onion production in selected areas of Rajbari district. Gross returns for the small, medium and large farmers were Tk. 118765.50, Tk. 157606.75. Tk. 155627.25 and net returns were Tk. 81280.15, Tk.115376.84 and Tk. 111553.04 respectively. Per hectare yields for the farmers were 9501.24 kg, 12608.54 kg and 12450.18 kg. Resource use efficiency was highest in the medium size farmers compared to small and large farmers.

Saha (1999) carried out a survey to examine comparative profitability different varieties of onion in selected areas of Pabna district. Faridpuri variety was found more profitable than other varieties. Gross returns per hectare for Taherpuri, Indian and Faridpuri variety of onion were Tk. 112389, Tk. 106570 Tk. 135640.89 and net returns were Tk. 46756.28, Tk. 50405.65 and Tk. 67945.41 respectively. It was found that net return was influenced by the use of human labor, irrigation water, seed, fertilizer etc.

Bhanudas (2002) attempted to find out the economics of production and marketing of onion in Ahmednagar district. In the studied area, two seasonal onions were cultivated. Per hectare cultivation cost of kharif onion was Rs. 22031.67 while rabi onion was Rs. 22953. Per hectare profit was higher in rabi onion than of kharif onion. Input output

ratio for kharif onion was 1:1.45. On the other hand, input output ratio for rabi onion was 1:1.46. Maximum onion was sold through producer- commission agent cum wholesaler-retailer-consumer in both the seasons.

Haque (2005) studied a comparative economic analysis of onion and garlic production in a selected areas of Santhia upazila of Pabna district. Both of them were profitable but onion cultivation is more profitable than garlic cultivation. Per hectare average yield of onion and garlic was 8412 kg and 4510 kg.

Haque *et al.* (2009) conducted a study on economic assessment of onion and garlic under zero tillage and traditional methods of cultivation in major growing areas of Bangladesh. The cost of onion cultivation was Tk. 93517, Tk. 87696 and Tk. 72001 per hectare on full cost, variable cost and cash cost basis. Human labor, seed, manures, TSP, MOP, irrigation water for onion and garlic had positive effect on yield.

Hasan *et al.* (2009) conducted a study on returns to investment in summer onion research and extension in Bangladesh. The results revealed that the growth of area and production of onion increased due to farm level adoption of summer onion. The yield of onion was 57.04 percent higher than the local variety. The internal rate of return (IRR), net present value (NPV) and benefit cost ratio (BCR) were estimated to be 25%, Tk. 35.29 million and 3.09 respectively. Sensitivity analysis revealed that under various assumptions IRR raged from 20% to 41%, NPV from Tk. 18.37 to Tk. 64.05 million and BCR from 2.31 to 5.95. The results indicated that investment in research and development of summer onion was a good investment.

Hasan (2010) conducted an economic study on onion production in selected areas of Bangladesh. Per hectare yields of onion were 14217 kg, 12202 kg and 10637 kg for small, medium and large farmers. In technical inefficient model farm size was significant but showed negative sign which means that larger farm holdings were technically efficient.

Islam (2010) examined an economic analysis of garlic production in some selected areas of Bangladesh. The gross return of small, medium and large farmers were calculated at Tk. 517770, Tk. 483735.83 and Tk. 459571.50 respectively. Per hectare

average net return of all farmers were Tk. 302088.03 and BCR was 2.45 which showed that garlic production was highly profitable in the study areas.

Barakade *et al.* (2011) carried out a study to determine the economics of onion cultivation, marketing channels and marketing efficiency of onion in Satara district. The average net return, gross return were Rs. 49800.41 and Rs. 152437 per hectare. The maximum quantity of onion passed through channel IV followed by II, III and I. It was also observed that onion growers did not have any control over the market. The marketing efficiency was low and maximum share of consumers rupee were obtained by the middleman.

Baree *et al.* (2011) conducted a study on comparative study of technical efficiency of onion producing farmers in Bangladesh. The coefficients of education, experience were negative in small, medium farm but were positive in large farm.

Haque *et al.* (2011) examined a survey on profitability of onion cultivation in some selected areas of Bangladesh. The gross margin and net return were found to be Tk. 85308 and Tk. 79487 per hectare respectively. Human labor, seedling, irrigation water, Urea, TSP had positive effect on the yield of onion.

Karim (2011) undertook a study that was an economic analysis of turmeric production in some selected areas of Bangladesh. The study was based on the farm size. Per hectare total costs of turmeric production under small, medium and large were Tk. 223448.26, Tk. 212493.42 and Tk. 230585.48. Net return was Tk. 446558, Tk. 416365.44 and Tk. 445607.50 per hectare respectively under small, medium and large farm. It was noticed that small group of farmers got the highest net return followed by large and medium. Overall net return was estimated Tk. 435017.25.

Haque (2013) carried out an experiment on technical efficiency and profitability of onion production in some selected areas of Bangladesh. The net return was Tk. 17459.7 and per hectare yield was 13704 kg. The coefficients of human labor, seed bulb, irrigation water were positive which had positive effect on onion production. In technical inefficient model experiment, farm size, training had negative coefficients which helps in reducing technical inefficiency.

Baloch *et al.* (2014) conducted a study to determine the economic analysis of onion production and marketing in Awaran district. On an average per acre TC of production was Rs. 75050. Per acre revenue earned by the growers was Rs. 172800. Net income and input output ratio were Rs. 97750 and 1:2.30 respectively.

Anjum and Barman (2017) attempted to estimate the profitability, domestic resource cost and problems of onion production. They study revealed that total costs of onion production per hectare were about Tk. 150097 and Tk. 116831 in Kushtia and Jhenaidah district respectively. BCR was 2.02 and 1.83 which indicated profitable onion production. Domestic resource cost was 0.47 and 0.52 in Kushtia and Jhenaidah. This showed that Bangladesh has comparative advantages in onion production.

Mostafizur *et al* (2017) conducted a survey on diversity of cropping patterns and land use practices in Faridpur region. 43.32% net cropped area was covered by only jute. Among spices, onion is leading nine cropping patterns covering the largest area of 56450 hectares that is equivalent to 11.50% NCA in the region.

The above reviews indicate that a few studies have been conducted on financial profitability of onion cultivation. The present study aims to collect information on profitability of onion cultivation. The result of present study would help researchers, respected farmers and policy makers in taking necessary steps for increasing onion yield. Ultimately that will help for increasing total production.

CHAPTER 3

RESEARCH METHODOLOGY

CHAPTER 3
RESEARCH METHODOLY

3.1 Introduction

In any research the reliability of the research paper totally depends on the use of proper methodology. The present study was based on the primary data which were collected from the field survey and secondary data were collected from different journals, books, websites and reports. The design of the survey for the present study involved some necessary steps.

3.2 Selection of the Study Area

The study area was selected on the basis of objectives of the research. Faridpur district was selected for the present study. Primary data were collected from three upazila namely Bhanga upazila, Nagarkanda upazila and Sadarpur upazila. The main reasons for selecting the study area were as follows:

I. Availability of large number of onion farmers in the study area.
II. Easy accessibility and good communication facilities in those area.
III. This type of study was conducted very few in the study area.

3.3 Preparation of Survey Schedule

The survey schedule was designed in accordance with the objectives of the study. The draft was made which included various questions that should be asked. Before taking actual interview draft schedule was pre-tested by interviewing some onion farmers. Improvement and modification were done based on the experience of pretesting interview. This will help the researcher to get more information regarding onion farmers.

3.4 Selection of Sample and Sampling Technique

It is impossible to make a survey covering whole area. For this reason, sampling was done to minimize the cost and time. A total of 90 farmers had been selected randomly from three upazila. Total six villages were selected from three upazila. From each upazila two villages were selected purposively. Each upazila represents 30 respondents

for this study. Data were collected by the researcher herself using a pre-designed interview schedule. Face to face interview was done to collect information from the onion growers.

3.5 Data Collection Period

In the present study, necessary information was collected by the researcher through personal interview. Data were collected during the period from July to August 2019.

3.6 Method of Data Collection

There are different methods of collecting information from the respondents. In the present study, face to face interview was designed because this type of interview is more appropriate than others. Before taking actual interviews the whole purpose of the study was explained to the sample farmers. During the interview if farmers did not get any questions, researcher explained the question in an easier way. In order to reduce the error, data were collected in local unit but later those units were converted into standard international units.

3.7 Analytical Technique

The collected data were analyzed with the purpose of achieving the objectives of the study. The following two techniques of analysis were used:

I. Tabular technique
II. Statistical technique

3.7.1 Tabular Technique

Tabular technique is generally used to find out the variation between variables. It was applied to classify data in order to get meaningful result by using statistical measures like sum, means, percentage etc. Different costs, gross margin and net profit were calculated in tabular form. In this study data were mostly presented in tabular form because of its simple and convenient characteristics.

3.7.1.1 Profitability Analysis

Variables such as cost of human labor, cost of land preparation, cost of seed (bulb), cost of urea, cost of TSP, cost of MOP, cost of irrigation, cost of insecticides in cultivating onion were considered for profitability analysis and Cobb-Douglas production function. The following profit function was used in the study.

$$Profit\ (\pi) = \sum_{i=1}^{n}(Pyi.Yi) - \sum_{i=1}^{n}(Pxi.Xi) - TFC$$

Where,

π = Net Return

P_{yi} = Price per unit of the ith produce

Y_i = Quantity of the ith produce

P_{xi} = Price per unit of the ith inputs

X_i = Quantity of the ith inputs

TFC = Total Fixed Cost

3.7.2 Statistical Technique

3.7.2.1 Production Function Analysis

To learn more about the relationship between output and input, Cobb-Douglas production function was used. It was chosen to estimate the effects of key variables on production process of onion. Considering the effect of explanatory variables on output of onion cultivation, eight explanatory variables were hypothesized to estimate the effect of inputs on output. Gross return was considered as the response variable. Some independent variables like Zink, DAP, Gypsum and Growth Hormone etc., which might have affected onion production, were excluded from the model on the basis of some preliminary estimation.

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

$$Y = a\ X_1^{b1}\ X_2^{b2}\ X_3^{b3}\ X_4^{b4}\ X_5^{b5}\ X_6^{b6}\ X_7^{b7}\ X_8^{b8}\ e^{ui}$$

The empirical production function was the following:

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

Where,

Y = Gross Return (Tk./ha)

X_1= Human labor cost (Tk./ha)

X_2 = Land preparation cost (Tk./ha)

X_3 = Seed (Bulb) cost (Tk./ha)

X_4 = Urea cost (Tk./ha)

X_5 = TSP cost (Tk./ha)

X_6 = MOP cost (Tk./ha)

X_7 = Irrigation cost (Tk./ha)

X_8 = Insecticides cost (Tk./ha)

a = Intercept

$b_1, b_2, b_3 \ldots\ldots\ldots\ldots b_8$ = Coefficients of the respective variables

u_i= Error term

3.7.2.2 Measurement of Resource Use Efficiency

Farmers can get maximum profit up to the point where value of added product is greater than the cost of the added resources in producing it. When marginal physical product is measured in monetary terms (MPP * product price), it is called marginal value product. Marginal factor cost (MFC) is the price of per unit of input. In order to test the efficiency of resource allocation, the ratio of MVP to MFC for each input is considered to 1 which can be written by following:

$$\frac{MVPxi}{MFCxi} = 1$$

Marginal value product of a particular resource represents the addition to gross return by adding one unit of that resource while others inputs are remained constant. The most useful estimate of MVP is obtained by taking resources (X_i) and yield (Y) at their geometric means (Dhawan and Bansal, 1977).

$$\text{MVP } (X_i) = b_i \ \frac{Y\ (\overline{GM})}{\text{Xi}\ (\overline{GM})}$$

Where,

b_i = Regression coefficient per resources

$\overline{Y}$ = Mean value (GM) of gross return

$\overline{X_i}$ = Mean value (GM) of inputs

If the marginal factor costs of all inputs expressed in terms of an additional, Taka in calculating the ratio of MVP to MFC, the denominator will always be one and therefore, the ratio will be equal to their respective MVP (Akter, 2014).

The resources are considered to be efficiently used when the ratio of MVP to MFC is one. If the ratio is greater than 1, yield can be increased by using more resources and if the ratio is less than 1, the resources are overused which will minimize the profit (Sapkota *et.al*, 2018).

3.8 Procedure of Estimating Cost and Returns

The cost of the inputs is an important factors which affect the decision making process of farmers. In the study areas farmers used purchased and home supplied inputs which were calculated at the prevailing market rate or the prices at which farmers bought. In calculating cost, the following costs were considered.

3.8.1 Cost of Human Labor

Human labor is an important input in producing agricultural product. In this study human labor was measured in terms of man-days and eight hours of work were equivalent to one man-day. The average wage of family labor was taken as the opportunity cost of the hired labor. In the study areas, the cost of human labor was estimated by multiplying wage rate with recorded man-day/ha.

3.8.2 Cost of Land Preparation

Land preparation is one of the most important components in agricultural production process. Land preparation for onion requires ploughing, laddering to make soil suitable for planting seedling. The number of ploughing varies from plot to plot. In the study areas, most of the time they ploughed land for 3 times.

3.8.3 Cost of Seed (Bulb)

In the study area, most of the farmers used purchased seed for onion production. Some of the farmers used home supplied seeds as well. Cost of seeds varied depending on its quality and availability. The cost of purchased seed was calculated based on the actual price paid by the farmers. The cost of home supplied seed or bulb was estimated at the prevailing market price.

3.8.4 Cost of Urea

For the higher production, most of the farmers used chemical fertilizers. They used different kinds of fertilizers for higher yield. The cost of urea was estimated at present market prices during the survey.

3.8.5 Cost of TSP

Among different chemical fertilizers TSP is one of them. The cost of TSP was estimated at present market prices during the survey.

3.8.6 Cost of MOP

MOP is one of the important fertilizers which is used for onion cultivation. The cost of MOP was estimated at present market prices during the survey.

3.8.7 Cost of Zink, Gypsum and DAP

Besides Urea, TSP and MOP, different types of fertilizers like Zink, Gypsum and DAP were applied in onion cultivation. These fertilizers were calculated at present prices during the survey.

3.8.8 Cost of Irrigation

Irrigation is the most important input for onion production. In the study area, shallow tube-well, river, ponds etc. were used as sources of irrigation. Cost of irrigation varies from farmers to farmers. It was calculated based on how many times irrigation needed per hectare and how was its cost.

3.8.9 Cost of Insecticides

Farmers used many types of insecticides for 3-4 times to keep their crop free from pests and diseases. Cost of insecticides was calculated based on the market price which was applied in the field per hectare.

3.8.10 Cost of Growth Hormone

Farmers applied different types of growth hormones for onion cultivation. Cost of these hormone was calculated by using market price during the survey.

3.8.11 Interest on Operating Capital

Interest on operating capital was determined on the basis of opportunity cost principles. It was calculated by taking all the cost incurred throughout the production period at the rate of 5.5% per annum for four months. Following formula was used:

$$IOC = AIit$$

Where,

IOC = Interest on operating capital

AI = Total investment/3

i = Interest rate

t = Total time period of a cycle

3.8.12 Cost of Land Use

Land use cost was estimated on the basis of opportunity cost of the use of land per hectare for four months during the production period. That's why cash rental value of land had been used for estimating cost of land use.

3.8.13 Calculation of Returns

3.8.13.1 Gross Return

Per hectare gross return was estimated 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

3.8.13.2 Gross Margin

Gross margin is the difference between gross return and variable costs. Generally gross margin was calculated on total variable cost (TVC) basis. Per hectare gross margin was obtained by subtracting variable cost from gross return. That is,

Gross Margin = Gross Return – Total Variable Cost

3.8.13.3 Net Return

Net return was estimated by deducting the total production cost from the total return.

Net Return = Total Return – Total Cost

3.8.13.4 Benefit Cost Ratio (BCR)

BCR is used to compare benefit per unit of cost. Higher BCR indicates higher return from the production. To estimate the BCR, the following equations were used.

When we used total cost,

$$BCR = \frac{Gross\ Return}{Total\ Cost}$$

When we used variable cost,

$$BCR = \frac{Gross\ Return}{Total\ Variable\ Cost}$$

CHAPTER 4

DESCRIPTION OF THE STUDY AREA

CHAPTER 4
DESCRIPTION OF THE STUDY AREA

4.1 Introduction

To know the overall features of the study area, a short description has been presented in this chapter. It is necessary to know the agricultural activities, possible development opportunities and potentials of the study area. This will help the agricultural organization to make appropriate decision regarding various agro- related activities. Location, physical features, topography, climate, temperature etc. are discussed below.

4.2 Location

The selected farmers in the present study are from Faridpur district. Area of Faridpur district is 2072.72 sq km, located in between 23°17' and 23°40' north latitudes and in between 89°29' and 90°11' east longitudes (Banglapedia, 2015). Three upazila namely Bhanga, Nagarkanda and Sadarpur are selected for this study. The area of the above upazilas is 216.34 sq km, 198.42 sq km and 290.20 sq km respectively. These upazilas are mostly bounded by each other. The locations of the upazila are presented in the Map 4.1.

4.3 Physical Features, Topography and Soil Conditions

Faridpur district is in Lower Ganges River Floodplain. The region comprises the eastern half of the Ganges River Flood Plain which is low-lying. Soils of the region are silt loams and silty clay loams on the ridges and silty clay loams to heavy clays on lower sites. Organic matter content is low in ridges but moderate in the basins. Soils are calcareous in nature and general fertility level is medium. Soil of the study area is very fertile as a result various types of crops are cultivated.

Table 4.1: Land topography in the survey area

Study Area	Land Type					
	High Land	Medium High Land	Medium Low Land	Low Land	Very Low Land	Total
Faridpur	23309	63768	63381	13251	299	208569

Source: BBS, 2019.

4.4 Population

Population and density of population of the study areas are presented in Table 4.2. The highest population density is in Bhanga upazila compared to other two upzilas. Population is also higher in Bhanga. Proportion of female is higher in Sadarpur. Male and female proportion was overall same in the respective areas.

Table 4.2: Population size under the study areas

Name of Upazila	Population	Male %	Female %	Population density
Bhanga	259032	48.4	51.6	1203
Nagarkanda	197898	49.7	50.3	1030
Sadarpur	186254	48.1	51.9	713

Source: BBS, 2013a.

4.5 Climate, Temperature and Rainfall

Agricultural production depends mostly on the environment of the region. Climate, temperature and rainfall are important factors for any crops production. Maximum temperature of the study area varies from 26.6 to 31.2 ^{0}C and minimum temperature of the study area is from 20.9 to 22.1 ^{0}C. From Table 4.4 we can see that annual rainfall is increasing over the passage of time.

Table 4.3: Average maximum and minimum temperature (^{0}C) in selected station

Name of Station	2015		2016		2017	
	Max.	Min.	Max.	Min.	Max.	Min.
Faridpur	31.2	21.5	31.9	22.1	26.6	20.9

Source: BBS, 2019.

Table 4.4: Annual rainfall (in millimeter) in selected station

Name of Station	Year			
	2014	2015	2016	2017
Faridpur	1552	1827	1649	2117

Source: BBS, 2019.

4.6 Land and Agriculture

Total cultivable land of Faridpur district is 490,490 hectares (Mustafizur *et al*, 2017). Onion is mostly grown spices in this study area. Paddy, jute, garlic, oil seed, wheat etc. are some major crops in this area. Many different cropping patterns are seen in different region of Faridpur. But most dominants cropping patters are Onion-Jute-Fallow, Onion-Jute-T. Aman, Onion- B. Aman, Onion-Aus-Fallow.

Table 4.5: Distribution of land type in study areas

Name of Upazila	Single Cropping Pattern	Double Cropping Pattern	Tipple Cropping Pattern
Bhanga	5.9%	60.8%	31.1%
Nagarkanda	12.3%	55.11%	28.8%
Sadarpur	0.51%	61.3%	32.9%

Source: BBS, 2013a.

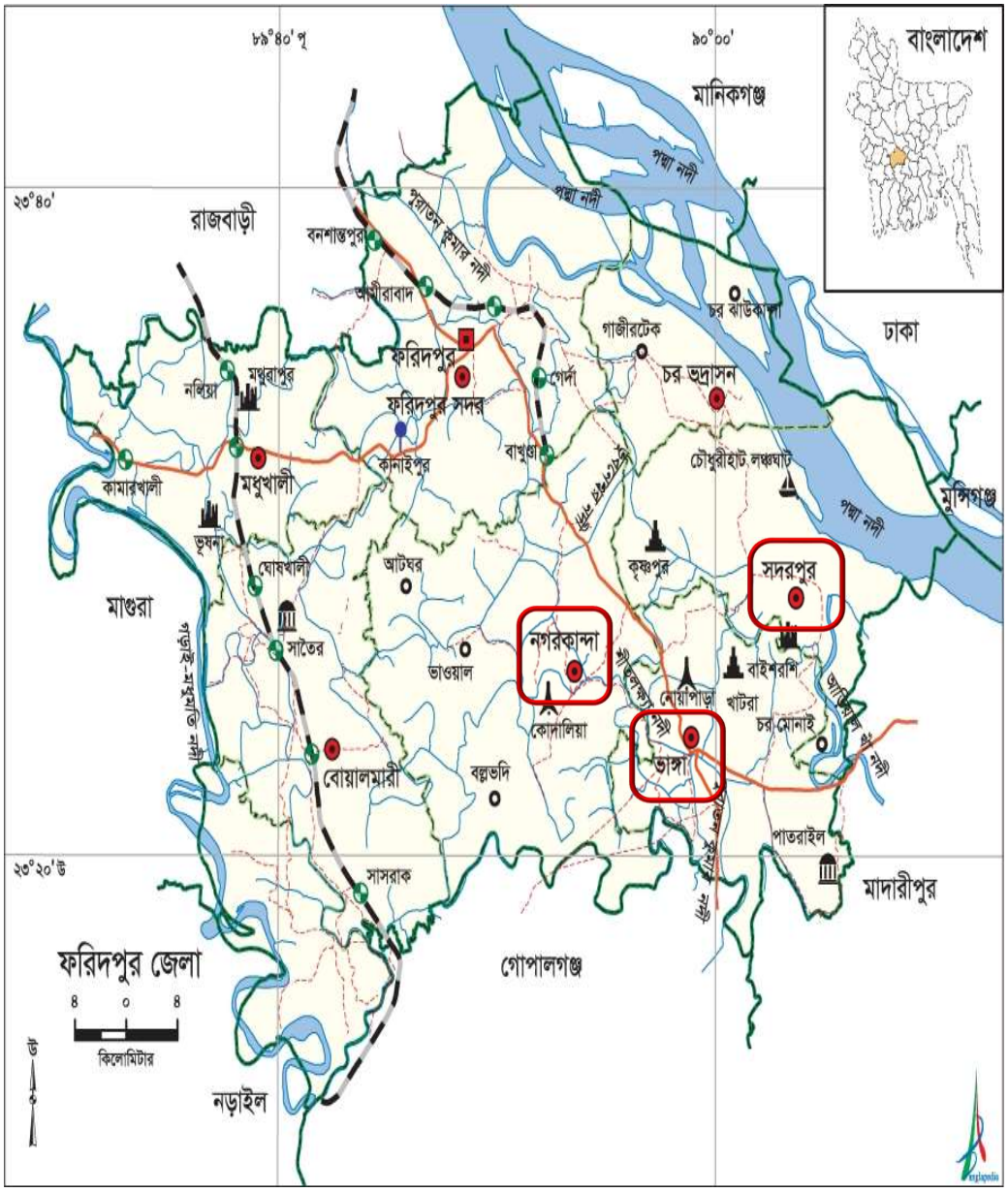


Figure 4.1: Map of Faridpur district

Source: Banglapedia, 2015.

4.7 Occupation

The economy of Faridpur is predominantly agricultural. The major occupation of the present study area is agriculture, non-agricultural laborer, service holder, industrial laborer and others. Average wage rate varies in different areas. Occupational status of different upazilas is presented in Table 4.6.

Table 4.6: Occupational level in the study areas

Name of Upazila	Agriculture	Non-agriculture	Industry	Service	Comm-erce	Others
Bhanga	55.51	2.79	1.36	6.12	20.32	13.9
Nagarkanda	68.98	2.80	0.74	4.91	11.49	11.08
Sadarpur	67.79	2.33	0.74	5.68	11.41	12.05

Source: Banglapedia, 2015.

4.8 Communication, Transportation and Marketing Facilities

Transportation and communication plays a vital role in overall development of a country. Without good transportation system, it is hardly possible to supply goods and other products in urban and city areas in time. At present days transportation and communication systems are in good condition in the study areas than before. Most of the roads are concreted and some of them are muddy. Different types of vehicles are also available in those areas. Markets are also available which make farmers receive good prices for their produced.

4.9 Non-Government Organizations

At present a number of non-government organizations (NGOs) such as Grameen Bank, BRAC, ASA etc. are available in the study area. They operate their activities for the betterment of the people and the poor farmers in particular.

CHAPTER 5

SOCIO-ECONOMIC CHARACTERISTICS OF ONION FARMERS

CHAPTER 5
SOCIO-ECONOMIC CHARACTERISTICS OF ONION FARMERS

5.1 Introduction

Socio-economic characteristics give vital information about social, financial, economic conditions of the farmers. These things are important because these make farmers to take decision in farming.

5.2 Age Distribution of the Farmers

Age is an important factor that influences farmer's production decision, efficiency etc. In the study area, farmer's age ranged from 26 to 78. The respondents were classified into four categories. Age distribution of the farmers was showed in table 5.1. On an average 33.3% farmers were 41-50 years old where highest proportion is found in Nagarkanda upazila (43.3%). About 8.9% farmers age were 20-30 years. Percentage of farmers age in between 20-30 years range were also seen but they were low in numbers in all the study areas. On an average 23.3% farmers were in 31-40 years age category. In Bhanga upazila, approximately 33.3% farmers were found in between 31 to 40 years age range. The study reported that 34.5% farmers age were above 50 years where most of the farmers were found in Sadarpur upazila (53.4%).

Table 5.1: Age distribution of the sample farmers in the study areas

Age (Year)	Percentage of Farmers			
	Nagarkanda	Bhanga	Sadarpur	All Areas
20-30	6.7	16.7	3.3	8.9
31-40	16.7	33.3	20	23.3
41-50	43.3	33.3	23.3	33.3
Above 50	33.3	16.7	53.4	34.5

Source: Field Survey, 2019.

5.3 Educational Status of the Farmers

Education is an important socio-economic indicator. It plays a vital role in reducing poverty, improving health and standard of living and making rational decision. It also helps farmers enhance their productivity. The respondent farmers were classified into six categories as shown in table 5.2. On an average 32.2% farmers completed primary education. In different areas, respondent farmers completed primary education where proportion was highest in Bhanga upazila (40%). About 2.2% farmers completed their degree level. Only 6.7% completed degree in Bhanga among others. On an average 6.7% and 16.6% farmers completed their secondary and higher secondary education. The study indicated that 14.5% respondent farmers were illiterate. Most of the farmers in Nagarkanda upazila were illiterate which constituted 20%. However, most of the respondent farmers completed primary education in the study area.

Table 5.2: Educational status of the sample farmers in the study areas

Literacy Level	Percentage of Farmers			
	Nagarkanda	**Bhanga**	**Sadarpur**	**All Areas**
Illiterate	20	6.7	16.7	14..5
Can signature only	26.7	13.3	43.3	27.8
Primary	30	40	26.7	32.2
Secondary	16.7	3.3	0	6.7
Higher secondary	6.6	30	13.3	16.6
Degree	0	6.7	0	2.2

Source: Field Survey, 2019.

5.4 Occupational Status of the Farmers

Selected respondents in the study area are engaged in various types of occupation. Most of their primary occupation is agriculture. Besides farming some of them has been dealing with different occupations such as service, business, day laborer etc. On an average 43.3% farmers were engaged in agriculture as their main occupation where highest proportion of respondents were found in Nagarkanda upazila (53.4%). In the study area, 30% farmers were involved in agriculture plus business. In Sadarpur upazila 36.7% engaged in agriculture plus business occupation which indicated highest

percentage compared to the other two upazilas. About 7.8% and 18.9% respondent farmers were engaged in agriculture plus service and agriculture plus others category respectively. Both of these category were found highest in Bhanga upazila (16.7% and 20%). Table 5.3 represented the occupation status of the respondent farmers.

Table 5.3: Occupational status of the sample farmers in the study areas

Types of Occupation	Percentage of Farmers			
	Nagarkanda	Bhanga	Sadarpur	All Areas
Agriculture	53.4	33.3	43.3	43.3
Agriculture + Business	23.3	30	36.7	30
Agriculture + Service	3.3	16.7	3.3	7.8
Agriculture + Others	20	20	16.7	18.9

Source: Field Survey, 2019.

5.5 Family Size

Family size of the farmers in the study has been defined as total number of people living together and having meal together under one kitchen. Family size of the sample farmers were divided into three categories such as 1-4 members, 5-7 members and above 7 members. On an average 32.2% respondent farmers had 1-4 members in their household where proportion was highest in Bhanga upazila (36.7%). In the study area, 66% respondent farmers had 5-7 members in their household. About 70% farmers in Sadarpur upazila had 5-7 members in their family which was highest compared to the other two upazilas. On an average 7.8% respondent farmers had above 7 members in their family. Above 7 members were found highest in Nagarkanda that was 13.3%. However, most of the farmers belong to the second category (5-7 members) in the study areas.

Table 5.4: Family size of the sample farmers in the study areas

Category of Family Size	Percentage of Farmers			
	Nagarkanda	Bhanga	Sadarpur	All Areas
1-4 Members	33.3	36.7	26.7	32.2
5-7 Members	53.4	56.7	70	66
Above 7 Members	13.3	6.6	3.3	7.8

Source: Field Survey, 2019.

5.6 Farm Size

Farm size is measured by the entire land area operated by the farmers. It is calculated by adding owned cultivated land, rented or leased or mortgaged in from others and by subtracting rented or leased or mortgaged out to others. The farm size was measured using the following formula:

Farm Size = owned + leased + mortgaged in – leased out – mortgaged out.

Table 5.5 represented the size of land holdings of the sample farmers where the average farm size was found higher in Bhanga (1.77) followed by Sadarpur (0.91) and Nagarkanda (0.77). On an average farm size was 0.95 hectare.

Table 5.5: Size of land holdings of the sample farmers

Types of Land	Nagarkanda	Bhanga	Sadarpur	All Areas
Homestead (ha)	0.06	0.05	0.09	0.06
Owned cultivated land (ha)	0.45	0.43	0.49	0.46
Leased/mortgaged in (ha)	0.26	0.69	0.32	0.43
Leased/mortgaged out (ha)	0	0	0	0
Farm size (ha)	0.77	1.17	0.91	0.95

Source: Field Survey, 2019.

The average farm size was 0.95 hectare but this area was not fully allocated to onion cultivation. The area under onion cultivation was about 0.51 hectare. Table 5.6 represented the allocation of land by farmers under onion cultivation.

Table 5.6: Allocation of land by sample farmers to onion cultivation

Name of Upazila	Average Land Allocation to Onion Cultivation	
	Operated area (ha)	Area under onion (ha)
Nagarkanda	0.77	0.38
Bhanga	1.17	0.85
Sadarpur	0.91	0.31

Source: Field Survey, 2019.

5.7 Experience in Onion Cultivation

In the study area, farmers experience in onion cultivation ranged from 1 to 48 years. On the basis of farming experience, the sample farmers were classified into three categories showed in Table 5.7. About 54.4% farmers were belong to second category that was in between 15-30 years. Most of the farmers in Bhanga upazila (63.3%) had in between 15-30 years farming experience. On an average 23.3% respondent farmers had above 30 years farming experience. Above 30 years farming experience was highest in Sadarpur upazila that was 33.3%. In the study area, about 22.2% farmers had under 15 years farming experience. Under 15 years farming experience was same in Nagarkanda (20%) and Sadarpur (20%) but highest was found in Bhanga upazila (26.7%). Most of the farmers in the study area had in between 15-30 years farming experience.

Table 5.7: Distribution of farmers according to their farming experience.

Farming Experience (Year)	Percentage of Farmers			
	Nagarkanda	Bhanga	Sadarpur	All Areas
Under 15	20	26.7	20	22.2
15-30	53.3	63.3	46.7	54.4
Above 30	26.7	10	33.3	23.3

Source: Field Survey, 2019.

5.8 Annual Income

The level of income reflects upon the socio-economic status of sample farmers. Income level of onion farmers different from one another. Their annual income was measured by aggregating all the incomes from various sources. In the present study, income of onion farmers were classified into three categories according to the national income. On an average 36.7% respondent farmers annual income level was in between 200000 to 350000 Taka. Most of the farmers in Sadarpur upazila (50%) were in second category income level that was in between 200000 to 350000 Taka. About 42.2% respondent farmers income were above 350000 Taka. In Bhanga, 63.4% respondent farmers annual income level were above 350000 Taka. In Nagarkanda farmers income percentages were overall same in all categories. About 21.1% farmers had less than 200000 Taka income level but percentage of respondent farmers income in this category was low in all the study areas.

Table 5.8: Annual income level of the sample farmers in the study areas

Income Level (TK.)	Percentage of Farmers			
	Nagarkanda	Bhanga	Sadarpur	All Areas
Less than 200000	30	13.3	20	21.1
200000-350000	36.7	23.3	50	36.7
Above 350000	33.3	63.4	30	42.2

Source: Field Survey, 2019.

5.9 Concluding Remarks

From the above discussions it is clear that there are some variations in socio-economic characteristics among the onion farmers. But the degree of variations was not large. Majority of the sample farmers were engaged in agriculture. Overall literacy status of the farmers was good in the study areas.

CHAPTER 6

PROFITABILITY OF ONION CULTIVATION

CHAPTER 6
PROFITABILITY OF ONION CULTIVATION

6.1 Introduction

Making decision for producing any crop, financial profitability is the mostly used criterion. It is measured on the basis of net returns, gross margin and benefit cost ratio. The cost of all items are calculated to get the total cost of production. The return is estimated based on the value of the products.

6.2 Variable Costs

6.2.1 Cost of Human Labor

Human labor is required for performing different types of operations such as land preparation, sowing, fertilizer and insecticides application, irrigation, harvesting, storing etc. The quantity of human labor used in onion cultivation was about 227 man-days (Table 6.1) per hectare for all areas. On an average labor wage rate was Tk. 400 in the study areas. The average cost of human labor per hectare was Tk. 90723 which represented 48.81 percent of total cost (Table 6.2). Human labor cost was found higher in Bhanga upazila (Tk. 93815) followed by that of Sadarpur (Tk. 90653) and Nagarkanda upazila (Tk. 87701). In Bhanga upazila, highest man-days were required that's why human labor cost was found higher in Bhanga compared to the other two areas.

6.2.2 Cost of Land Preparation

The average per hectare land preparation cost of onion cultivation was found to be Tk. 13466 which covered 7.26 percent of total cost. Land preparation cost was highest in Sadarpur upazila (Tk. 15283) which constituted 8.44 percent of total cost. In this area farmers used more number of tillage and laddering than the other two areas. (Table 6.2). Though average number of ploughing was three but in Sadarpur their ploughing number was four to five.

6.2.3 Cost of Seed (Bulb)

Prices of seed totally depend on the quality and availability of seed. On an average per hectare seed requirements was 1210 kg (Table 6.1). Highest 1270 kg per hectare of seed (bulb) was used by the farmers in Nagarkanda upazila. Overall seed cost per hectare was Tk.28389. Per hectare seed (bulb) cost was found higher in Nagarkanda upazila (Tk. 30873) than the other two upazilas because of highest used of seed (bulb) in onion cultivation (Table 6.2).

Table 6.1: Per hectare input use pattern of onion cultivation

Particulars	Unit	Nagarkanda	Bhanga	Sadarpur	All Areas
Human labor	Man-days	219	235	227	227
Land Preparation	Tk.	12216	12899	15283	13466
Seed (Bulb)	Kg	1270	1132	1229	1210
Urea	Kg	241	234	207	227
TSP	Kg	178	245	228	217
MOP	Kg	202	248	171	207
Zink	Kg	8	12	5	8
DAP	Kg	65	69	72	69
Gypsum	Kg	10	13	9	11
Growth Hormone	Tk.	3200	5900	3750	4283
Irrigation	Tk.	12063	12603	10091	11586
Insecticides	Tk.	4138	8057	3675	5290

Source: Field Survey, 2019.

6.2.4 Cost of Urea

Farmers in the study areas used different types of fertilizers. Urea is mostly used fertilizers among others. The average urea was used about 227 Kg per hectare (Table 6.1). In Nagarkanda (241 kg), farmers used highest amount of urea followed by Bhanga (234 kg) and Sadarpur (207 kg). Overall urea cost was Tk. 3644 which was 1.96 percent of total cost (Table 6.2). In the study area, urea cost was overall same.

6.2.5 Cost of TSP

Per hectare application rate of TSP was 217 kg and cost was Tk. 5920 (Table 6.2). This constituted 3.17 percent of total cost. Farmers spent more money on TSP in Bhanga upazila (Tk. 7184). It was evident from table 6.1 that farmers in that area used highest amount of TSP which ultimately made higher cost compared to the other areas.

6.2.6 Cost of MOP

Among different types of fertilizers used in onion production, the application rate of MOP was lower than those of other fertilizers. The application rate of MOP was 202, 248 and 171 kg per hectare for Nagarkanda, Bhanga and Sadarpur upazila respectively. Overall use of MOP was 207 kg (Table 6.1). On an average per hectare cost of MOP was Tk. 3108 that was 1.66 percent of total cost. Per hectare MOP cost was highest in Bhanga upazila (Tk. 3724) and lowest in Sadarpur upazila (Tk. 2562) (Table 6.2).

6.2.7 Cost of Zink, Gypsum and DAP

Farmers generally use Urea, TSP and MOP in onion cultivation. Besides these fertilizers they also used Zink, Gypsum and DAP. On an average cost of Zink, Gypsum and DAP was Tk. 1323, Tk. 1333 and Tk. 1785 per hectare respectively which covered 0.71, 0.71 and 0.96 percent of total cost respectively (Table 6.2).

6.2.8 Cost of Irrigation

Irrigation is considered as an important input of onion production. On an average irrigation cost was Tk. 11586 that was 6.22 percent of total cost. Per hectare irrigation cost was overall same in Nagarkanda (Tk. 12063) and Bhanga (12603) than that of Sadarpur upazila (Tk. 10091) (Table 6.2).

6.2.9 Cost of Insecticides

To keep the spices crop disease and pest free, farmers need to spray different types of insecticides. Overall per hectare insecticides cost was Tk. 5290 that was 2.81 percent of total cost. Per hectare cost of insecticides for onion production was estimated at Tk. 4138, Tk. 8057 and Tk. 3675 for Nagarkanda, Bhanga and Sadarpur upazila respectively. In Bhanga upazila, insecticides cost was almost two times higher than that

of the other two upazilas because they used more insecticides than the requirement (Table 6.2).

Table 6.2: Per hectare cost of onion cultivation

Items of cost	Nagarkanda	Bhanga	Sadarpur	All Areas
	Cost (Tk.)	Cost (Tk.)	Cost (Tk.)	Cost (Tk.)
A. Variable Cost				
Human labor	87701 (48.61)	93815 (47.77)	90653 (50.05)	90723 (48.81)
Land preparation	12216 (6.77)	12899 (6.57)	15283 (8.44)	13466 (7.26)
Seed (Bulb)	30873 (17.11)	26037 (13.26)	28256 (15.60)	28389 (15.32)
Urea	3858 (2.14)	3756 (1.91)	3317 (1.83)	3644 (1.96)
TSP	4642 (2.57)	7184 (3.66)	5934 (3.28)	5920 (3.17)
MOP	3037 (1.68)	3724 (1.90)	2562 (1.41)	3108 (1.66)
Zink	1200 (0.67)	1770 (0.90)	1000 (0.55)	1323 (0.71)
DAP	1690 (0.94)	1794 (0.91)	1872 (1.03)	1785 (0.96)
Gypsum	1250 (0.69)	1625 (0.83)	1125 (0.62)	1333 (0.71)
Irrigation	12063 (6.69)	12603 (6.42)	10091 (5.57)	11586 (6.22)
Insecticides	4138 (2.29)	8057 (4.10)	3675 (2.03)	5290 (2.81)
Growth Hormone	3200 (1.77)	5900 (3.00)	3750 (2.07)	4283 (2.28)
Interest on TOC @ 5.5% for months	3041 (1.69)	3285 (1.67)	3071 (1.70)	3132 (1.68)
Total variable Cost (TVC)	**168909 (93.63)**	**182449 (92.90)**	**170589 (94.18)**	**173982 (93.57)**
B. Fixed Cost				
Rental Value of Land	11500 (6.37)	13950 (7.10)	10540 (5.82)	11997 (6.43)
C. Total Cost (A+B)	**180409 (100)**	**196399 (100)**	**181129 (100)**	**185979 (100)**

Source: Field survey, 2019.

Note: Figures inside the parentheses indicate percentage of total cost.

6.2.10 Cost of Growth Hormone

Farmers used different growth hormone for higher onion yield. The average growth hormone cost was Tk.4283 which covered 2.28 percent of total cost. The cost of growth hormone per hectare was Tk. 3200, Tk. 5900 and Tk. 3750 for Nagarkanda, Bhanga and Sadarpur which covered 1.77, 3.00 and 2.07 percent of total cost respectively. In Bhanga upazila farmers used more growth hormone than regular requirement (Table 6.2).

6.2.11 Interest on Operating Capital (IOC)

The interest on operating capital was calculated by taking into account all the operating cost incurred during the production period. 5.5 percent interest rate for four months was considered for estimating interest on operating capital. The average cost of IOC for onion production was estimated at Tk. 3132 which constituted 1.68 percent of total cost (Table 6.2). Interest on operating capital was almost same in the study areas.

6.2.12 Total Variable Cost

The total variable cost of onion production was different in different areas of Faridpur. The average total variable cost per hectare was Tk. 173982 which was 93.57 percent of total cost. Total variable cost was found higher in Bhanga (Tk. 182449) followed by Sadarpur (Tk. 170589) and Nagarkanda (Tk. 168909) (Table 6.2). The reason for higher total variable cost in Bhanga upazila was most of the variable inputs cost were also higher in number.

6.3 Fixed Cost

6.3.1 Rental Value of Land

Rental value of land was estimated on the basis of opportunity cost. Per hectare average land value was Tk. 11997 which represented 6.43 percent of total cost. In the study area, the rental value of land was Tk. 11500, Tk. 13950 and Tk. 10540 per hectare for Nagarkanda, Bhanga and Sadarpur upazila which represented 6.37, 7.10 and 5.82 percent of total cost respectively (Table 6.2). Land rental value was highest in Bhanga because of easy accessibility, good transportation system etc.

6.4 Total Cost

Costs of all resources used in onion production process have been summed up. On an average per hectare total cost was Tk. 185979. The total cost of onion production per hectare was estimated at Tk. 180409, Tk. 196399 and Tk. 181129 for Nagarkanda, Bhanga and Sadarpur upazila respectively. The study reported that human labor cost was in the highest rank among the other variables cost (Table 6.2).

6.5 Returns of Onion Cultivation

6.5.1 Gross Return

Gross return was calculated by multiplying total yield by their per unit price. On an average yield was found to be 11833 kg and gross return was Tk. 335173 per hectare (Table 6.3). Average yield was more than average national yield (9730 kg) in the study areas (BBS, 2019). Per hectare onion yield was highest in Nagarkanda (12084 kg) due to the better land preparation, good soil condition and quality seed. Per hectare gross return of onion cultivation was highest in Nagarkanda upazila (Tk. 338363) due to the highest yield of this upazila (Table 6.4).

Table 6.3: Per hectare yield and unit price of onion cultivation in the study areas

Items	Unit	Nagarkanda	Bhanga	Sadarpur	All Areas
Yield	Kg	12084	11544	11871	11833
Price	Tk./kg	28	29	28	28

Source: Field survey, 2019.

6.5.2 Gross Margin

Per hectare overall gross margin was Tk. 161191. Gross margin was found higher in Nagarkanda (Tk. 169454) followed by Sadarpur (Tk. 161796) and Bhanga (Tk. 152321) (Table 6.4). Gross margin was highest in Nagarkanda upazila due to the lowest total cost than the other two upazilas.

Table 6.4: Per hectare profitability of onion cultivation

Items	Unit	Nagarkanda	Bhanga	Sadarpur	All Areas
Gross Return	Tk.	338363	334770	332385	335173
Total Variable Cost	Tk.	168909	182449	170589	173982
Total Cost	Tk.	180409	196399	181129	185979
Gross Margin	Tk.	169454	152321	161796	161191
Net Return	Tk.	157954	138371	151256	149194
BCR (Full cost basis)		1.88	1.70	1.84	1.80
BCR (Cash cost basis)		2.00	1.83	1.95	1.93

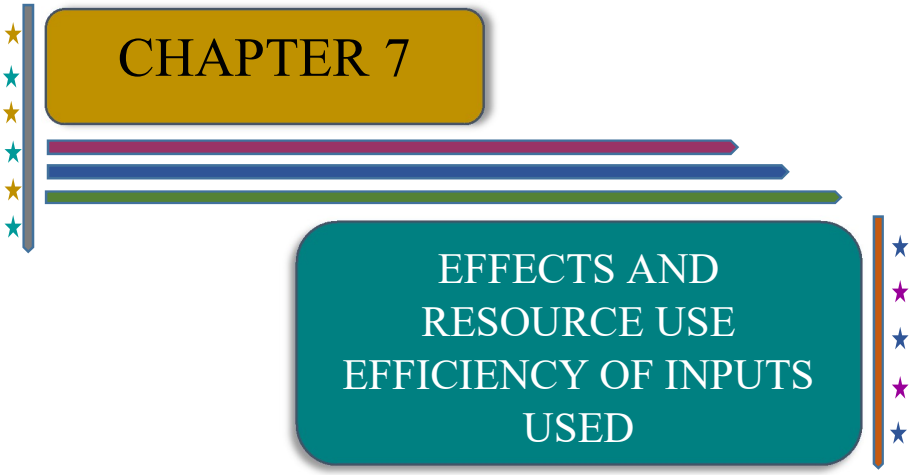
Source: Field survey, 2019.

6.5.3 Net Return

Net return was measured by substituting the total cost from the gross return. The average net return per hectare was Tk. 149194. Per hectare net return was Tk. 157954, Tk. 138371 and Tk. 151256 for Nagarkanda, Bhanga and Sadarpur upazila respectively (Table 6.4). Net return was highest in Nagarkanda upazila due to the highest yield and moderate per unit onion price.

6.5.4 Benefit Cost Ratio

The average BCR on full cost basis was 1.80 which indicated that one taka investment in onion production generated Tk. 1.80. Benefit cost ratio on full cost basis was found higher in Nagarkanda upazila (1.88) compared to Bhanga (1.70) and Sadarpur (1.84). The average BCR on cash cost basis was 1.93 (Table 6.4). BCR on cash cost basis was found higher in Nagarkanda (2.00) compared to the other two. So from the above estimation, it was found that onion cultivation was profitable in the study areas.


CHAPTER 7
EFFECTS AND
RESOURCE USE
EFFICIENCY OF INPUTS
USED

CHAPTER 7
EFFECTS AND RESOURCE USE EFFICIENCY OF INPUTS USED

7.1 Introduction

The main focus in this chapter was to find out the effects of some important variables on gross return. For this reason Cobb-Douglas production model had been used to determine the effects of different variables on gross return of onion cultivation.

7.2 Factors Contributing to Gross Return

In the study area, for cultivating onion some vital inputs namely human labor, land preparation, seed/bulb, urea, TSP, MOP, irrigation and insecticides were considered as independent variables responsible for the variation of gross return. Multiple regression analysis was conducted to understand the relationship between input and output.
The following Cobb-Douglas production model was used in the present study:

$$Y = a\, X_1^{b1}\, X_2^{b2}\, X_3^{b3}\, X_4^{b4}\, X_5^{b5}\, X_6^{b6}\, X_7^{b7}\, X_8^{b8}\, e^{ui}$$

In linear form, model was written as follows:

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

The estimated production function for onion was:

$$Y = 1.406 + 0.523^{***} + 0.249^{***} + 0.365^{***} - 0.056 + 0.017 - 0.043 + 0.111^{*} - 0.141^{***}$$
$$(0.073)\quad (0.077)\quad (0.102)\quad (0.088)\quad (0.055)\quad (0.067)\quad (0.069)\quad (0.052)$$

The figures in the parentheses are standard errors and the asterisk sign indicates the level of significance.

7.3 Interpretation of the Estimated Values

The estimated values of the coefficients and related statistics of the production function are presented in Table 7.1.

Important features of the model are:

- Testing the significance level of each variable at one, and ten percent probabilities.
- Total variation of the output was measured by co-efficient of multiple determinations (R^2).
- Goodness of fit of the model was measured by F-value.

7.3.1 Human labor cost (X_1)

The regression coefficient of human labor cost (X_1) was 0.523 which was positive and significant at 1 percent level. It implied that one percent increase in human labor cost, remaining other factors constant, would increase the gross return by 0.523% (Table 7.1).

7.3.2 Land Preparation Cost (X_2)

The regression coefficient of power tiller cost (X_2) was 0.249 which was positive and significant at 1 percent level. It implied that one percent increase in land preparation cost, keeping other factors constant, would increase the gross return by 0.249% (Table 7.1).

7.3.3 Seed (Bulb) Cost (X_3)

The regression coefficient of seed (bulb) cost (X_3) was 0.365 which was positive and significant at 1 percent level. It implied that one percent increase in seed (bulb) cost, remaining other factors constant, would increase the gross return by 0.365% (Table 7.1).

7.3.4 Urea Cost (X_4)

The regression coefficient of urea cost (X_4) was -0.056 which was negative and insignificant. It indicated that urea did not have any effect on the gross return in the study areas (Table 7.1).

7.3.5 TSP Cost (X_5)

The regression coefficient of TSP cost (X_5) was 0.017 which was positive but insignificant. It indicated that TSP had no effect on the gross return in the study areas (Table 7.1).

7.3.6 MOP Cost (X_6)

The regression coefficient of MOP cost (X_6) was -0.043 which was negative and insignificant. It indicated that MOP had no effect on the gross return in the study areas (Table 7.1).

Table 7.1: Estimated values of the coefficients and related statistics of Cobb-Douglas production function of onion

Explanatory variables	Coefficients	Standard error	t- value
Intercept	1.406	0.601	2.34
Human labor cost (X_1)	0.523***	0.073	7.08
Land Preparation cost (X_2)	0.249***	0.077	3.23
Seed (Bulb) cost (X_3)	0.365***	0.102	3.57
Urea cost (X_4)	-0.056	0.088	-0.64
TSP cost (X_5)	0.017	0.055	0.32
MOP cost (X_6)	-0.043	0.067	-0.65
Irrigation cost (X_7)	0.114**	0.069	1.66
Insecticides cost (X_8)	-0.141***	0.052	-2.70
R^2	0.89		
Adjusted R^2	0.88		
F- value	87.95***		
Returns to scale $\sum b_i$	1.03		

Source: Field survey, 2019.

Note: *** Significant at 1% level

** Significant at 10% level

7.3.7 Irrigation Cost (X_7)

The regression coefficient of irrigation cost (X_7) was 0.114 which was positive and significant at 10 percent level. It indicated that one percent increase in irrigation cost, remaining other factors constant, would increase the gross return by 0.114% (Table 7.1).

7.3.8 Insecticides Cost (X_8)

The regression coefficient of insecticide cost (X_8) was -0.141 which was negative and significant at 1 percent level. It implied that one percent increase in insecticides cost, remaining other factors constant, would decrease the gross return by 0.141% (Table 7.1).

7.3.9 Coefficient of Multiple Determination (R^2)

The coefficient of multiple determination was 0.89. It indicated that 89% variation in the gross return was explained by the explanatory variables which were included in the model (Table 7.1).

7.3.10 Adjusted R^2

The adjusted R^2 of onion cultivation was 0.88 which indicated that 88 percent variation in the gross return were explained by the explanatory variables included in the model (Table 7.1).

7.3.11 F-value

The F-value of onion cultivation was 87.95 and highly significant at 1% level which indicated that all the included explanatory variables were important for explaining the variation in the gross return of onion (Table 7.1).

7.3.12 Returns to Scale

Returns to scale of onion cultivation were computed by adding all the coefficients. The sum of all the production coefficients of the equation was 1.03 (Table 7.1). It indicated that the production function showed increasing returns to scale.

7.4 Measurement of Resource Use Efficiency

From the analysis of the regression equation we can find out the ability of farmers to allocate resources in onion cultivation. Resources are always limited that's why it is important to ensure efficient use of resources. In order to test the efficiency of resource allocation, the ratio of MVP to MFC for each input is considered to 1 which can be written by following:

$$\frac{MVP}{MFC} = 1$$

The resources are considered to be efficiently used when the ratio of MVP to MFC is one. If the ratio is greater than 1, yield can be increased by using more resources and if the ratio is less than 1, the resources are overused which will minimize the profit (Sapkota *et.al*, 2018).

Table 7.2: Estimated resource-use efficiency in onion cultivation

Variables	Geometric -mean	Coefficient	MVP	MFC	MVP/ MFC	Comment
Gross Return	127104					
Human Labor	36443	0.523	1.82	1	1.82	Under utilized
Land Preparation	4864	0.249	6.51	1	6.51	Under utilized
Seed (bulb)	10739	0.365	4.32	1	4.32	Under utilized
Urea	1243	-0.056	-5.73	1	-5.73	Over utilized
TSP	1992	0.017	1.08	1	1.08	Under utilized
MOP	1015	-0.043	-5.38	1	-5.38	Over utilized
Irrigation	4054	0.114	3.57	1	3.57	Under utilized
Insecticides	1629	-0.141	-11.0	1	-11.0	Over utilized

Source: Field Survey, 2019.

The ratio of MVP and MFC of human labor, land preparation, seed (bulb), TSP and irrigation was positive and greater than one which implied under use of those resources. To attain efficiency and to increase the output, use of those resources should be increased. Ultimately this will maximize the gross return (Table 7.2).

The ratio of MVP and MFC of urea, MOP and insecticides was negative and less than one which indicated that farmer in the study areas using these inputs inefficiently. Cost of urea, MOP and insecticides should be reduced to mitigate the total cost of production (Table 7.2).

CHAPTER 8

PROBLEMS OF ONION CULTIVATION

CHAPTER 8
PROBLEMS OF ONION CULTIVATION

8.1 Introduction

Agriculture is considered as one of the important economic sector in Bangladesh. But now-a-days farmers are facing different problems during cultivation period. This chapter aims at identify some major constraints regarding onion cultivation.

8.2 Output Price Fluctuation

Price fluctuation was one of the main problems faced by the onion farmers in the study areas. Farmers in the study areas do not get fair price after immediate harvesting period because of ample supply. In Faridpur district, onion is cultivated on commercial basis but there is a continuous price fluctuation of onion price which ultimately make farmers to shift into other crops cultivation. Table 1.5 shows that area and production of onion in Faridpur district are fluctuating over the period. Low price of onion after harvesting period was the main reason behind this fluctuation. Approximately 92% farmers reported this problem in the study areas (Table 8.1).

8.3 High Wage Rate

High wage rate was another problem for sample farmers. During harvesting season, the wage rate was comparatively high. As onion cultivation was labor intensive, they had to hire human labor at high wage rate which was the highest cost of the total cost. Approximately 90% farmers reported this problem in the study area (Table 8.1).

8.4 High Input Cost

High input cost was another problem in the selected areas. Approximately 89% farmers were facing this problem while buying seeds, growth hormones and insecticides. Sometimes they got adulterated inputs at high price which had negative effect on their yield (Table 8.1).

8.5 Lack of Quality Seed

Production highly depends on the using of quality seed. During cultivation season, there was shortage of hybrid seeds. This was one of the limitations in the study areas. Sometimes farmers got cheated by the seed dealer and from local market in the name of hybrid seed. About 87% farmers reported this as one of the main problems in the study areas (Table 8.1).

Table 8.1: Problems of onion cultivation faced by the farmers

Type of Problems	Percentage of Farmers	Rank
Output Price Fluctuation	92	1
High Wage Rate	90	2
High Input Price	89	3
Lack of Quality Seed	87	4
Shortage of Labor	86	5
Lack of Capital	83	6
High Cost of Irrigation Water	79	7
Lack of Technical Knowledge	73	8
Storage Problem	65	9
Natural Calamities	56	10

Source: Field Survey, 2019.

Note: Farmers responded more than one approach.

8.6 Shortage of Labor

Farmers reported that there was high shortage of labor during the harvesting season. Even there was a high shortage of local labors because of their involvement in other sectors. That's why they had to hire labors from others districts at high wage rate. About 86% reported this problem as one of the main problems faced by the farmers (Table 8.1).

8.7 Lack of Capital

In the study areas, most of the farmers belong to medium size category and they were facing shortage of capital to cover operating cost. Even they did not get adequate credit facilities from the authority when they needed. It was evident from Table 8.1 that 83% farmers had faced this problem.

8.8 High Cost of Irrigation water

Irrigation is an important input for onion production. Yield of onion varies with application of water. In the study areas most of the farmers had no shallow tube well of their own. For this reason they had to pay a high amount of money to the suppliers. About 79% farmers had encountered this problem. In different areas irrigation was different but in Bhanga upazila irrigation cost was higher compared to other two (Table 8.1).

8.9 Lack of Technical Knowledge

Technical knowledge regarding agriculture effects on the production. In the study areas, farmers did not have adequate knowledge of right doses and method of using inputs and technologies. Lack of technical knowledge hindered them from using improved technology as well as declining their yields. In the study areas, most of the farmers cultivated their goods on the basis of their experience. It was reported that 73% farmers faced this problem (Table 8.1).

8.10 Storage Problem

Usually farmers do not sell their whole goods immediately after harvesting. Rather they store their production in a traditional way at their houses. Onions are highly perishable as they are extremely sensitive to heat and humidity (Greama *et al.* 2014). So they need extra care to reduce the wastage. Availability of storage facilities was so poor that they rather stored their onion at their houses. To reduce the wastage caused by poor storage system, they need knowledge about how to improve that system or government should provide some storage facilities that might reduce their yield. Ultimately it will reduce the production waste. About 65% faced this problem in the study areas (Table 8.1).

8.11 Natural Calamities

Natural calamities like drought, high temperature, excessive rainfall, acute cold etc. hinders the yield of the farmers. Excessive rainfall during harvesting reduces both the quantity and storability of onion. In the study areas most of them were not aware of the weather forecast. As a result they did not take any precaution which caused huge loss. About 56% farmers faced this problems due to heavy cold and rainfall (Table 8.1).

CHAPTER 9

SUMMARY, CONCLUSION AND RECOMMENDATIONS

CHAPTER 9
SUMMARY, CONCLUSION AND RECOMMENDATIONS

9.1 Introduction

This chapter focuses on the summary of the previous chapters and conclusion has been made on the basis of the empirical result. Besides this, recommendation are drawn for further improvement of onion cultivation.

9.2 Summary

Developing country like Bangladesh, agriculture is the key player of economic sector. This sector has a great impact on macroeconomic objectives like employment generation, poverty alleviation and food security. Agriculture provides employment to 40.6% of her total labor forces. It also contributes to 13.60% GDP.

In our country onion is known as winter spices crop and is grown in winter. Bangladesh requires huge amount of onion per annum to meet her domestic demand. But Bangladesh produces only 1737714 MT of onion. So we have to increase the production of onion per year. Winter varieties usually grow at Faridpur, Pabna, Rajshahi, Rangpur, Manikganj etc. during the period of Dec-May. Total area under onion production was 178585.02 hectares and total production was 1737714 MT during the period of 2017-18. Among all districts, Faridpur covers a huge area of land use for onion production.

For this study, samples were randomly collected from three upazila of Faridpur where onion cultivation was intensive. A total of 90 farmers were selected where each upazila represents 30 respondents. Data were collected during the period from July to August 2019. Primary data were collected from selected farmers through face to face interview. Questions were asked based on the pre-scheduled questionnaires. All the data were computerized, summed up and scrutinized carefully to mitigate all possible errors. Both tabular and functional analysis had been done by using MS Excel and STATA programs to get the related statistics and parameters.

Socio-economic characteristics of the farmers includes age, education level, occupation level, farms size, experience etc. Maximum age of the farmers was 78 years. It was evident from the study that all farmers were more or less educated. In Bhanga upazila 6.7 percent respondents had completed graduation. It was found that the percentage of primary level education was largest in all areas. Agriculture was their main occupation in the study areas. Besides this, they were involved in other occupations like business, service etc. Most of the farmers had the range of 15-30 years farming experience. The average farm size of onion farmers was 0.95 ha.

Prevailing market price was used to estimate the cost of purchased inputs and for home supplied inputs opportunity cost principles was used. 5.5% bank interest rate per annum was used to calculate the opportunity cost of operating capital.

Profitability was measured on the basis of net return, gross margin and benefit cost ratio. On an average, per hectare human labor was 227 man-days. The quantity of human labor used in onion cultivation was 219, 235 and 227 man-days per hectare for Nagarkanda, Bhanga and Sadarpur respectively. The total cost of human labor was Tk. 90723. Highest per hectare human labor cost was found in Bhanga upazila (Tk. 93815) followed by that of Sadarpur (Tk. 90653) and Nagarkanda (Tk. 87701). The average per hectare land preparation cost was (Tk. 13466). Farmers in Sadarpur upazila (Tk. 15283) spent more money on land preparation. On an average, per hectare seed (bulb) cost was Tk. 28389. Farmers used different types of fertilizers in the study areas. Overall quantity of Urea, TSP, MOP, Zink, Gypsum, DAP were 227 kg, 217 kg, 207 kg, 8 kg, 11 kg and 69 kg respectively and the average cost of those fertilizers were Tk. 3644, Tk. 5920, Tk. 3108, Tk. 1323, Tk. 1333 and Tk. 1785 respectively. On an average, per hectare growth hormone cost was Tk. 4283. The average cost of irrigation was Tk. 11586 which represented 6.22 percent of total cost. On an average insecticides cost was Tk. 5290. On an average total variable cost was Tk. 173982 which was 93.57 percent of total cost.

The average total cost was Tk. 185979. Per hectare total cost was highest in Bhanga upazila (Tk. 196399) because most of the inputs cost were also highest in Bhanga.

The average yield and price per kg were 11833 kg and Tk. 28. Per hectare yield was found higher in Nagarkanda (12084 kg) followed by that of Sadarpur (11871 kg) and Bhanga (11544 kg). On an average per hectare gross return, gross margin and net return were Tk. 335173, Tk. 161191 and Tk. 149194 respectively. BCR on full cost basis and cash cost basis were higher in Nagarkanda compared to the other two because of the high yield, moderate per unit price as well as lowest total cost. The average BCR on full cost basis was 1.80 which implies that one taka investment generated 1.80 taka. The average BCR on cash cost basis was 1.93. From the above results we can see that onion cultivation was profitable in the study areas.

To estimate the effects of main variables, Cobb-Douglas production function model was used. The explanatory variables were human labor, land preparation, seed, urea, TSP, MOP, irrigation and insecticides. Among the included variables human labor, land preparation, seed and irrigation showed positive and significant effect on gross return. On the other hand, insecticides showed negative significant effect on gross return and rest of them had insignificant effect.

The coefficient of multiple determinations, R^2, was 0.89 which indicated that 89% of the variation of gross return was explained by the included explanatory variables. The F-value was 87.95 and highly significant at one percent probability level which indicated good fit of the model. The returns to scale was 1.03 which implied increasing returns to scale.

In measuring resource use efficiency, it indicated that all the resources were under used except urea, MOP and insecticides.

9.3 Conclusion

From the result of present study, it revealed that onion cultivation was profitable. So onion cultivation in the study areas could help in increasing income, employment and overall standard of living of onion farmers. The present study indicates that there is an opportunity to increase production to a large extent using the existing level of agricultural inputs, agricultural extension services and modern technology. Farmers in the study areas cultivate winter onion. Most of them have little knowledge about

summer onion. Summer onion varieties has a high yielding rate compared to the winter varieties. To some extent they started cultivating summer onion. Farmers in the study areas did not know about the application of right doses of inputs. Providing training according to their needs and problems may lead them to enhance production and income from onion cultivation.

9.4 Recommendations

This thesis paper revealed that onion cultivation was profitable in the study areas. So there was a great opportunity to enhance the productivity of onion due to its high demands. Some policy recommendations from the results of this paper are given below:

I. Disease resistance, good quality and high yielding varieties of seeds need to be provided to the farmers at reasonable price.
II. Supply of inputs should be ensured in right time at reasonable price and adulteration should be controlled strictly. In this case market should be monitored as well as government should take action against adulteration of inputs specially fertilizers and those whom ask high price over government fixed price.
III. Fair price should be ensured after harvesting period which would encourage them to cultivate in the following season. During harvesting period, government should ban import of onion from other countries as well as they should directly buy onion from the farmers. As a result farmers will get good price for their products.
IV. Capital shortage was another problem faced by the farmers throughout their production process. So credit facilities should be made available to farmers on easy terms.
V. To develop technical knowledge of the farmers, more training on onion cultivation should be provided by government and NGOs.

9.5 Limitations of the Study

There were some limitations during the survey conducting period. The researcher had to face the following problems in collecting data from the field.

I. Farmers did not keep any records of their farming. So, most of the answers were from their memory.
II. Sometimes respondents could not answer to questions accurately.
III. Farmers provided data in local units of measures in response to questions.
IV. Sometimes respondents did not cooperate willingly to provide information. So researcher had to put extra effort during the interview.
V. Most of the farmers did not have any knowledge about research study. Therefore, it was difficult to explain.

9.6 Scope for Further Study

The study might provide some valuable information to the farmers, extension workers, researchers and policy makers. Due to the limitation of time and resources, this study could not cover some important areas. Above all it is not free from criticism. The weaknesses of the study may open door to other researchers for further research which are given below:

I. A study on financial profitability of onion cultivation based on different farmer categories can be done.
II. Comparative study can be undertaken to assess the relative profitability of onion and garlic or other spices in the study areas.
III. The present study is performed to assess the profitability of onion but there is a scope for analyzing technical efficiency of onion in the study areas.
IV. A study on different types of onion varieties can be undertaken to assess the effect on yield.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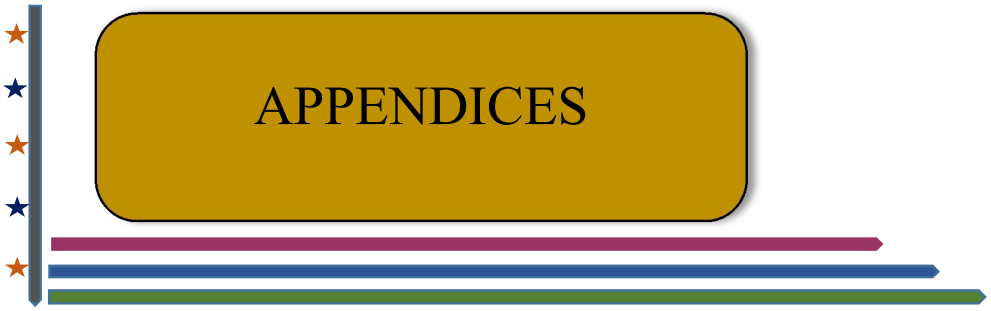
APPENDICES

APPENDIX I

Table A.1.1: Area and production of onion in Bangladesh from 2010-11 to 2017-18

Year	Area ('000' ha)	Production ('000' MT)
2010-11	128	1051
2011-12	136	1159
2012-13	134	1168
2013-14	151	1387
2014-15	170	1704
2015-16	177	1735
2016-17	186	1867
2017-18	179	1738

Source: Field Survey, 2019.

APPENDIX II

Department of Agricultural Economics

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INTERVIEW SCHEDULE ON

PROFITABILITY AND RESOURCE USE EFFICIENCY OF ONION CULTIVATION IN FARIDPUR DISTRICT

Sample No. ☐

Name of farmer: ……..

Village: ……. Upazila:……..

District: …….. Mobile No.:……..

1. Socio-economic profile of the farmer:

1.1: General information

a.	Age:		
b.	Educational Status: (put tick marks)		
	○ Illiterate ○ can sign only ○ Primary ○ Secondary ○ Higher Secondary ○ Degree		
c.	Main Occupation:	d.	Subsidiary Occupation:
e.	Farming experience: (year)		

1.2: Family Size

a.	Total family member:
b.	Male:
c.	Female:
d.	How many members involved in agriculture? _____

1.3: Opportunity cost of mortgaged or leased land during the cultivation period

_____ Tk.

1.4: Farm Size

Types of land		Area	
		Local Unit	Hectare
a.	Homestead land		
b.	Own cultivated land		
c.	Rent/ Mortgaged in		
d.	Rent/ Mortgaged out		
e.	Others		
Total			

1.5: Farmers Income Source

Agricultural source		Non-agricultural source	
Crop	Amount (Tk.)	Income source	Amount (Tk.)
a. Jute		a. Business	
b. Wheat		b. Service	
c. Rice		c. Driver	
d. Pulse crop		d. Shopkeeper	
e. Spices crop		e. Others	
f. Others			

2. Crop (Onion) Cultivation Related Information:

2.1: General Information

a.	Onion cultivated land (bigha)	
b.	Variety name	
c.	Seed (bulb) source:	
d.	Seed (bulb) amount (kg/bigha)	
e.	Seed (bulb) price (Tk./kg)	
f.	Seed planting month	

2.2: Details about Land Preparation

Particulars	Rent (No.)	Medium (put tick mark)	Cost (Per tillage in 1 bigha)	Total(Tk.)
Tillage No.		Power tiller/tractor		
Laddering No.		Power tiller/tractor		
Total				

2.3: Material Inputs Used

Particulars	Amount (kg)	Price (Tk./kg)	Total (Tk.)
Fertilizer:			
a. Urea			
b. TSP			
c. MOP			
d. Zink			
e. Gypsum			
f. DAP			
g. Organic fertilizer			
h. Others			
Irrigation			
Insecticides			
Growth hormone			
Total			

2.4: Human Labor Requirement

Name of items	Wage (Tk./man-days)	No. of labor		Working hour	Total Man-days	Total (Tk.)
		Own	Hired			
Land preparation						
Transplanting						
Fertilizer application						
Insecticides application						
Hoeing/Weeding						
Harvesting						
Others						
Total						

2.5: Amount of Onion Production

Yield (mounds)	
Price (Tk./mounds)	
Highest Price (Tk./mounds)	
Lowest Price (Tk./mounds)	
Total (Tk)	
Price per unit (Tk./kg)	

3. Crop (Onion) Cultivation Related Problems and Suggestions:

3.1: Mention some problems faced by you during onion cultivation:

a.

b.

c.

d.

e.

3.2: What are your suggestion to overcome the above problems?

a.

b.

c.

d.

e.

Thank you for your kind co-operation

Date:

…….....

Signature of the interviewer