# FINANCIAL PROFITABILITY AND RESOURCE USE EFFICIENCY OF TUBEROSE CULTIVATION IN JASHORE DISTRICT OF BANGLADESH

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# FINANCIAL PROFITABILITY AND RESOURCE USE EFFICIENCY OF TUBEROSE CULTIVATION IN JASHORE DISTRICT OF BANGLADESH

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# CERTIFICATE

This is to certify that the thesis entitled "**FINANCIAL PROFITABILITY AND RESOURCE USE EFFICIENCY OF TUBEROSE CULTIVATION IN JASHORE DISTRICT OF BANGLADESH**" submitted to the Department of Agricultural Economics, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science (MS) in AGRICULTURAL ECONOMICS** embodies the result of a piece of *bona-fide* research work carried out by **SADIA ISLAM ORIN, Registration No. 14-05936** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

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# Dedicated to My Beloved Parents

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## TABLE OF CONTENTS


| ITEMS | PAGE |
|---|---|
| **ACKNOWLEDGEMENTS** | i |
| **TABLE OF CONTENTS** | ii-iv |
| **LIST OF TABLE** | v |
| **LIST OF FIGURE** | v |
| **ABSTRACT** | vi |

| CHAPTER | TITLE | PAGE |
|---|---|---|
| **CHAPTER I** | **INTRODUCTION** | 1-6 |
| | 1.1 Global floriculture | 1-2 |
| | 1.2 Bangladesh floriculture | 2-3 |
| | 1.3 Origin and development of tuberose | 3 |
| | 1.4 Justification of the study | 4 |
| | 1.5 Objectives of the study | 5 |
| | 1.6 Outline of the study | 5-6 |
| | 1.7 Limitation and scope of the study | |
| **CHAPTER II** | **REVIEW OF LITERATURE** | 7-11 |
| **CHAPTER III** | **MTHODOLOGY** | 12-23 |
| | 3.1 Selection of the study areas | 12-13 |
| | 3.2 Selection of sample and sample size | 14 |
| | 3.3 Preparation of interview schedule | 14 |
| | 3.4 Period of data collection | 14 |

| | | |
|---|---|---|
| | 3.5 Method of data collection | 15 |
| | 3.6 Processing of data | 15 |
| | 3.7 Analytical technique | 15-16 |
| | 3.8 Financial profitability of tuberose | 16 |
| | 3.8.1 Cost items | 16-19 |
| | 3.8.2 Return items | 19 |
| | 3.8.3 Analysis of data | 19 |
| | 3.8.4 Profitability analysis | 19-20 |
| | 3.8.5 Functional analysis | 20-21 |
| | 3.9 Resource use efficiency | 21-23 |
| **CHAPTER IV** | **SOCIO-DEMOGRAHIC PROFILE OF TUBEROSE FARMERS** | 24-28 |
| | 4.1 Distribution of age of the sample farmers | 24-25 |
| | 4.2 Education status of sample farmers | 25-26 |
| | 4.3 Occupation of sample farmers | 26-27 |
| | 4.4 Land ownership pattern of sample farmer | 28 |
| **CHAPTER V** | **PROFITABILITY ANALYSIS** | 29-34 |
| | 5.1 Input used and cost of tuberose cultivation | 29 |
| | 5.1.1 Cost of human labor | 29 |
| | 5.1.2 Mechanical and animal power cost | 29-30 |
| | 5.1.3 Material input cost | 29-31 |
| | 5.1.4 Interest on operating capital | 32 |
| | 5.1.5 Total variable cost | 32 |

| | | |
|---|---|---|
| | 5.1.6 Land used cost | 32 |
| | 5.1.7 Total fixed cost | 32 |
| | 5.1.8 Total cost | 32-33 |
| | 5.2 Return of tuberose cultivation | 33 |
| | 5.2.1 Gross return | 33 |
| | 5.2.2 Gross margin | 33 |
| | 5.2.3 Net return | 34 |
| | 5.3 Benefit- Cost ratio | 34 |
| **CHAPTER VI** | **RESOURCE USE EFFICIENCY OF TUBEROSE CULTIVATION** | 35-38 |
| | 6.1 Factors affecting the return from tuberose cultivation | 35-36 |
| | 6.1.1 Interpretation of production function | 36 |
| | 6.1.2 Returns to scale | 37 |
| | 6.2 Findings of resource use efficiency | 37-38 |
| **CHAPTER VII** | **CONSTRAINTS FACED BY TUBEROSE FARMERS** | 39-42 |
| | 7.1 Constraints faced by farmers | 39-41 |
| | 7.2 Suggestions for solving the problems in tuberose cultivation | 42 |
| **CHAPTER VIII** | **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS** | 43-45 |
| | 8.1 Summary | 43-44 |
| | 8.2 Conclusion | 44 |
| | 8.3 Recommendation | 45 |
| | **REFERENCE** | 46-49 |

## LIST OF TABLE


| TABLE TITLE | PAGE |
|---|---|
| Table 4.1 Land ownership pattern of sample farmers | 28 |
| Table 5.1 Cost of labor used for tuberose cultivation | 29 |
| Table 5.2 Cost of mechanical and animal Power | 30 |
| Table 5.3 Material input cost for producing tuberose | 31 |
| Table 5.4 Calculation of total cost | 33 |
| Table 5.5 Calculation of gross return | 33 |
| Table 5.6 Calculation of net return and BCR | 34 |
| Table 6.1 Estimated co-efficient and their related statistics of tuberose cultivation | 35 |
| Table 6.2 Resource use efficiency of tuberose cultivation | 37 |
| Table 7.1 Problems of tuberose production faced by the farmers | 40 |


## LIST OF FIGURE


| FIGURE TITLE | PAGE |
|---|---|
| Figure1.1: Worldwide consumption of flower. | 2 |
| Figure 3.1: Map of Jhikargacha upazila (study area) of Jashore District. | 13 |
| Figure 4.1 Age distribution of farmers | 25 |
| Figure 4.2 Education status of sample farmer | 26 |
| Figure 4.3 Main occupation of sample farmers | 27 |
| Figure 4.4 Subsidiary occupation of sample farmers | 27 |

# ABSTRACT

The present study was undertaken to determine the financial profitability and resource use efficiency of Tuberose cultivation in some selected area of Jashore district. Data were collected from randomly selected 100 farmers using an interview schedule as the sample of the study from a population 430 farmers of Jhikargacha upazila under Jashore district. Descriptive statistics along with a production function analysis was carried out to achieve the objectives of the study. Tuberose cultivation is profitable in the study area. The results revealed that per hectare average costs of tuberose cultivation were estimated at Tk.2,12,920 .Average yield was estimated 3, 35,775 stick per hectare. The gross return and net return were Tk. 6, 82,550 and Tk. 4,69,630 per hectare respectively. Undiscounted Benefit Cost Ratio (BCR) was found 3.2. The production function exhibited increasing returns to scale. Production function analysis suggested that human labor, bulb and Manure had positive and significant effect on the yield of Tuberose. The ratio of MVP and MFC of Human labor, bulb, Manure, Urea, TSP and MoP was found 2.5, 12.9, 4.7, -11.8, 7.01 and 6.5 respectively. It indicates that farmers in the study area over utilizing Urea while Human Labor, bulb, Manure, TSP and MoP were underutilized. The lack of scientific knowledge, high yielding variety and lack of storage facilities were reported to be major problems in tuberose cultivation. Supply of credit on easy terms, supply of inputs and machinery by responsible authority, formation of farmer's organization can play an important role in increasing tuberose production.

# CHAPTER I

# INTRODUCTION

Floriculture, a branch of horticultural science comprises the production segments of cut-flower, live plants, floral greens, dried flower, ornamental plants etc. and their marketing, Unlike other agriculture commodities, floriculture encompasses thousands of different plant species and a number of unique cultivars. Flowers have been associated with mankind since time immemorial. Cultivation of flowers and ornamentals for various religious and cultural festivals such as worshipping, religious and social function has existed in all civilized societies as well as Bangladesh for ages. But in the present time, flower and foliages becomes important not only for their aesthetic and social value, but also for their economic contribution. Production and trade with this crop are now very much specialized in the developed and developing countries with a significant contribution to their national economy. Floriculture has emerged as a profitable agri-business option in the world in recent years, particularly in the developing nations. With increasing demand and consumption, production has increased and non-traditional areas have emerged as important players in floriculture production. Due to increasing demand, it is now being considered as an international trade commodity. Many developing countries like, Netherland, Colombia, Ecuador, Kenya and Israel are earning significant amount of foreign currency by exporting flowers. World floriculture trade totals more than USS 7,907 million (Dadlani, 2003). The cut flower constitute 45 percent share of the total world trade in floricultural product.

## 1.1 **Global Floriculture**

The world floriculture industry is in a state of unrest, with drastic changes in supply and demand positions. New markets as well as new suppliers are emerging and disappearing in short span of time. The growth potential of the industry though affected significantly by recent global economic crisis; nevertheless, the global exports has been growing at an annual average growth rate of 10.3 percent, and of this growth rate world exports are expected to reach USS 25 billion by 2012 (Anon., 2010). In terms of total area in production, Asia-Pacific with an area of 2, 44.263 ha accounts for nearly 60% of the total world area which is estimated to be nearly 4, 00,000 hectares. The world floriculture trade

is characterized by a high degree of concentration by product and sources. Developed countries in Europe, America, and Asia account for more than 90 percent of the total world trade in Horticulture products (Figure 1). Estimates of the annual consumption of commercially grown flowers worldwide vary by source and range from USS 40 - 60 billion (Anon., 2010).

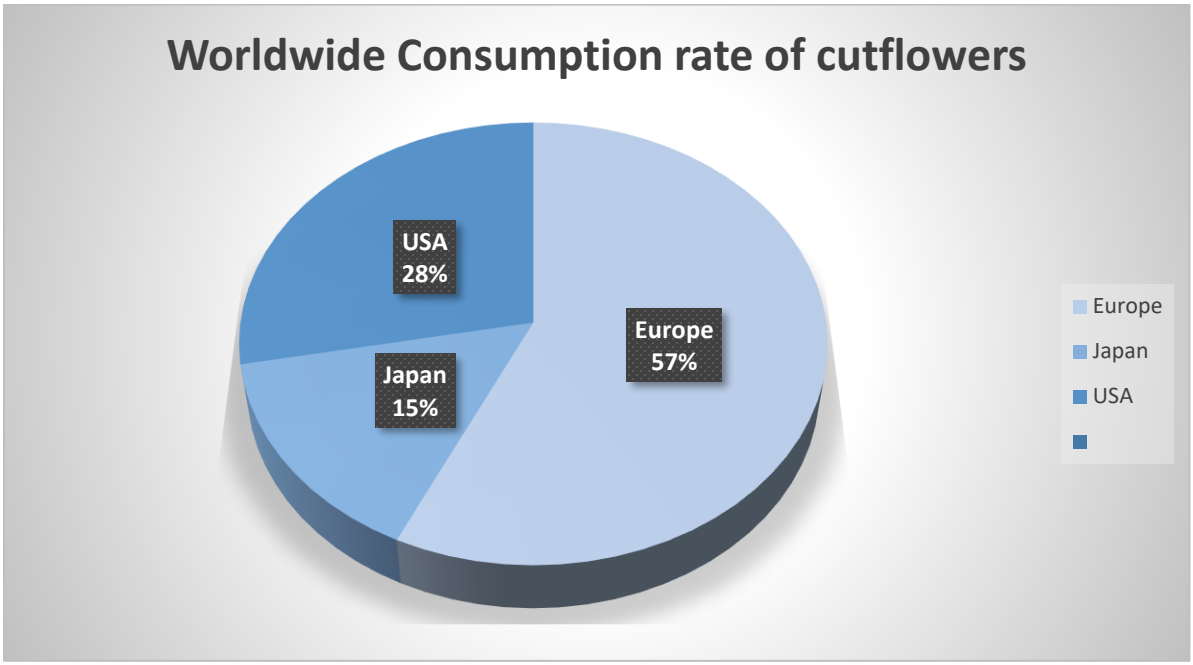



Figure1.1: Worldwide consumption of Flower. (Anon., 2010)

On the demand side, around 80 percent of the consumption is accounted for by six countries, such as, Germany, USA, UK, France, the Netherlands and Switzerland. When worldwide consumption has been on the rise, at the same time, consumers have also become more refined in demanding new products.

### 1.2 Bangladesh Floriculture

In Bangladesh floriculture practices has been done for many decades by traditional way but production restricted however mainly for self-use. In the recent years commercial floriculture cultivation has been oriented. Floriculture, with its ability to yield higher economic returns per unit area is slowly gaining ground in the diversification plan in agriculture Small sized farm has the possibility of practicing commercial activity, mainly household labor utilization, supported by growing demands for the floriculture products in

the fast developing domestic market, has led to the area under flower production to increase substantially in the recent past.

Available information shows, floriculture has not received any organized interventions for development. The growth which has been witnessed in the recent years in this sector has been solely due to the efforts of growers and their confidence in flower production activity to yield higher income and profitability per unit area as compared to other crops. Cultivation of flower crops is reported to give 3-5 times higher returns than paddy and 15 -2 times from vegetables (Dadlani, 2003). According to Dadlani (2003), Bangladesh has very good potentialities to become an important supplier of lower and ornamental plants for Asia, the Middle East and Europe. But the records of commercial activity in the field are very few. Due to lack of statistical information, it is necessary to keep track of these data accurately as is done for other horticultural crops. Market demand for natural flower is constant and can depend on the seasons. Market demand tends to be significantly higher in urban areas then rural areas. At present approximately 10,000-12,000 farm families are involved in floriculture business for their livelihood. The annual turnover in this sector is about Tk 400 million. Our export earning in this sector increased from LS 5734 million in 2004-05 15 US $55.97 million in -6. This shows an increasing trend of flower export of Bangladesh Posts gladiolus tuberose, orchid, dahlia, and marigold. Jipsophilla, kathbeli, chrysanthemum. Calendula, zinnia, lily, carnation, aster, Jasmines, red ginger etc. are the examples of some important cut flowers with high demand in the fresh Mower market. According to Ara (2010) the total area under floriculture crops in different parts of Bangladesh is about 10.000 ha of which 70% of this area is under flower production and the rest being devoted to ornamental nursery business.

### 1.3 Origin and Development of Tuberose

Tuberose *(Polianthes tuberosa*) is commonly known as Rajanigandha in Bengali and Hindi and Gulo-e-Shabu in Urdu (Bose and Yadav, 1989).Tuberose is a native of Mexico from where it spread to the different parts of the world during 16' century. The name tuberose is derived from Tuberosa, this plant being the tuberose hyacinth as distinguished from the bulbous hyacinth. How and when the tuberose found its way to Bangladesh, India and later to Sri Lanka and elsewhere in the orient is probably an unanswerable question, but it was

first introduced in this sub-continent in India during the period of Mughals from England and other European countries mainly by the English and the Portuguese, missionary priests and individual amateur gardeners (Das et al.,1988).In Bangladesh, its commercial cultivation was introduced during 1980 by some pioneer and innovative farmers at Panishara union of Jhikargacha thana under Jessore district. Now a days tuberose commercially cultivated in Jessore (Sharsha, Chaugacha, Chikorgacha), Satkhira. Bogra Comilla and Chittagong district.

Tuberose is half hardy bulbous perennial plants perpetuating itself through the bulb lets. There are three types of tuberose:

1. Single with one row of corolla segment.
2. Semi-double bearing flowers with two to three rows of segment.
3. Double having more than three row of corolla segment.

Single flower type is more fragrant and it is more widely cultivated than the other types. It may be noted that in Bangladesh the production pattern of tuberose can be grouped into two categories; some are cultivated for sale as cut flower while others are planted in garden mainly for display.

**1.4 Justification of the Study**

In Bangladesh, tuberose is grown in limited area on commercial basis. However, there is a demand for tuberose all over the country. Farmers allocate land and other resources in the production of different vegetables and cereal crops on the basis of relative financial profitability & resource efficiency. With the rapid increase of different types of occasion and programs and national days, the demand for flower has been increasing. To meet up growing demand of tuberose; cultivable area of tuberose should be increased.

It is noted that no intensive study has yet been conducted on profitability and resource use efficiency of tuberose in Jashore district in the recent time. On the other hand, there are some studies related to commercial flower cultivation and its profitability, but very few researches has been reported at home and abroad to determine profitability and resource use efficiency of tuberose. So there is a gap in information. From this point of view the present study is undertaken to analyze the profitability and resource use efficiency

of tuberose in Jashore district. This study may provide valuable information for the policy makers of the Government and NGOs to formulate policy aimed at increasing production and improvement in flower marketing. This study can be a base for conducting further studies on flower production**.**

### 1.5 Objective of the Study

i. To identify the socio-demographic profile of tuberose producers.
ii. To assess the financial profitability of tuberose cultivation.
iii. To estimate the resource use efficiency of tuberose cultivation.
iv. To identify the constraints faced by tuberose producer during their cultivation and to recommend some suggestions.

### 1.6 Outline of the Study

This paper contains a total of eight chapters which have been organized in the following sequence. Chapter I includes Introduction including the background, justification and objectives of the study. The review of literature is presented in Chapter II. Methodology of the relevant study is discussed in Chapter III. Chapter IV contains the socio-demographic profile of tuberose producing farmers. Chapter V deals with the profitability analysis of tuberose cultivation. Chapter VI describes the resource use efficiency of tuberose cultivation. Chapter VII find out the problems and constraints confronted by the farmers in case of tuberose cultivation. Summary, conclusion and recommendations to increase tuberose roduction discussed in Chapter VIII.

### 1.7 Scope and Limitation of the Study

The findings of the study will be applicable to Jhikorgacha upazila under Jashore district. However, the findings may also have implication to other areas of Bangladesh with similar physical, socio-economic, cultural and geographical conditions. The findings will be of special interest to the students, researcher, extension workers and particularly policy makers in formulation and redesigning the programs especially for increasing commercial flower cultivation. The findings are expected to be helpful to the field workers of various organizations to work with farmers' community more effectively. Almost all research studies have some limitations considering the availability of time, financial support and

personnel. To make the study manageable and meaningful, it was necessary to impose certain limitations as noted below:

i. The study was confined to Jhikorgacha upazila under Jashore district where production and trading was concentrated. So the findings of the study may not represent situation of the whole country.

ii. Due to shortage of time, the study could not cover wide areas for collecting necessary information.

iii. No written record was maintained by the respondents so the researcher had to depend solely on the memory of the respondents. One production cycle of tuberose is completed in one year, so the collection of the information on costs and returns of the one year production cycle was difficult from the memory of the respondents, especially at farmer's level initially the flower farmers were unwilling to co-operate with the researcher. They thought that data would be used by Government personnel to impose tax on their forming business. But researcher himself tries to understand them that information was needed for an educational purpose and finally took the information.

iv. Findings of the study could not be generalized for improving the whole tuberose producing system of the country due to the above limitations. In spite of the above limitations, some findings of the study could be cautiously used in providing important clues and information for decision makers and others.

# CHAPTER II

# REVIEW OF LITERATURE

Review of literature is crucially imperative for any scientific research. It helps to identify prevailing knowledge gap of any research area. It also assists in developing a sound methodology for carrying out study and to relate the research findings with the past experience. Keeping this aspect in view, a thorough review of related literature is presented in this Chapter. The related issues were reviewed and presented in the following sections: Siddika (2004) conducted a study on Marketing of commercial cut-flower in Bangladesh". This study examined the marketing system of some selected flowers such as tuberose, rose, gladiolus and marigold prepared with the help of primary and secondary data. Study areas were primary market (Jessore), wholesale market (Dhaka city) and retail market (Dhaka city). Among the four flowers, cost of production was highest for rose (Tk. 198095/ha) and lowest for marigold (Tk. 87,671/ha). The highest net return was earned from rose (TK. 157405/ha) followed by tuberose (Tk. 13,178/ha), marigold (Tk. 79,223/ha) and gladiolus (Tk. 87,651/ha). Tuberose was considered more profitable than other flowers. Total marketing cost per hundred flowers was highest for retailers (Tk. 37) and lowest for wholesaler cum retailers (Tk. 6.04). Marketing margin was higher for retailers (Tk. 65) followed by local traders (Tk. 19) and wholesaler cum retailers (Tk. 14). The net marketing margin was highest for retailers (Tk.19) because they changed its form and sold it to the users and lowest for the local traders (TK. 7). She found that Bangladesh has a scope for expanding floriculture export as it enjoys comparative advantages in term of favorable agro-climatic conditions to meet seasonal market opportunities in the overseas market as well as low cost of production because of cheap labor.

**Raha and Siddika (2014)** conducted a study on "Price spread in cut-flower marketing: some evidence from Bangladesh". They examined the existing marketing system, estimated marketing cost, margins of different flowers of different marketing channels. They showed that flower growers received 30.75% to 60.42% of the consumer's taka while 24.71% to 58.5% were spent as the marketing cost. The net marketing margin varied from 30% -37.83% of consumer's taka. Growers used channel (Flower grower to local trader to wholesaler cum retailer to retailer to consumer) most though it involved highest cost of all

the channels. Adoption of proper measure for the solution of the current problems would improve the efficiency of the marketing system which will in turn increase grower's share in consumer's taka.

**Kumar *et al*. 2003** studied the effect of bulb size (((<1.5, 1.5-2.5 or 2.5-3.5 cm) and spacing (20 × 20, 25 × 25 and 30 × 30 cm) and planting depth (3, 6 or 9 cm) on growth and development of tuberose (Polianthes tuberosa cv. Single) in Unium, Meghalays, India, during 1998 and 1999. Sprouting was delayed with the increase in bulb size, planting depth and reduction in spacing. Large bulb resulted in the earliest spike emergence (93.89 days). Spike emergence delayed with the increase of the planting depth. Spike lengths 88.78 and 89.37 cm and rachis lengths 19.76 and 20.06 cm were greatest with medium and large bulbs. The depth of planting was inversely related to flower quality in terms of spike and rachis length.

**Misra *et al*. (2000)** studied the effect of bulb size and spacing (10 × 30, 15 × 30, 20 × 30 and 30 × 30 cm) on growth and flowering of tuberose (P. tuberosa) cultivars (Single and double) in Faizabad, Uttar Pradesh. India, during 1997-98. Bulb size significantly influenced spikes initiation in both cultivars. The maximum days for spike initiation by smaller bulb size was 170.8 and 222.7 days for single and double cultivars, respectively. The larger bulb size produced the highest number of spikes/plant for both cultivars. With closer spacing, the plants took a longer time to produce spikes than wider-spaced plants.

**Behari (1998)** has written a comprehensive overview of marketing of cut flower in India. In this article he dealt with production, marketing, marketing channel, post highest treatments, quality standard and grading and export of cut flower in India. He has also discussed a number of issues related to production, post-harvest processing and preservation, quality control and plant health regulation etc. issues related to cut flower.

**Hassan (1996)** conducted a study to identify the production, marketing system, their profits, acceptability, problems, and offered suggestion in tuberose marketing in Jessore and Dhaka city. The sample of the study included 40 farmers, 30 traders and 30 users. He reported that monthly gross margin of large, medium and small traders for 100 flowers

were Tk. 100, Tk. 105, and Tk. 110 respectively. Marketing cost of large, medium and small traders were Tk. 49.50, Tk. 43.50 and Tk. 79.00 respectively for 100 sticks of flower. For 100 sticks of flowers, net margin were calculated at Tk. 52.50, Tk. 61.50 and Tk. 31.00 per month for large, medium and small tråders respectively.

**Baksh and Elias (1995)** carried out a study on "Return from tuberose: a sustainable farm a income in Jessore region". This study documented the extent and causes of adoption of tuberose, yield and sustainability of returns. It was observed that tuberose cultivation gaining popularity day by day. The area of cultivation has been increased up to 450% from 1988 to 1992. Higher profit, sustainable return throughout the year, and risk and uncertainty of other crop prices were the main causes of growing tuberose commercially by the farmers. Farmers harvested tuberose sticks for two to three consecutive years by planting once. The highest yield was found in second year compared to first and third year. Tuberose yielded the highest number of Power sticks during July-August. Net return, net present value (NPV) and benefit cost ratio (BCR) were higher during second year followed by third and first year respectively although farmers invested more in third year.

**Baksh and Elias (1995)** conducted a survey on "Tuberose cultivation in Jessore region: an agro-economic assessment". The study revealed the existing production techniques, economic viabilities and identified the constraints to higher production of tuberose cultivation. They found that majority of the farmers cultivated tuberose commercially for two to three consecutive years by planting one time, Plant spacing was maintained Slem x 31 cm accommodating about 63251 numbers of hills per hectare. The study reveals that higher number of irrigation and more chemical fertilizers were used in third year while highest yield (1291830 no. stick/ha) was obtained in second year followed by third year. Flower stick harvesting was peaked during July August compared to other months. Net return was highest in second year (Tk. 327907/ha) followed by third year (Tk. 209738/ha). They also found that lack of awareness about modern tuberose cultivation techniques, highest input prices and insect infestation were the main constraints to higher production.

**Sultana (1995)** carried out a study on "Flower marketing in Dhaka city". She analyzed the marketing systems, buyers acceptability, problems involved and offered suggestions for

improving the present marketing systems with 30 shops and 30 flower users. She identified that monthly gross margin of large, medium and small traders were TX. 10910.55, Tk. 49920.96 and Tk. 22466.49 and their gross margin for 100 flowers were Tk. 104.88, Tk 105.71 and Tk. 122.88 respectively. Marketing costs of large, medium and small shops were Tk. 49.68, Tk. 48.67 and TK 88.48 respectively. The major problems were non-availability of sufficient flowers according to demand at right time, spoilage, and lack of adequate and suitable transportation system. For solution of the problems flower traders mentioned some measures such as establishment of modem storage facilities, improvement of cultivation practices of flower for the whole year and arrangement of contract marketing, Hossain and Rahman (1994) conducted a study on "The potential of flower marketing in Dhaka city". They analyzed the existing marketing system of cut flowers in Dhaka city from the viewpoint of demand and supply prospect. In evaluating the potentiality, the study sought opinions from the lower cultivators the sellers and the users as well as non-users of flower. The sample of the study included 20 sellers. 89 users and 11 non-users. Production trend of some selected flowers exhibited a positive growth, the total production of Tuberose, Rose, Marigold and Dahlia registered an increase of approximately 11 percent per annum. The findings of the study indicate some important characteristics of flower business. The capital investment of flower business has been increasing, the total number of shop exhibits an increasing trend merchandizing me have been diversified, the sale of flower made products is rising. The positive attitude of respondents toward flowers. Multipurpose uses of flowers increasing uses of flower made products and an unsatisfied demand of some flowers are all positive indicators of the business boom.

**Baksh and Elias (1994)** conducted a study to identify the marketing participants their profit and constraints in tuberose marketing in Jessore, Khulna and Dhaka city market their findings show that about 20960, 1530 and 675 sticks were marketed at Dhaka Khulna and Jessore towns respectively in 1993-94. During November, December supply of tuberose

was inadequate but demand was very high which resulted in higher price. On the other hand, adequate supply of tuberose stick was found during May and June and the price gain

money losses and spoilage were the main constraints for the farmers and berries in tuberose marketing.

**Aditya (1992)** conducted a survey on 20 flowers shop in Dhaka city. He studied only the output price aspect and stated that tuberose with moderate price of Tk. 2-5 per stick was the most popular. The survey also stated that the lower shops in Dhaka city were selling cut flower worth more than Tk. 12 million per annum.

**Research Gap of the study**

A general survey of the relevant literature reveals that a few studies on profitability and resource use efficiency analysis of tuberose have been conducted in different areas of Bangladesh. That is why the farmers do not know efficient use of input in their field and the marketing process. Therefore, the present study attempts to analyze the production of tuberose in some selected areas of Jashore district. This will make a scope to deliver information to the researchers and policy makers so that they can allocate available resources for enhancing tuberose production and sustainable growth in future.

# CHAPTER III

# METHODOLOGY

The credibility of the result of a scientific research depends to a great extent on the appropriate methodology used in the research. This chapter gives a detail description of the methods adopted in different stages of the study and analysis of the collected data. The researcher took great care in following a scientific and logical methodology for carrying out this research. There are various methods of collecting socio-economic data to be used in research. The present study is based on mainly primary data. In this chapter, first the procedures of selection of the study areas are discussed, which is followed by selection of samples and sampling technique and preparation of interview schedule. For the present study, survey method was used to collect data. The following steps were followed in conducting the study.

## 3.1 Selection of the Study Areas

On the basis of high concentration, Jashore district is considered as one of the leading cut flowers (such as tuberose, rose, gladiolus and marigold) producing zones in Bangladesh. There are eight upazilas under Jashore district but Jhikorgacha is the main upazila under tuberose cultivation of the district. So two unions namely Gadkhali and Panisara under Jikorgacha upazila of Jashore district were selected purposively for this study . Because these two areas are the best places where selected cut flowers are produced in larger quantity and from these places the flower are marketed in different distant markets.

**The reasons for selecting Jashore district are:**

1. An area, which produced a proportionate quantity of tuberose due to favorable physiographic condition which might help conduct the field survey more conveniently.
2. Good transportation facilities of Jashore district, which may help the survey to become less expensive and less time consuming.

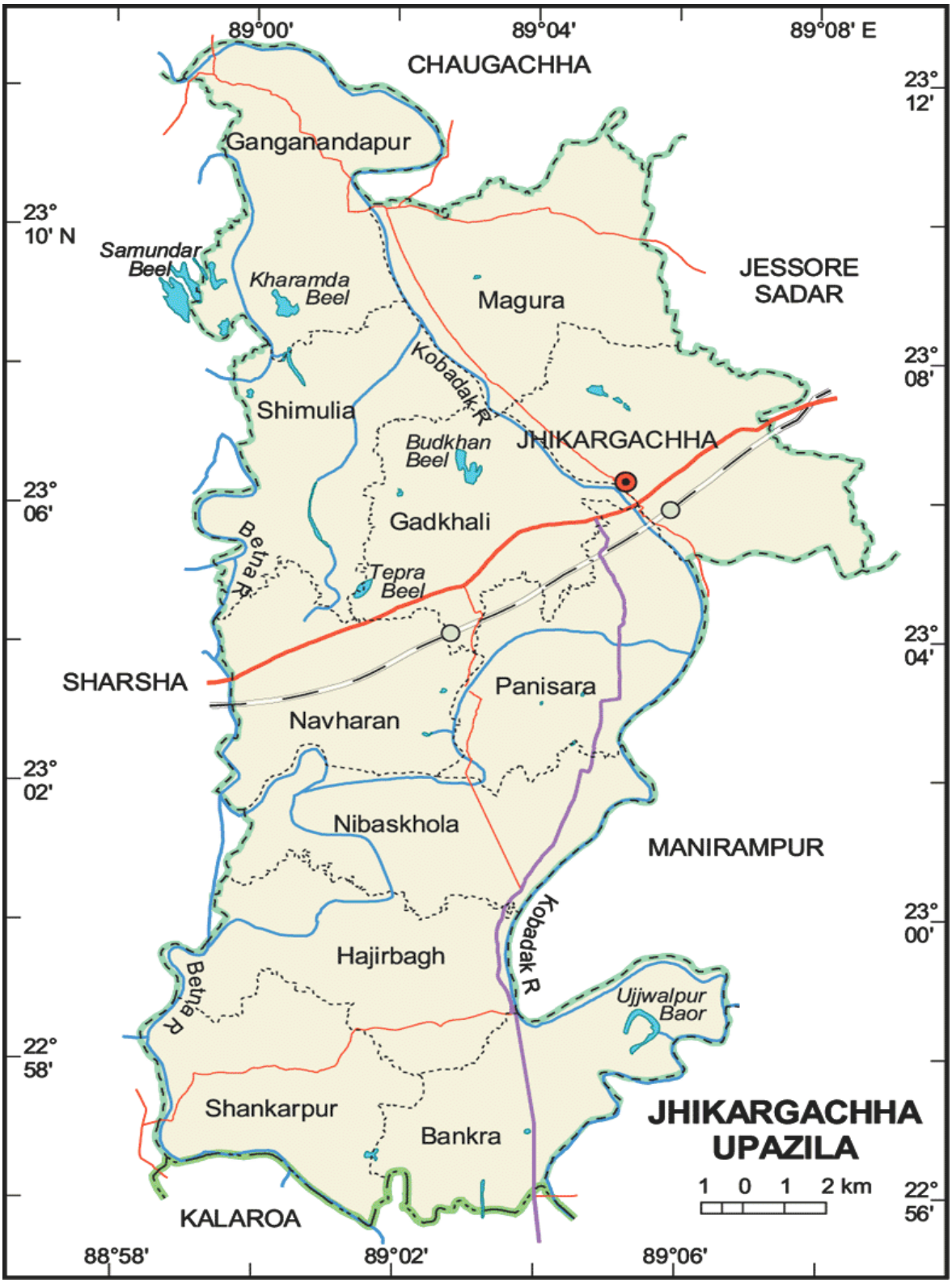



**Figure 3.1:** Map of Jhikargacha Upazila (study area) of Jashore District.

### 3.2 Selection of Sample and Sample Size

Flower farmers of the selected area constitute population of this study. A reasonable size of sample is necessary to satisfy the objectives of the study was taken into account. After purposively selecting the study area a list of tuberose farmers were prepared with the help of village leaders and field level extension personnel. Then samples of flower farmers were randomly selected in order to meet the objectives of the study. A total of 100 flower farmers were selected randomly in which 60 farmers selected fom Gadkhali union and 40 farmers selected from Panisara union of Jikargacha Upazila in Jashore district.

### 3.3 Preparation of Interview Schedule

To meet the objectives of the study a preliminary survey schedule was designed for collecting data. The draft schedule was pre-tested in the study area by the researcher himself. Thus, some parts of the draft schedule were improved, rearranged and modified in the light of the actual and practical experiences gathered from pre-testing. The following items were taken into account while preparing the questionnaire:

i. Identification of the respondent and their family composition along with information on education and occupation.
ii. Land utilization pattern.
iii. Quantity of assets and their present value.
iv. Input costs including human labor cost, bulb cost, all fertilizer cost and miscellaneous cost
v. Returns from tuberose cultivation.
vi. Problem faced by the tuberose farmers.

### 3.4 Period of Data Collection

The farmers were interviewed at their village homes from February to March, 2020 when they were generally in leisure. At first the researcher introduced himself with the farmers and explained the study objectives so that the farmers could interact with them freely in providing data. The selected farmers were directly interviewed at different points.

### 3.5 Method of Data Collection

Generally most of the farmers in Bangladesh do not keep written records of their agricultural activities. So it was very difficult to collect actual data and the researcher had to rely completely on the memory of the farmers. Primary data were collected from the respondents through face to face interview by researcher himself. During data collection the objectives of the study were clearly explained to the respondents so that they could response freely. The questions were asked systematically in a very simple manner and the information were recorded on the interview schedule. In order to minimize errors, data were collected in local units. However, those local units were later converted to standard units.

In addition to primary data, secondary data were also collected by reviewing the various articles published in different Books, Proceedings, Abstracts, Review papers, Journals, MS thesis, Ph.D. Dissertation etc. available in the library of Sher-e-Bangla Agricultural University, Horticulture Research Center of Bangladesh Agricultural Research Institute (BARI), Agricultural Economics and Rural Sociology Division of Bangladesh Agricultural Research Council (BARC) etc. Valuable suggestions from honorable major professor, course instructors and other resource personnel were taken into account to enrich the thesis paper. After collecting necessary information, it was compiled and arranged chronologically for the fulfillment of the objectives.

### 3.6 Processing of Data

All the collected data were checked and crosschecked before transferring to the computer. Therefore, these were classified, tabulated and analyzed to accomplish the specific objectives of the study. Data were presented mostly in the tabular form, because it was of simple calculation, widely used and easy to understand. Besides, functional analysis was also adopted in a small scale to arrive at expected findings. Raw data were inserted in computer using the concerned SPSS and MS Excel.

### 3.7. Analytical Technique

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

i. Tabular technique
ii. Statistical Analysis

**Tabular technique**

Tabular technique was applied to classify data in order to derive meaningful findings by using simple statistical measures like means, percentage and ratios.

**Statistical analysis**

This component of financial analysis was designed to study the factors contributing to Tuberose production and resource use efficiency. To accomplish that goal, a production function analysis was carried out to explore the contribution and

### 3.8 Financial Profitability of Tuberose

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

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

Where,

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

$P_1$ = Per unit price of the output;

$Q_1$ = Quantity of output obtained (per hectare);

$P_2$ = Per unit price of by-product;

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

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

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

TFC = Total fixed cost

#### 3.8.1 Cost Item

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

a) Variable cost
b) Fixed cost

**a) Variable cost**

This mainly includes the following heads:

i. Cost of seed
ii. Labor cost
iii. Fertilizers cost
iv. Machinery and animal cost and
v. Interest of Operating Capital

**Fixed cost**

This mainly include only:

i. Land Use Cost
ii. Family Labor

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

**Bulb Cost:** Bulb constituted the second main cost item for Tuberose farms. Cost of bulb is the money value of total costs of Tuberose bulb, purchased or kept from previous year by the farmers during Tuberose cultivation

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

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

human labor was deducted from the cost paid for the services of a pair of with the ploughman, because the cost of attended was included in the human labor cost.

**Mechanical Power Cost:** The costs of Machinery services were calculated by taking into account the actual costs incurred by the Mustard farmers. In the study area almost all the sample farmers used power tiller and other machineries for land preparation and threshing. They mainly used hired power tiller. A power tiller owner supplied fuel as well as driver for land preparation and threshing. Service charge was included into the machinery cost.

**Cost of insecticide and pesticide:** In the study area farmers used insecticide and pesticide. Most of the insecticides and pesticides used were in liquid form. Insecticide and pesticide price was estimated on the basis of taka per litre.

**Cost of Irrigation:** Irrigation is a leading input in producing tuberose. In the study area machine was used for irrigation. Irrigation costs consisted of fuel and payment for the use of machine.

**Land use cost:** Land is the basic resource and most valuable asset which support the production of all agricultural commodities. Land value differs from location to location and on land quality. Cost of land can be computed in different ways.

The common methods ( Hoque, 2000) followed in calculating land use value are:

i) Rental value of land,
ii) Interest on the value of land, and
iii) Opportunity cost from best alterative use.

For easy understanding and considering simplicity of calculation, the rental value of land was used for estimating the land use cost in this study.

**Interest on operating capital**

In the study, the amount of money needed to meet the expenses on hired or purchased inputs was treated as operating cost. The interest rate was considered 10% for tuberose production.

This yearly interest rate was fixed by the local branch office of Bangladesh Krishi Bank.

As all expenses did not incur at the beginning of the production process, rather these were spent throughout the production period, the operating cost was, therefore, computed by using the following formula:

$$\text{Interest on operating capital} = \frac{\text{Operating Capital X Interest Rate X Time Considered}}{2}$$

### 3.8.2 Return Item

Return items were as follows:

i. Return from selling tuberose.
ii. Return from selling by product.

### 3.8.3 Analysis of Data

The filled up interview schedules were scrutinized and the collected data were edited and code in der to remove ambiguities and inconsistencies. The collected data were then transferred to master sheets compiled and summarized to facilitate tabulation. Qualitative data were converted into quantitative equivalents by means of suitable scoring. A list of table was provide in order with the aims and objectives of the study. Analytical software SPSS 12 was mainly followed for analyzing the data. Simple statistical tools like count and percentage were used to obtain the results of the study.

### 3.8.4 Profitability analysis

Enterprise costing was followed in calculating cost and return. Economic performances as well as relative profitability of tuberose were calculated on the basis of gross margin and net return.

**Gross margin analysis:** Gross margin is the difference between total revenue and total variable cost. Reason to choose this analysis was that the farmers of Bangladesh are very eager to know their return over total variable cost or cash expenses.

**Net Return:** Per hectare net return was defined by subtracting the total cost (variable cost+ fixed cost) from the total return obtained from tuberose production.

**Benefit cost ratio (BCR):**

A benefit-cost ratio (BCR) is an indicator showing the relationship between the relative costs and benefits of a proposed project, expressed in monetary or qualitative terms. If a project has a BCR greater than 1.0, the project is expected to deliver a positive net present value to a firm and its investors. BCR for the tuberose cultivation was measured by the following way:

$$\text{BCR on TC} = \frac{\text{GR}}{\text{TC}}$$

Where, GR = Gross return; TC = Total Cost and the decision rules are that, when

BCR>1, the return from tuberose cultivation was economically satisfactory;

BCR<1, the return was not economically satisfactory; and

BCR=1, there exist economic breakeven point of tuberose cultivation.

### 3.8.5 Functional analysis

No single form of function can be used to characterize agricultural production und all environmental conditions. The algebraic form of the function and is magnitude will vary with soil, type and variety of crops, magnitude of other inputs in 'fixed quantity' for the farm etc. Hence a problem in each study is the selection of an appropriate algebraic form of function. This is consistent with the phenomena under investigation.

Cobb-Douglas production function was chosen to estimate the effects of key variables on production processes of tuberose. COBB-Douglas production function is the most widely used form for fitting agricultural production data, because of its mathematical properties,In case of interpretation and computational simplicity (Heady and Dillon, 1969). It is a homogenous function that provides a scale factor enabling one to measure the return to scale and to interpret the elasticity co-efficient with relative case. It is also relatively easy

to estimate because in logarithmic form it is linear and parsimonious (Beattie and Taylor, 1985). Thus Cobb-Douglas specification provides an adequate representation of the agricultural production technology.

The Double log form of the Cobb-Douglas production function model proved to be a superior alternative on theoretical and econometric grounds. The functional form of the Cobb-Douglas Model is given below:

$$Y=aX_i^{bi}\, e^{U} \qquad \text{Where, } i=1,2,3,\ldots\ldots,n$$

The production function was converted to logarithmic form so that it could be solved by least square method,i.e.

$$\ln Y = \ln a + b_i \ln X_i + U$$

The Empirical Production function model was the following:

$$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + U_i$$

Where,

Y = Gross Return ( Tk/ha)

$X_1$ = Cost of Labor (Tk/ha)

$X_2$ = Cost of Bulb (Tk/ha)

$X_3$ = Cost of Manure (Tk/ha)

$X_4$ = Cost of Urea Tk/ha)

$X_5$ = Cost of TSP (Tk/ha)

$X_6$ = Cost of MOP (Tk/ha)

a = Intercept

$b_1, b_2, \ldots . b_9$ = Coefficient of the respective variable to be estimated.

$U_i$ = Error Term

### 3.9 Resource use efficiency

Returns to Scale: The summation of all the production co-efficient indicates returns to scale.

If returns to scale > 1,it indicates increasing returns to scale

If returns to scale = 1,it indicates constant returns to scale

If returns to scale <1,it indicates decreasing returns to scale

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

$$\text{i.e. } \frac{\text{MVP}}{\text{MFC}} = r$$

Where,

MVP = Value of change in output resulting from a unit change in variable input (Tk.) and MFC = Price paid for the unit of variable input (Tk.).

Under this method, the decision rules are that, when;

r >1, the level of resource use is below the optimum level, implying underutilization of resources. Increasing the rate of use of that resource will help to increase productivity.

r <1, the level of resources use is above the optimum level, implying over utilization of resources. Reducing the rate of use of that resource will help to improve productivity.

r = 1, the level of resource use is at optimum implying efficient resource utilization.

The marginal productivity of a particular resource represents the additional to gross returns in value term caused by an additional unit of that resource, while other inputs are held constant. When the marginal physical product (MPP) is multiplied by the product price per

unit, the MVP is obtained. The most reliable, perhaps the most useful estimate of MVP is obtained by taking resources ($X_i$) as well as gross return (Y) at their geometric means. Since all the variables of the regression model were measured in monetary value, the slope co-efficient of those explanatory variables in the function represented the MVPs, which are calculated by multiplying the production co-efficient of given resources with the ratio of geometric mean (GM) of gross return to the GM of the given resources, i.e.;

$$\ln Y = \ln \alpha + \beta_i \ln X_i$$

$$\frac{dY}{dX_i} = \beta_i \frac{Y}{X_i}$$

Therefore, MVP ($X_i$) = $b_i \frac{\bar{Y}(GM)}{\bar{X}_i(GM)}$

Where,

Y = Mean value (GM) of gross return in Tk.

$X_i$ = Mean value (GM) of different variable input in Tk. i =1,2,3……..

MFC is the price of input per unit. If the MFC of all the 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.

# CHAPTER IV

# SOCIO-DEMOGRAHIC PROFILE OF TUBEROSE FARMERS

This section deals with the socio-economic characteristics of the sample farmers. To get a complete and accurate scenario of tuberose producing famers of a particular area, it is required to know these socio-economic characteristics. An effort has, therefore, been made in this chapter to describe briefly some of the basic socio-economic characteristics of the sample farmers of the study area because people differ from one to another in many respects. Decision making behavior of an individual is determined by his socio-economic characteristics. There are numerous interrelated and constituent attributes that characterize a person and these profoundly influence development behavior. Socio economic characteristics of the producers affect their production process and technology use. It was, however, not an easy task to collect all the relevant information regarding the socio-economic characteristics of the sample farmers due to limitation of time and resources (Ali, 2005).

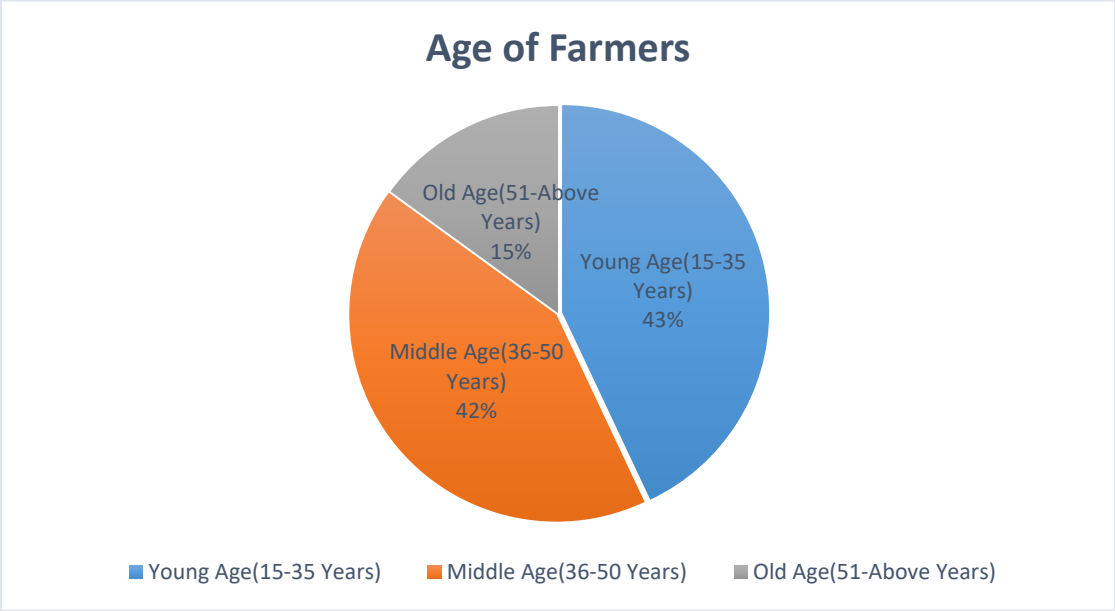
## 4.1 Distribution of age of the Sample farmers

Age of the sample farmer is a significant part for expressing demographic profile of that area. Age of the farmer also plays an important role for Tuberose cultivation. Age of a farmer referred to the period of time from his birth to the time of interview. It was measured in terms of actual years. In the study area, On the basis of the age, the farmers were classified into three categories.

i. Young farmers (15-35) years,
ii. Middle age farmers (36-50) years and
iii. Old farmers (51-above) years.

Age distribution of the selected Tuberose Farmers is presented in Figure 4.1. It is evident from the table that the highest number of Tuberose Farmers (43 %) belongs to the age group of 15-35 years followed by middle age (42%) and old age (15%) group.

**Figure 4.1:** Distribution of age of the Sample farmers

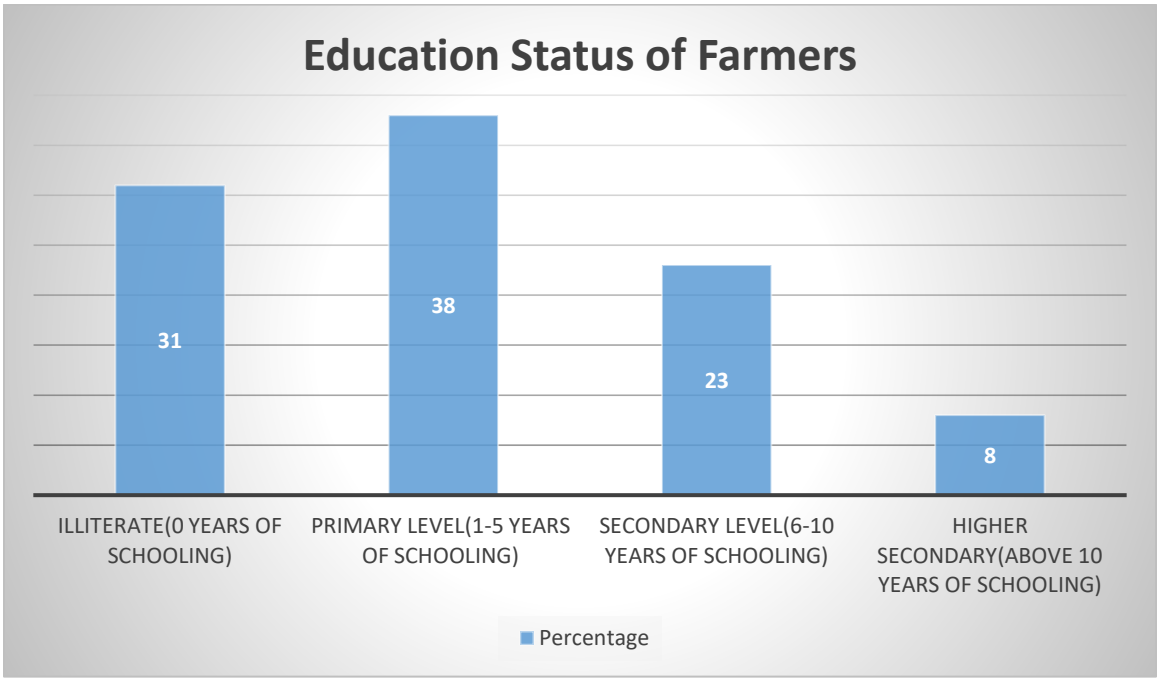



Source: Field Survey, 2020

### 4.2 Educational Status of the sample farmers

Education status affects the adoption of appropriate technology and production. The level of literacy is generally considered as an index of social advancement of a community. Literacy has its own merits and it contributes to economic and social development. It plays an important role in agriculture modernization. Literacy helps a person to have day to day information on the modem techniques together with technological change in various production processes. Education enables man/women more capable of managing scarce resources and maximizing profit (Miah, 1987). Although education is not in itself a sufficient condition for development of agriculture, it is certainly a necessary condition (Mellor, 1974). Literacy is likely to influence management of farming. The education of sample farmers were classified into four categories viz. illiterate (no schooling), primary (1-5 years of schooling), secondary (6-10 years of schooling) and higher secondary (more than 10 years of schooling).

**Figure 4.2:** Educational Status of the sample farmers



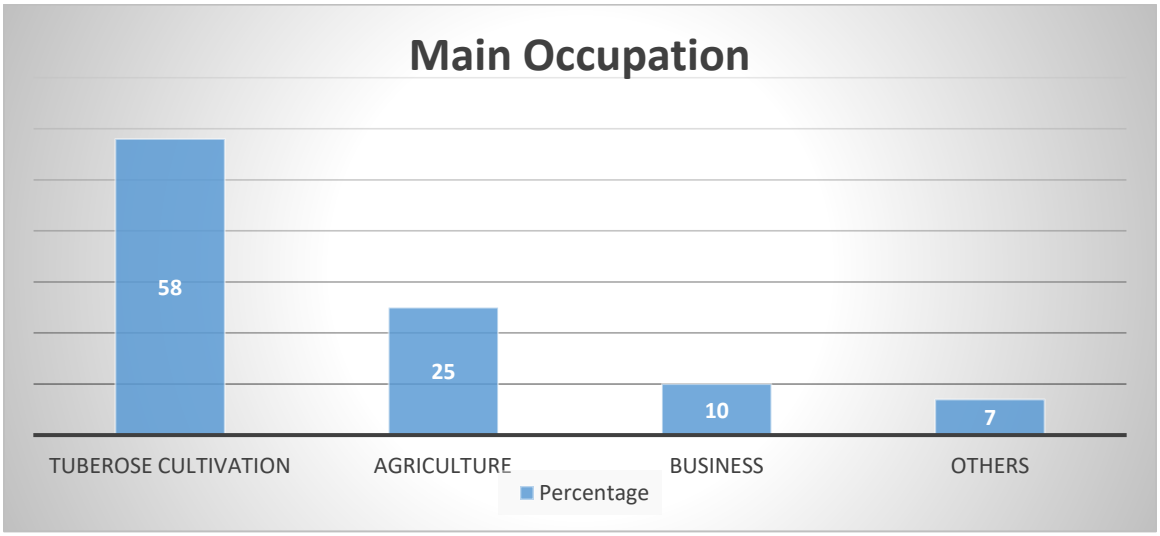

Source: Field Survey, 2020

Figure 4.2 shows that maximum farmers had primary level education 38%, secondary level of education (23%) and Higher Secondary and above level of Education (8%). The Figure also indicates that about 31% of the farmers were illiterate of the study area

### 4.3 Occupation of Sample Farmers

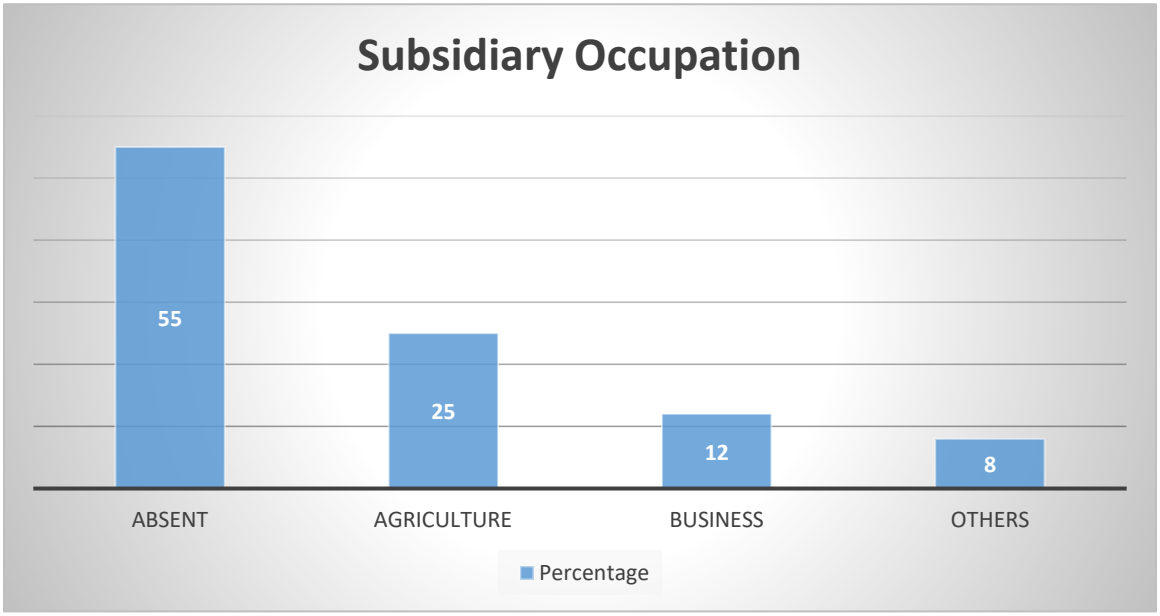
The farmers were mainly lived their livelihood from agriculture. Figure 4.3 shows the Main occupational status of the sample farmers. Tuberose production is the main occupation for most of the farmers (58%). About 25, 10 and 7 percent of farmer's main occupation is agriculture, business and others respectively.

**Figure 4.3:** Main occupation of the sample farmer




Source: Field Survey, 2020

**Figure 4.4:** Subsidiary occupation of the sample farmers




Source: Field Survey, 2020

Figure 4.4 Shows that about 25%, 12% and 8% of farmers were involved into agriculture, business and others indirectly as subsidiary occupation and 55% farmers directly involved with tuberose production.

### 4.4 Land ownership pattern of sample farmers

In the present study, land ownership was classified into different categories i.e., cultivated own land, land rented in, land rented out, land mortgaged in, land mortgaged out, pond and homestead area. The average farm size of all farmers was found to be 0.84 Hectares. Average farm size was calculated using the formula given below;

Average farm size = Homestead + Pond + Own land in cultivation + Rented in land + Mortgage in land – Rented out land –Mortgage out lands

**Table 4.1:** Land ownership pattern of sample farmers

| Sl No. | Ownership pattern of land | Average Farm Size (hectares) |
|---|---|---|
| 1 | Homestead area | 0.06 |
| 2 | Pond | 0.02 |
| 3 | Own cultivable land | 0.67 |
| 4 | Rented in | 0.03 |
| 5 | Rented out | 0.02 |
| 6 | Mortgage in | 0.01 |
| 7 | Mortgage out | 0.01 |
| 8 | Total | 0.84 |

Source: Field Survey, 2020

# CHAPTER V

# PROFITABILITY ANALYSIS

In this chapter researcher made a discussion on the profitability of tuberose cultivation in the study area. Before the presentation of extensive explanation on the profitability, the input use pattern and Cost incurred tuberose cultivation was discussed. And lastly revenue as well as profitability of the practices was explored and discussed.

## 5.1 Input Used and Cost of Tuberose Cultivation

Around thirteen different types of input were identified by the researcher which had been used for tuberose cultivation in the study area. These inputs were land use, Land preparation, equipment, human labor, bulb, Manure, fertilizer, Pesticide, irrigation etc.

### 5.1.1 Cost of Human Labor

Labor is very much essential for cultivation or any kind of production process Production depends on efficient use of labor. On an average, per hectare total human labor cost was Tk. 69,000 for all farm categories. From the table 5.1 it was observed that cost of family labor was TK.26,500 and cost of hired labor was TK. 42,500.

**Table 5.1:** Cost of labor used for tuberose cultivation

| Sl No. | Items | Average Labor(Man-day/ha) | Price (Tk) | Cost of Labor (Tk/Ha) |
|---|---|---|---|---|
| i. | Family Labor(Man-day/ha) | 53 | 500 | 26500 |
| ii. . | Hired Labor(Man-day/ha) | 85 | 500 | 42500 |
| iii. | Total | 138 | - | 69000 |

Source: Field Survey 2020

### 5.1.2 Machinery and Animal Power cost

Land preparation was done by ploughing the soil several times followed by laddering Depending upon number of ploughing with power tiller or tractor or animal power cost of land preparation was varied in the study area. Animal and mechanical power was required mainly for land preparation. On an average, per hectare Tk. 6748 was required for animal and mechanical power cost for tuberose cultivation (Table 5.2). Of them Tk. 4426 was spent or mechanical power and Tk. 2,322 was spent for animal power to cultivating tuberose.

**Table 5.2:** Cost of Mechanical and Animal power

| Sl No. | Items | Cost (Tk/ha) |
|---|---|---|
| i. | Animal power | 2322 |
| ii. | Machinery | 4426 |
| iii. | Total | 6748 |

Source: Field Survey 2020

### 5.1.3 Material input cost for producing tuberose

For producing tuberose, non-labor (material) inputs cost is also important cost item that included the cost of bulb, fertilizer, insecticide, pesticide, irrigation etc. Non-labor input is the material input.

**Cost of bulb:** On an average, per hectare bulb cost was Tk. 26,880 for all farm categories. Price of per Kg. bulb was Tk 7.5.

**Cost of fertilizer and manure:** For tuberose cultivation farmers used various types of fertilizers like urea, TSP, MP. gypsum, zinc sulphate and manure like cow dung. From the Table 5.3, it can be observed that average cost of fertilizers and manure was Tk. 32026 per hectare capital. On the other hand large farm had more financial ability to use more fertilizer. As a result fertilizer cost of large farm was more than small and medium farms.

**Table 5.3** Material input cost for producing tuberose

| Operations | For all farms | | | |
|---|---|---|---|---|
| | Per hectare | | | Total (Tk. /ha) |
| | Qty (Kg/ha) | Price (Tk./kg) | Cost (Tk./ha) | |
| Bulb | 4084 | 7.5 | 26880 | 30630 |
| Manure | 9666 | 1.5 | 14499 | 14499 |
| Urea | 264 | 16 | 4224 | 4224 |
| TSP | 202 | 22 | 4443 | 4443 |
| MOP | 190 | 15 | 2850 | 2850 |
| Gypsum | 10 | 25 | 250 | 250 |
| Zinc | 32 | 180 | 5760 | 5760 |
| Total Cost of Fertilizer and Manure | 32026 | | | 32026 |
| Pesticide | - | - | 21060 | 21060 |
| Irrigation | - | - | 18900 | 18900 |
| Total Cost | | | 98866 | 102616 |

Source: Field Survey, 2020

**Cost of pesticide and insecticide:** On an average pesticide cost was Tk.21,060 per hectare Tuberose cultivation. (Table 5.3)

**Cost of irrigation:** Table5.3 showed that irrigation cost of Tuberose cultivation was Tk.18,900/ha. In the study area seasonal contractual irrigation cost was less than per time irrigation cost. But in seasonal contractual basis full amount of irrigation cost must be paid in one or two installments

### 5.1.3 Land Use Cost

Per hectare land use cost of tuberose cultivation over a complete production cycle (one year) was Tk. 30,000 for all farm. The cost of land used was estimated by the cash rental value of land. Rental value of land of land was calculated according to farmer's statement. Land use cost was varying from location to location. In this study it was observed that most of the lands of farm situated close to the main road, Rental value of road side lands was higher than distance lands.

### 5.1.4 Interest on Operating Capital

On an average , Per hectare interest on operating capital was Tk. 4556 for tuberose cultivation. From Table 5.4 it was observed that interest on operating capital was higher because large farms use more labor, fertilizers, insecticides, pesticides, etc.

### 5.1.5. Total Variable Cost

Total variable cost was estimated adding all the variable costs such as hired labor cost. purchased bulb cost, mechanical power cost, cost of urea, TSP, MP, gypsum, zinc sulphate, insecticide, pesticide, cost of cow dung, cost of purchased irrigation and Cost of Interest on Operating Capital. The percentage of cost varied among different farm sizes. On an average per hectare variable cost was Tk.1,56,420.

### 5.1.6 Total Fixed Cost

Total fixed cost was the summation of all fixed costs, which was land use cost and family labor cost. On an average, per hectare fixed cost of tuberose production was Tk.56,500 for all farm categories,

### 5.1.7 Total Cost

Total cost was the summation of total variable cost and total fixed cost. Total cost was Tk.2,12,.920

**Table 5.4:** Calculation of Total Cost

| Items | Cost (TK/Ha) |
|---|---|
| i. Hired Labor Cost | 42,500 |
| ii. Animal Power & Machinery Cost | 6,748 |
| iii. Material Cost | 1,02,616 |
| iv. Interest on Operating Capital (for 4 month @ 9%) | 4,556 |
| **A. Total Variable Cost** | 1,56,420 |
| i. Family Labor Cost | 26,500 |
| ii. Land Use Cost | 30,000 |
| **B. Total Fixed Cost** | 56,500 |
| **C. Total Cost(A+B)** | 2,12,920 |

Source: Field Survey 2020

## 5.2 Returns From Tuberose Cultivation

### 5.2.1 Gross Return

Per hectare gross return of tuberose production was shown in table 5.5,It was the summation of Return from Flower product and it's by product leaf and bulb.On an average Return from tuberose production was Tk. 6,82,550.

**Table 5.5:** Calculation of Gross Return

| Items | Yield (Piece) | Price (Tk./Piece) | Return (Tk./ ha) |
|---|---|---|---|
| Product | 335775 | 2 | 671550 |
| By-Product | - | - | 11000 |
| Total | - | - | 682550 |

Source: Field Survey, 2020

### 5.2.2 Gross Margin

Considering all farms, gross margin of tuberose in the study area was Tk. 5,26,130 per hectare.( Table 5.6)

### 5.2.3 Net Return

On an average, net return from tuberose was Tk. 4,69,630 per hectare.( Table 5.6 )

**Table 5.6:** Calculation of Net Return and BCR

| Items | TK/Ha |
|---|---|
| A. Total Variable Cost | 1,56,420 |
| B. Total Fixed Cost | 56,500 |
| C. Total Cost(A+B) | 2,12,920 |
| D. Gross Return | 6,82,550 |
| E. Gross Margin(D-A) | 5,26,130 |
| F. Net Return(D-C) | 4,69,630 |
| G. BCR(D/C) | 3.2 |

Source: Field Survey 2020

### 5.3 Benefit Cost Ratio (BCR)

Considering all farms, benefit cost ratio was 3.2 . The BCR was greater than one indicating that tuberose cultivation was very profitable for farmers in the study area.

# CHAPTER VI

# RESOURCE USE EFFICIENCY OF TUBEROSE CULTIVATION

Cobb-Douglas production function was applied to determine the affecting factors and resource use efficiency of mud crab fattening practices in the study area. Findings of the research are being discussed in this chapter.

## 6.1. Factors Affecting the Return from Tuberose cultivation

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

| **Explanatory Variable** | **Co-efficient** | **Standard Error** | **t - Value** |
|---|---|---|---|
| Intercept | 18.888 | 5.387 | 3.50 |
| Cost of Human Labor($X_1$) | 0.27*** | 0.052 | 5.19 |
| Cost of Bulb($X_2$) | 0.64** | 0.273 | 2.34 |
| Cost of Manure($X_3$) | 0.11* | 0.065 | 1.69 |
| Cost of Urea($X_4$) | -0.08 | 0.23 | -0.34 |
| Cost of TSP($X_5$) | 0.05 | 0.255 | 0.19 |
| Cost of MOP($X_6$) | 0.03 | 0.166 | 0.18 |
| R Square | **0.465** | | |
| F – Value | **13.49** | | |
| Return to Scale | **1.02** | | |

Source: Author's own estimation

**Note**: *** , **, and * indicate significant at 1%, 5% and 10% level respectively.

The cobb-Douglas model fitted the data quite well as indicated by F- values and R Square. The co-efficient of multiple determinations (R Square) is 0.465 for tuberose growers. The value of R Square means that the explanatory variables explained about 46.5% of the variation in tuberose production. The contribution of Specified factors affecting productivity of tuberose can be observed from the estimates of regression equation.

### 6.1.1 Interpretation of production function

**Human Labor($X_1$):** The regression co-efficient for the costs of human labor was 0.27 which was significant at 1% level of significance. It indicates that considering all other factors constant, 1% increasing costs on human labor would increase the gross return from tuberose cultivation by 0.27%

**Bulb($X_2$):** The regression co-efficient for the costs of bulb was 0.64 which was significant at 5% level of significance. It indicates that considering all other factors constant, 1% increasing costs on bulb would increase the gross return from tuberose cultivation by 0.64%.

**Manure($X_3$):** The regression co-efficient for the costs of manure was 0.11 which was significant at 10% level of significance. It indicates that considering all other factors constant, 1% increasing costs on manure would increase the gross return from tuberose cultivation by 0.11%.

**Urea($X_4$):** The regression co-efficient for the cost of Urea was -0.08 but not significant at the desired level of significance. It has no severe effect on tuberose cultivation.

**TSP($X_5$):** The regression co-efficient for the cost of TSP was 0.05 but not significant at the desired level of significance. It has no severe effect on tuberose cultivation.

**MOP($X_6$):** The regression co-efficient for the cost of MOP was 0.03 but not significant at the desired level of significance. It has no severe effect on tuberose cultivation.

### 6.1.2 Returns to scale:

The summation of all the production co-efficient indicates returns to scale. For tuberose cultivation, the summation of the co-efficient was 1.02 which means that the production functions exhibit increasing returns to scale. An increasing amount of investment in this venture would increase the returns from the farm.

## 6.2 Findings of the Resource Use Efficiency of Tuberose Cultivation

Resource use efficiency means how efficiently the farmers can use their resources in the production process. Because of the scarcity of resources, its efficient use is important. For calculating resource use efficiency, six input factors like cost on human labor, bulb, Manure, TSP, MOP, Irrigation were considered.

**Table 6.2:** Resource Use Efficiency of tuberose cultivation

| **Variable** | **Geometric mean *(GM)*** | ***$\bar{Y}$(GM)/ $\bar{X}_i$(GM)*** | **Co-efficient *(β)*** | ***MVP ($X_i$)*** | ***r = MVP/ MFC*** | **Decision rule** |
|---|---|---|---|---|---|---|
| Yield of Tuberose *(Y)* | 620041.13 | | | | | |
| Human labor *($X_1$)* | 68324.19 | 9.07 | 0.27 | 2.5 | 2.5 | Under Utilized |
| Bulb *($X_2$)* | 30563.92 | 20.29 | 0.64 | 12.9 | 12.9 | Under Utilized |
| Manure *($X_3$)* | 14470.68 | 42.84 | 0.11 | 4.7 | 4.7 | Under Utilized |
| Urea *($X_4$)* | 4203.68 | 147.52 | -0.08 | -11.8 | -11.8 | Over Utilized |
| TSP *($X_5$)* | 4416.67 | 140.38 | 0.05 | 7.01 | 7.01 | Under Utilized |
| MOP *($X_6$)* | 2851.01 | 217.48 | .03 | 6.5 | 6.5 | Under Utilized |

Source: Author's own estimation

The ratio of MVP and MFC of Human labor was positive and greater than one indicating under use of the resources. It indicates that human labor use in tuberose production should increase considerably to reduce the cost of production and increase profit (Table 6.2)

The ratio of MVP and MFC of bulb was positive and greater than one indicates under use of the resources. It indicates that bulb use in tuberose production should increase considerably to reduce the cost of production and increase profit (Table 6.2).

The ratio of MVP and MFC of Manure was positive and greater than one indicates under use of the resources. It indicates that manure use in tuberose production should increase considerably to reduce the cost of production and increase profit (Table 6.2).

The ratio of MVP and MFC of Urea was negative and less than one. It indicates over use of the resources. It indicates that farmers in the study areas using this input inefficiently (Table 6.2). Urea use in tuberose production should reduce considerably to reduce the cost of production and increase profit.

The ratio of MVP and MFC of TSP was positive but more than one. It indicates under use of the resources. There is ample scope to increase the use of TSP for higher yield (Table 6.2).

The ratio of MVP and MFC of MOP was positive but more than one. It indicates under use of the resources. There is ample scope to increase the use of MOP for higher yield (Table 6.2).

# CHAPTER VII

# CONSTRAINTS FACED BY TUBEROSE FARMERS

There were many constraints faced by farmers and intermediaries in the production and marketing of tuberose though Jashore (study area) was very suitable for tuberose production and marketing. The problems faced regarding production and marketing of tuberose are discussed below.

## 7.1 The Constraints faced by farmers

Bangladesh has an economy mainly dependent on agriculture. But this agricultural sector is negligible still now. Various problems are associated with this sector. Experience has shown that farmers in Bangladesh seldom get the required quantity of bulb, adequate capital, fertilizers, technical support and finally the remunerative price of their produces. Farmers faced various problems in production of tuberose which are discussed below:

**Lack of adequate capital or institutional credit:** Production of flower needs proper doses of fertilizer, irrigation, insecticide in addition to special agronomic care and therefore flower farmers need sufficient money to buy the necessary inputs. In the study area, most of the farmers reported that they did not have adequate amount of operating capital. Most of them failed to receive the institutional credit. As a result, financial inability and pressing need for cash money force them to borrow money from neighbor or moneylenders at exorbitant rate of interest. In the study area lack of adequate capital was the 1st severe problem (Table7.1)

**High labor cost:**Labor cost is very high in this region. Most of the farmers had to pay high price for labor..In the study area,high rate of labor price was the 2nd severe problem among the sample farmers (Table 7.1).

**Lack of adequate storage facilities:** Lack of storage facilities is one of the important problems in the study area. Many flowers are destroyed sometimes due to lack of storage facility of farmers. Lack of adequate storage facility problem was the 12th problem in the study area (Table 7.1).

**Table7.1: Problem of tuberose production faced by the farmers**

| Types of Problem | Value obtain out of 10 | Rank |
|---|---|---|
| Lack of adequate capital and institutional credit | 10 | 1 |
| High labor cost | 9.45 | 2 |
| Lack of adequate storage facilities | 8.92 | 3 |
| Lack of scientific knowledge and training | 8.31 | 4 |
| Lack of quality bulb | 7.28 | 5 |
| Lack of proper use of fertilizer | 6.33 | 6 |
| Disease and insects infestation | 5.81 | 7 |
| Carrying problem | 5.47 | 8 |
| Poor communication and transportation facility | 5.15 | 9 |
| Lack of extension work | 4.24 | 11 |
| Low output price | 3.46 | 12 |

Source: Field survey, 2020

**Lack of scientific knowledge and training:** There is a shortage of trained manpower to handle commercial tuberose production activities such as production. Post-harvest handling, product development and biotechnology. Most of the farmers keep a little knowledge about modern technology. In the study area lack of scientific knowledge was the 5th severe problem (Table 7.1).

**Lack of quality bulb:** In the study area, most of the farmers could not collect quality bulb from their own farm due to natural adversities and lack of their proper knowledge. So they had to depend on others bulb. Even they had to pay illogically very high price. In the study area lack of quality bulb was the 4th severe problem among the farmers (Table 7.1).

**Lack of proper use of fertilizers**: Fertilizer is the most important input for producing tuberose. They usually use urea, TSP and MP. For the better production farmers had used fertilizer several times in their field. Most of the cases they over use of fertilizer which increase the production cost (Table 7.1).

**Disease and insects infestation:** This is one of the problem for the tuberose producers. Due to disease and insects infestation the production may be reduced. To solve this problem sometime they used insecticide and pesticide which increase their production cost. . In the study area, disease and insects infestation was the 7th constraint problem among the farmers (Table 7.1)

**Carrying problem:** It was one of the problem in the study area. To carry various inputs and outputs from market field and field to market has great hampered due to proper carrying, Carrying problem was ranked as 8th problem in the study area (Table 7.1).

**Poor communication and transportation facilities:** Transportation was a great problem for the producers in the study area. The Dhaka-Jessore-Jhikorgacha highway passes through the study area and that was the only one pucca road in the study area and all other connecting roads were kutcha. In the rainy season the kutcha roads became so muddy and unusable that there was no alterative way for transportation except vans/carts. Moreover, the tuberose farms were about 8 kilometer away from local market places. So, more than 60 percent of total marketing cost was covered by transportation cost. Many respondents were compelled to sell their tuberose at farm yards at lower price only because of transportation. In the study area, poor communication & transportation facilities was very important problem. Poor communication and transportation facilities ranked as 9th in the study area (Table 7.1).

**Lack of extension work:** To aware about new technology is very much important for production. Many producers claimed that lack of extension contact with any organization. That caused not to introduce them new information and technologies. Lack of extension problem was the 11th problem in the study area (Table 7.1).

**Low output price:** Most of the farmers were forced to sell their products just after harvesting at very low price to maintain their household expenditures, pay labor cost etc. The conscious farmers identified the price of their products as very low in relation to the production cost. In the study area, low output price was the 3rd severe problem among the farmers (Table 7.1).

## 7.2 Measures for Solving the Problems in Production of Tuberose

The farmers who had identified their own problems also provided some suggestions for overall improvement of the efficiency of the existing tuberose production.

**Measure suggested by the farmers**

The following measures were suggested by farmers for solving the problems faced in tuberose production. Adequate amount of fertilizer should be supplied at government subsidized price at tuberose producing areas. Institutional credit facilities should be made available to the tuberose farmers to ensure the use of adequate inputs for improving the production of tuberose.

Scientific knowledge and technology about tuberose cultivation should be imported to tuberose growers. Specially scientific as well as economic techniques should be introduced for weeding and fertilizer application. Communication and transportation facilities should be improved. Priority should be given to the development of such roads which linked villages to the main roads and markets.

Low cost storage facilities should be developed in primary and secondary markets.

# CHAPTER VIII

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary of findings, conclusions and recommendations of the study. The summary of the study shows the findings in brief. By conclusion, the main points of the report can be identified quickly. Recommendation draws the attention of the respective authority to implement some strategy for improving the situation of the farmers of Tuberose cultivation.

## 8.1 Summary

The general socio-economic characteristics of the sample farmers such as average age of the respondent farmers in the study area was found to be young aged and old aged. In the study area the highest number of Tuberose Farmers (43 %) belongs to the age group of 15-35 years followed by middle age (42%) and old age (15%) group.

Education level in the study area was that maximum farmers had primary level education 38%, secondary level of education (23%) and Higher Secondary and above level of Education (8%). The Figure also indicates that about 31% of the farmers were illiterate of the study area.

On an average, 138 man-days of human labor was required for per hectare tuberose cultivation. About Tk. 6,748 was required for animal and mechanical power cost for tuberose cultivation. On an average, 4,084 kg bulb was required for per hectare tuberose cultivation. Human labor cost was Tk. 69,000 per hectare for all farms. In the study area average Tk. 6,748 per hectare was spent for land preparation in all farms where Tk. 2322 per hectare for animal power and Tk. 4,426 per hectare for mechanical power. Average cost of fertilizers and manure was Tk. 32,026 per hectare. Large farm use more inputs compared to medium and small farms. On an average, gross return from tuberose was Tk. 6,82,550 per hectare.Net return was 4,69,630. Benefit cost ratio (BCR) of tuberose cultivation was 3.2. These implying that production of tuberose under Jashore district was very profitable.

The production function exhibited increasing returns to scale. Production function analysis suggested that human labor, bulb and Manure had positive and significant effect on the yield of Tuberose. The ratio of MVP and MFC of Human labor, bulb, Manure, Urea, TSP and MoP was found 2.5, 12.9, 4.7, -11.8, 7.01 and 6.5respectively. It indicates that farmers in the study area over utilizing Urea while Human Labor, bulb, Manure, TSP and MoP were underutilized. The lack of scientific knowledge, high yielding variety and efficient transport facility were reported to be major problems in tuberose cultivation. Supply of credit on easy terms, supply of inputs and machinery by responsible authority, improvement of transportation facilities, Formation of farmers' organization, improvement of market facilities can play an important role in increasing Tuberose production

## 8.2 Conclusion

The following conclusion may be formed based on the outcomes of the study in some selected area of the Jashore district:

- Most of the sample farmers are young between 15-35 years and Maximum farmers have primary level education.
- Tuberose cultivation is the primary source of income for the majority of farmers.
- Among the cost items highest cost incurred for human labor.
- Tuberose production is profitable in the study area.
- BCR is found 3.2 indicating tuberose cultivation is highly profitable in the study area although there are some input use inefficiency.
- Human labor, bulb and manure had positive and significant effect on the yield of Tuberose. Farmers in the study area underutilizing most of the inputs.
- High labor cost, lack of scientific knowledge, lack of adequate storage facilities are the most severe problems of Tuberose cultivation in the study area.

### 8.3 Recommendations

Tuberose farming in the Jashore area is profitable, according to the current study. Based on the findings of the study, steps should be done to improve the farmer's profit margin by providing better technical knowledge and credit support, since they employ traditional cultivars that provide poor yields. Farmers should get short-term instruction on how to properly use inputs. It will aid farmers in increasing the efficiency with which they employ their resources in Tuberose growing. The current research was conducted in a small area of the Jashore district. Similar studies might be carried out in other sections of the country to acquire a complete image of the country, which would helpful for policy formation.

# REFERENCE


Ara, K. A., Sharifuzzaman, S. M. and Ahmed, S. 2009. Floriculture in Bangladesh. A paper presented on Expert Consultation Meeting of Floriculture. Kunming, China. pp. 9-20.

Aditya, D. K. 1992. Floriculture in National Economy. A paper presented at the 6" National Horticulture Conference and symposium held on 16 to 17" April. 1992, Bangladesh Agricultural University, Mymensingh. pp 30-35.

Ali, M.R. 2005. Profitability and efficiency of pineapple production in some selected areas of Tangail district. MS thesis, Department of Agricultural Economics, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur.

Anonymous. 1992. Agrojatira-92. Department of Agricultural Extension, Jessore region, Jessore

Anon, K. A. 2010. Floriculture in Bangladesh, paper presented on Expert Consultation Meeting January 07-09, 2010, Kunming, China.

Ara, K. A. and S. M. Sharifiuzzaman. 2001! Ful Chasher Gurutta and Shamvabana, Krishikatha.

Baksh, M. E. and S. M. Elias 1994. Tuberose marketing in Bangladesh: Problem and Prospects A paper presented in the Regional Seminar of Bangladesh Economic Association held on 24 August, 1994, 15angladesh Agricultural University, Mymensingh.

Baksh, M. E. and S. M. Elias. 1995. Return from tuberose: A sustainable farm income in Jessore region. Annals of Bangladesh Agriculture. 5(2): 99-104.

Behari, M. A, A.S. M. A. Hug. M: M. Rahman 1998. Tuberose cultivation in Jessore district: An agro-economic assessment. Bangladesh *Journal of Agricultural Research, 20 (2): 197-204.*

Beatlie, B. R and C. R. Taylore. 1985. The Economics of Production. Montana State University, John Wiley & Sons, New York, USABehari, O. P, 1993, Marketing of cut lower in India, An overview, Agricultural Marketing, (36)

Bose, T. K. and L. P. Yaday, 1989, Commercial flower, Noya Prakash, Calcutta.

Dadlani, N.K. 2003. Global Positioning of Bangladesh Floriculture. A Paper presented on a Seminar held on 6th November, 2003, BARC, Farmgate, Dhaka.

Dalai. N. K. 2003, Global Positioning of Bangladesh floriculture. A paper presented on a Seminar held on 6 November, 2003, BARC, Farm gate, Dhaka. 1-11

Das, T. K., A. K. Mitra and S. C. Sarker. 1988. Economics of tuberose cultivation in Nadia District (West Bengal). Economic Alairs, 33(2): 103-106. ENerson, I. N. 1963. Pineapple on Farm Management, Mcyrath Hill Book Company Inc.

Hasan, K. 2006. Yield gap in wheat production: A perspective of farm specific efficiency in Bangladesh. Ph. D. Thesis, Department of Agricultural Economics, Bangladesh Agricultural University. Mymensingh. 64-79.

Hassan, M.1996: A Study on Production and Marketing of Tuberose in Some Selected areas of Bangladesh. M.S. Thesis, Department of Cooperation and Marketing Bangladesh Agricultural University. Mymensingh Heady, E. O, and J.L. Dillion. 1969. Agricultural production function. Lower State University,Press, Ames. USA.

Hoque, A. M. M. M., A. E. Hossain, M. S. Akhtar, M: A. Mannan and M. Rafiuddin. 1992. Effect of row and plant spacing on the flower and bulb production of tuberose (Polianthes tuberose L). Bangladesh Horticulture. 20(2): 55-59

Hoque. A. T: M. R 2000. Productivity, profitability and allocative efficiency of local and improved mu ngbean production in some selected sites of Jamalpur district. M. S.Thesis. Department of Agricultural Economics, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Giavzipur, Bangladesh

Hossain, M.B. and M.M. Rahman. 1994. The Potential of Flower Marketing in Dhaka City, Bureau of Business Rescarch, University of Dhaka, Bangladesh.

Jaim, W.M.H. 1982. Food Production and Food Entitlement in Rural Bangladesh. The five year outlook lor small community in an Imigated Area. Ph.D.Thesis, University of London,U.K.

Kumar, R., Gobind, S. and Yadav, D. S. 2003. Growth and flowering of tuberose as influenced by different bulb size and spacing. Hariana J. Hort. Sci., 32 (1/2): 66-69

Khols, R. L. and J. N. Uhl. 1980. Marketing of Agricultural Products (Fifth edition). Macmillan Publishing Co., Inc., New York.

Misra, M., Mohapatra, A. and Mohanty, C. R. 2002. Effect of fertilizer and spacing on tuberose. Proceedings of the national symposium on Indian floriculture in the new millennium. Lal Bagh, Bangalore., pp. 338-339.

Mandal, M.A.S. 1979. An Economic Analysis of Resourses use with respect to Farm Size and Tenure in an Area of Bangladesh. Ph.D. Thesis University of London, U.K. Mellor, J. W. 1974. The Economics of Agricultural Department. Vora and Co., Bombay, India.

Miah, M. T. H. 1987. Appraisal of Deep and Shallow Tube well Irrigation Projects in the Tangail District in Bangladesh, M.Sc. Dissertation, University of New England, Ammidale, Australia.

Raha, S. K. and M. Siddika. 2014. Price spread in cut flower marketing: Some evidence from Bangladesh. The Bangladesh Journal of Agricultural Economics. 27(2): 87-97.

Siddika, M. 2004. Marketing of commercial cut flower in Bangladesh. MS Thesis, Department of Cooperation and Marketing, Bangladesh Agricultural University, Mymensingh. 1-13.

Sultana, N. 1995. A study on flower marketing in Dhaka city. MS Thesis, Department of Cooperation and Marketing, Bangladesh Agricultural University, Mymensingh. Sultana, N. 2003. Floriculture Exports From Bangladesh. A paper presented in the International. Floriculture Conference held on 6th November, 2003, Dhaka.

Uddin, M. J. and M. K. Hasan. 2003. Homestead agroforestry in char areas at Noakhali: An Seconomic analysis. Bangladesh Journal of Agricultural Research, 28 (3): 421-430.

Ullah, M. A. 1999. Future prospect of export of Flower and Potted Plant from Bangladesh. Proceeding of the 3rd International Plant Tissue Culture Conference held on 8 to 10March, 1999, Dhaka.