FINANCIAL PROFITABILITY ANALYSIS OF GERBERA FLOWER CULTIVATION IN SOME SELECTED AREAS OF JASHORE DISTRICT

SHARMIN AKTER

DEPARTMENT OF AGRICULTURAL ECONOMICS
SHER-E-BANGLA AGRICULTURAL UNIVERSITY
DHAKA-1207

JUNE, 2021

FINANCIAL PROFITABILITY ANALYSIS OF GERBERA FLOWER CULTIVATION IN SOME SELECTED AREAS OF JASHORE DISTRICT

BY

SHARMIN AKTER

REGISTRATION NO: 14-06257

A Thesis

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 (M.S.)
IN
AGRICULTURAL ECONOMICS

SEMESTER: JAN-JUNE, 2021

Approved by:

Dr. Rokeya Begum	**Hasan Mahammad Sammy**
Professor	Assistant professor
Department of Agricultural Economics	Department of Agricultural Statistics
Supervisor	**Co-Supervisor**

Dr. Ripon Kumar Mondal
Associate professor & Chairman
Department of Agricultural Economics

CERTIFICATE

This is to certify that thesis entitled, *"FINANCIAL PROFITABILITY ANALYSIS OF GERBERA FLOWER CULTIVATION IN SOME SELECTED AREAS OF JASHORE DISTRICT"* 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 (M.S.) in AGRICULTURAL ECONOMICS**, embodies the result of a piece of bona-fide research work carried out by **SHARMIN AKTER**, Registration no. **14-06257** 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.

Date:

Place: Dhaka, Bangladesh

Dr. Rokeya Begum

Professor

Department of Agricultural Economics

Sher-e-Bangla Agricultural University,

Dhaka-1207

DEDICATED TO

MY BELOVED

PARENTS

ACKNOWLEDGEMENT

ABSTRACT

Farmers are now profiting from Gerbera cultivation, but socioeconomic data and information about this flower are scarce in Bangladesh. The purpose of this study is to identify and analyze the relative profitability, factors affecting gerbera cultivation, problems faced by the farmers in December 2020. The study area was chosen purposively, the two villages (Gadkhali and Panisara) at Jhikargachha upazila, under Jashore district. The use of both purposeful and simple random sampling technique were considered. A total of 100 gerbera growers were chosen at random for this study. The data in this study was analyzed using both descriptive and statistical tools (Excel, SPSS, and STATA). After analyzing the data per hectare total cost, gross return, gross margin and net return were Tk. 552847, Tk. 1920042, Tk. 904168 and Tk. 1367195 respectively. Gerbera production was highly profitable in the study area. The benefit cost ratios was 3.47. Human labor, seedling, urea, zinc sulphate and irrigation in the gerbera production were significant in explaining the yield (stick per ha) except the insignificant effects of organic manure, TSP and insecticides. The coefficient with expected sign indicated that the selected inputs contribute positively to the yield. Returns to scale was 0.97. From the problem confrontation index it was found that 98 percent of the farmers confronted natural calamities as 1st ranked and 86 percent confronted huge investment in production as 2nd ranked problem. Lack of technical knowledge, lack of cold storage, unavailability of indigenous production materials and inadequate credit facilities were major issues in gerbera cultivation. The government should take the necessary measures to address these issues. Therefore, it is needed to emphasis dissemination activities of technologies (varietal, production etc.) and government support to encourage the farmer in Gerbera cultivation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1
INTRODUCTION

2.1. Background of the study

Bangladesh is an agricultural country, and the majority of the population relies on agriculture for their living, either directly or indirectly. Agriculture makes a significant contribution to the country's Gross Domestic Product (GDP). The population's activities were diversified towards different sectors at the start of industrialization. As a result, the agriculture sector's contribution is gradually decreasing, and it now accounts for 12.65 percent of GDP (BBS, 2021). Among the three sub-sectors of broad agriculture sector the growth rate of crops and horticulture forest and related service sector has decreased compared to previous fiscal year. The growth of agriculture and forestry sector i.e. crops and horticulture, animal farming, forest and related services reached 1.59 percent,3.80 percent, 6.12 percent respectively in FY 2020-2021 (BER 2021).

In Bangladesh, agriculture plays a dominant role towards ensuring food security, employment generation, human resources development, poverty alleviation, and raising standard of living and in increasing the export earnings. The population live in the villages and about forty three percent labor forces (43%) are engaged in Agriculture (BBS, 2020). The average per capita income of its population is only USD 2227 (BBS, 2021). The arable land area is being continually squeezed annually by its significant rate of non-agricultural use. Because our livelihood is mostly based on the production of cereal crops, finding additional sources of income is becoming increasingly challenging. Cereal crop growers are not getting proper price because in most of the cases production cost is higher than selling price. In addition, total crop failure is a common occurrence in our country. Our rural people make up the vast bulk of those who live in poverty. To address this issue, new ways must be devised that allow people to generate more money by employing their own resources. Cut-flower production is currently regarded as a viable alternative to traditional crops since it allows flower farmers to earn better returns per unit area, which is achievable due to rising flower consumption throughout the holiday season.

Flowers are inseparable from the social fabric of human life. Flowers being adorable creation of god used at occasions like at birth, marriage or death. In the past, flowers were not of much economic importance. To satisfy one's aesthetic desires, one would

grow flowers. Flowers were occasionally provided for sale to fulfill people's specific needs. With the passage of time, people's lifestyles have changed dramatically, resulting in commercialized flower farming. Flower plants are no longer limited to window gardens; they now play an essential part in the interior design of homes and businesses. Floriculture is a competitive and rapidly growing industry. Cultural techniques are changing as new farmers and crops are introduced, and as a result, new products are emerging. With the availability of equipment, ornamental crop production technology is increasing, and customer preferences are shifting. A new generation of growers is coming forward to employ modern technology for maximizing production and offer quality produce for consumer acceptability, thus fetching a better price.

Bangladesh's vast range of climate and soil conditions make it ideal for growing a wide range of horticulture crops. Horticulture, which includes the production of fruits, vegetables, flowers, spices, medicinal and aromatic plants, and plantation crops, has risen to prominence in Bangladesh as a key economic activity. Horticulture has emerged as a promising agricultural sector for speeding economic expansion throughout the years. It provides farmers with not just a diverse variety of crop diversification possibilities, but also considerable possibility for sustaining a big number of agro-industries that produce significant job prospects. Flower farming is currently more profitable than other crop farming. It can be as much as 2-3 times higher than any other cereal or vegetable cultivation (Mou, 2012). For many developing countries, commercial cut flower farming is a significant source of revenue. Bangladesh has a lot of floral potential, both for export and for the home market. Different agro climatic conditions can produce a wide range of flowers throughout the year. Bangladesh has a fantastic chance to earn a lot of foreign money on the international market.

2.2. Importance of cut flower

The growing middle class, equipped with disposable income, along with the rise of corporate businesses and widespread use of flowers in various programs have expanded the flowers and cut foliage business in Bangladesh. However, cultural changes among the young generation in celebrating western festivals such Valentine's Day, Friendship Day, Mother's Day and iconic cultural events like Pohela Boishakh, Pohela Falgun have expedited the growth of flower business in the country. People usually use flowers

in all their ceremonies like wedding, birthday and marriage day greetings, religious offerings and sometimes in social, political and historical occasions. The universal usage has created a real trend of producing flower on a commercial basis to meet increasing demand in the market. In addition, the celebration of National Days such as Ekushey February, Independence Day and Victory Day has reached to rural level more than ever before, which also helped boost the business. According to a recent Dhaka Chamber of Commerce and Industry (DCCI) statistics, the local market of flower and cut foliage has reached at Tk. 1,200 crore per annum and is witnessing a 10% yearly growth (Dhaka Tribune, 2019). Flowers are widely used in political, social and corporate events. This is because of economic growth, which brought changes in living standards of people as they have disposable income.

2.2.1. General significance of Gerbera

Gerbera (*Gerbera jamesonii L.*) connected to close family Asteraceae, a well-known cut flower grown all over the world in a variety of weather circumstances. It is famously known as 'Barberton daisy' or 'Transvaal daisy'. The genus Gerbera comprises of approximately forty varieties, which are of Asiatic and Southern African-American source. Among the different varieties, Gerbera jamesonii is the only varieties under farming (Prodhan *et al*., 2017). Modern gerbera occurred from Gerbera jamesonii hybridized with Gerbera viridifolia and possibly other varieties. The Gerbera Flower is an evergreen place. The Flower is actually an evergreen herb local to Southern African-American. The Gerbera Flower is also known as the African-American Flower, Transvaal Flower, Garb, and Barberton Flower. It is one of the most famous cut flowers. Gerbera is a leading flower and ranks among the top ten cut flowers of the world with wider applicability in the flower industry as cut flower and potted plant (Maitra *et al*., 2020).

Gerbera as a cut flower has tremendous demand in domestic and international markets. The flower occupies 6th position in the Alsameer flower auction center in Netherlands. The freshness and long-lasting characteristics of this flower made to use it in the form of parties, weeding functions, bouquet in the form of ornamental flower. Gerbera is an evergreen and herbaceous blooming place producing different colors of place. The flowers come in wide range of colour including yellow, white, red, orange, pink, maroon, crimson and intermediate shades of these colours. Under high temperature

conditions, physiological disorder may occur and hence, there is a need of partially controlled environment to grow the crop successfully. Each gerbera plant if properly maintained will produce 50 to 65 flowers per year (Gamanagatti and Patil, 2015).

Gerbera's significance extends beyond the beautification, design, or planning of Gajra, Garland, Veni, or Arrangements to include commercial significance. It's also used to remove essential natural oils, and it's a base for creating fragrances or attars. Despite the fact that gerberas are a foreign flower, they are in high demand in Bangladesh. Gerbera flowers are in high demand for many occasions such as weddings and New Year's celebrations. To meet this increased demand, floriculture has grown in popularity, and it has recently emerged as one of the most lucrative professions in the world. Gerbera flowers' future prospects include increased demand for cut flowers, live plants, high-quality seed production, and the sale of garden tools, pots, perfumery products, Bonsai development etc. and other accessories.

2.2.2. Public significance of gerbera

• Public Function: Wedding, interior design, worshipping, spiritual and self-adornment, flower flowers, kids wedding parties, pleasant friends or family members.

• Making of monetary products like perfume

2.2.3. Financial significance of gerbera

Perfume sectors can be established in the country which can help enhance the nationwide economic system. Flowers can be a resource of getting huge foreign currency by dispatching them.

• Flowers can be considered as an industrial product. Professional plant production may be helpful in increased making of the farmer.

• Establishment of plant production plants and perfume sectors can help fixing the lack of employment problem to a large level.

• It provides an opportunity to bring more rarely used land under plant farming.

2.3. History of flower in Bangladesh

The history of floriculture in Bangladesh may be old but flower business is not older than a decade. Flower cultivation was started commercially from the 1980's in Jhikargachha upazilla of Jashore district. Afterward it was extended to Jashore Sadar, Sharsha and Chowgachha upazilla as well as Kushtia, Chuadanga and Satkhira districts. At that time the agricultural crop production was going on in traditional manner. An initiator, Sher Ali, from Jhikargachha upazila under Jashore district brought the tradition of flower cultivation in this region. It can be said, that the beginning of commercial flower cultivation, for the very first time in Bangladesh. Sher Ali had his inspiration seeing of flower cultivation success in different regions of India, whilst the flower market was being captured at that time by India, Thailand and other countries including China (Manjira, 2018). Flower had a poor demand back at that period. During the eighties, flower cultivation started awakening here and there. After Jhikorgacha upazila, flower cultivation spreader gradually in Sharsha, Chougacha, Monirampur, and Keshabpur in a limited extent. Flower cultivation spreads in Sharsha, Chougacha, Monirampur, and Keshabpur to a limited extent after Jhikorgacha upazila. After being frustrated, some of them returned to their traditional cultivation methods. A complete revolution took place in Jhikorgacha upazila with hope and despair.

Marigold, Rose, and Tuberose were the first flowers to appear in the farmers' cultivable fields. Farmers in general began to recognize the advantages and drawbacks of flower cultivation. Meanwhile, the surrounding districts had begun to achieve success in this area. Farmers began importing the necessary ingredients for flower cultivation, such as flower plants and insecticide, from India in a variety of ways at first. During that time, the government and non-governmental organizations lacked precise knowledge of flower cultivation. In the interim, a flower bazaar was formed in Goaddkhali village under Jhikargachha upazila (JCF, 2012). From all around Jashore, the flowers were being gathered at Goadkhali market. From this market, through the wholesalers, flowers were being sent to all over the country. According to Bangladesh Flower Growers & Exporter Association (BFA), the Goadkhali market is now Bangladesh's largest flower bazaar. Recently, flower cultivation has adopted commercially in 19 districts of our country. The districts are Jhenidah, Chuadanga, Bogra, Rangpur, Dhaka, Manikganj, Narayanganj, Gazipur, Mymensingh, Chittagong, Sylhet ect.

2.4. Status of cut flower in Bangladesh

Small-scale flower production began in Bangladesh in the late 1970s with the production of tuberose, but large-scale commercial production began in the mid-1980s in the Jhikargacha upazila of the Jashore district. And flower farming began in Savar at the turn of the century. Rose, tuberose, marigold, gladiolus, chrysanthemum, carnation, gerbera, lily, gypsophila, heliconia, anthurium, and orchids are the most common commercially grown cut-flower species in Bangladesh. Bangladesh is well suited for cut-flower production due to its favorable climate and other factors such as the possibility of expanding cultivation on underutilized homestead lands, cheap labor, low capital investment, and a promising export market (Manjira, 2018). At present, 10,000 hectares of land covers flower cultivation taking the lead by Jashore district while commercial nurseries covered between 2000 to 2500 hectares of land. More than 5,000 farmers are growing flower and foliage in the country and about 1.5 lac people are directly or indirectly involved in floriculture business as their sole livelihood. The employment generation for both men and women are increasing with the increase in area at about 15.79% per year under floriculture industry (Islam, 2016).

Dhaka, Chittagong, Cox's Bazar, Jashore, Chuadanga, Jhenidah, Bogra, Rangpur, Kushtia, and Mymensingh are the major cut-flower production areas, with a total area under cultivation of different cut-flowers and foliages of about 3350 hectares. Every year in February, flower growers and traders make a lot of money because people celebrate three major events: "Pohela Falgun" (Spring Festival), Valentine's Day, and International Mother Language Day. According to Mohiuddin (2016), the country has approximately 4000 retail shops, with 40% in Dhaka, 25% in Sylhet and Chittagong, and the remaining 10% in other districts, with a daily wholesale flower business transaction of $16,000. However, this is still insufficient to meet market demand. Bangladesh needs to import flower and ornamental plants worth up to Tk. 2-3 million from abroad to meet market demand. In the Dhaka metropolitan city, there are estimated to be more than 100 permanent and 450 temporary shops. Each shop's individual business ranges from Tk. 3000 to Tk. 6000 and even more. In Dhaka, major flower traders can be found in Shahbag, Farmgate, and Gulshan. Chittagong and other major cities also have significant trade. Cut flowers account for 45 percent of global flower trade, according to the World Trade Organization (Mou, 2012). The majority (nearly 80%) of the flowers produced were sold through the BRAC Office under contract

farming agreements. Each shop's individual business ranges from Tk. 3000 to Tk. 6000 and even more. Flower society of Godkhali (Jashore) reported that flower of about USD 54 cores are produced in Godkhali alone every year and the total business amount stands at USD 100 cores. This indicates that aesthetic sense of people is increasing as the standard of living is increasing. But the stage of commercial development is still at a very early stage.

Table 2.1: Name of Flowers and Main Production Areas in Bangladesh

Cut flowers	Locations
Tuberose	Jessore (Sharasha, Chaudanga, Jhikargacha), Savar ,Satkhira, Bogra, Comilla, Chittagong
Rose	Gazipur (Kapasia, Salna, Kaliakair), Savar, Jessore, Dhaka, Satkhira, Dinajpu
Gladiolus	Dhaka, Jessore, Gazipur, (Sreepur, Kaliakair)
Chrysanthemum	Savar (Dhamrai, Nabinagar, Sadullahpur), Gazipur (Kapasia) Bogra, Narayanganj
Gerbera	Jashore (Sharsha, Jhikorgacha, Chuadanga) savar, Narayanganj, Gazipur
Dahlia	Dhaka, Savar, Gazipur, Bogra
Marigold	Narayanganj, Jessore, Savar
Lily	Narshingdi, Savar
Orchid	Dhaka, Gazipur, Savar, Mymensingh

Source: Rakibuzzaman et al., (2018)

2.5. International scenario of cut flower

With an annual global trade value of more than 100 billion dollars, the flower industry is ubiquitous in both developed and developing countries. Experts estimate that the trade is growing at a very encouraging rate of 11% per year. For years, Europe has dominated the flower industry as the largest flower export market, accounting for 77 percent of the total market. With a 52 percent global market share, the Netherlands is the world's largest exporter and producer of flowers (Laboni *et al*., 2019). Columbia was the first country to introduce flowers as a business item to the global market. Columbia's huge success in selling flowers to the international market inspired other countries to get involved, including the Netherlands, Columbia, Israel, Mexico, Peru, Kenya, and others. Flowers are in high demand in countries such as the United States, the United Kingdom, Canada, France, Italy, and Spain. The European Union is the most important export market for Dutch floriculture, with Germany, the United Kingdom,

and France being the top three countries importing flowers from the Netherlands. The United States has overtaken China as the world's leading flower importer (22%). (Vahoniya *et al*., 2018).

According to the experts, the trade is growing at a highly encouraging rate of 11% percent a year. About 305,105 ha area was under flower production in different countries of the world, of which the total area in Europe was 44,444 ha, North America 22,388 ha, Asia and Pacific 215,386 ha, the Middle East and Africa 2,282 ha and Central and South Africa 17,605 ha. Flowers grown under protected greenhouses in different countries around the world total 46,008 ha. India has the maximum area under ornamental crops (88,600 ha) followed by China (59,527 ha), Indonesia (34,000 ha), Japan (21,218 ha), USA (16400 ha), Brazil (10285 ha), Taiwan (9.661 ha), The Netherlands (8,017 ha), Italy (7.654 ha), the United Kingdom (6,804 ha), Germany (6,621 ha) and Colombia (4,757 ha) (Sudhagar *et al*., 2013).

Table 2.2: Top 10 flower export and import countries

Top 10 export countries			Top 10 import countries		
Rank	Countries	Revenue (US$)	Rank	Countries	Revenue (Euro)
1	Netherlands	4.2 billion	1	Kenya	307.5 million
2	Colombia	1.4 billion	2	Ethiopia	187.1 million
3	Ecuador	643.6 million	3	Israel	47.3 million
4	Kenya	635.4 million	4	Belgium	44.7 million
5	Ethiopia	190.2 million	5	Germany	39.1 million
6	china	125.8 million	6	Spain	31.3 million
7	Belarus	123.9 million	7	Italy	29.5 million
8	Italy	69.7 million	8	Zimbabwe	14 million
9	Malaysia	87.4 million	9	Denmark	11 million
10	Belgium	81.4 million	10	France	10.5 million

Source: Royal FloraHolland statista 2020

Ornamental crops are grown in more than 145 countries around the world, and the area under these crops is steadily increasing. Flower crop production has increased significantly, and there is a huge global demand for floricultural products, resulting in a growing international flower trade. Because of globalization and its impact on

income, global demand for cut flowers and potted plants is increasing at a rate of 10 to 15% per year. Flower consumption is closely linked to GNP per capita income and urban population in developed countries (Sudhagar *et al*., 2013)

2.6. Gerbera production technology

2.6.1. Techniques or start field cultivation

It is preferable to increase the vegetation under a poly/green home when growing Gerbera as a commercial venture. An acre of land is roughly 4000 square meters of greenhouse space. A technique area of 4000 sqm is sufficient to reap real benefits from this business. We can easily fit 24000 Gerbera plants into the space. Polyhouse development takes 25-30 days, with the base and water set up taking a week, bed planning and basal treatment taking two weeks, and Farmville farm relying on the region taking another two weeks. To put it another way, it will take less than two months to set everything up. Gerbera can be harvested throughout the entire season.

2.6.2. Soil

To have better main growth and clear transmission of origins, the ground should be highly permeable. For Gerbera farming, exotic loam with good water flow and drainage potential and a pH of 5.5–6.5 is preferable (Deshmukh *et al*., 2019). It is critical to sterilize the ground in order to reduce the attack of ground-borne infections such as Phytophthora, Fusarium, and Pythium, which could otherwise completely wipe out the vegetation. The mattresses should be saturated/fumigated with 2 percent substances (100 ml formalin in 5 liters water / m^2 area) or methyl bromide (70 g/m^2), then protected with a plastic material piece for at least 2 to 3 times.. The mattresses should be consequently well watered thoroughly to empty the harmful substances before growing. Well-developed cells lifestyle vegetation having 4 -6 results in can be placed strongly without burying the top.

2.6.3. Climate

The temperature should be within the range of 25° C – 27°C to avoid bud abortion/scorching inside the garden greenhouse.

2.6.4. Irrigation

Drip watering is done once in 2 – 3 times @ 3.75 liter/drip/plant for 15 – 20 minutes is adequate for Gerbera farming. Regular water need is about 500 – 700 ml/day/plant.

Water quality should be like the pH 6.5 – 7.0, EC should be < 450 ppm (Deshmukh *et al.*, 2019).

2.6.5. Season of blooming and harvesting

When flowers absolutely open, growing is done. Plant stalk is saturated in Salt hypochlorite solution (5-7 ml/lit of water) for 4-5 hours to improve container life. "In the 1st season production we can collect 1080000 nos of cut flowers.

2.6.6. Reproduction and planting

It can be spread through lollipops and cells lifestyle plantlets. Elevated boxes with 4 ft. size and 40 cm size are established at a period of 60 cm and growing is done in a space of 30 x 30 cm.

2.6.7. Natural manure basal or natures neem dessert

Urea 2.5 ton/ha, P – 400 g/100 sq.ft. , $MgSo4$ – 0.5 kg/100 sq.ft. Can be used for best results. Growth Regulators For smaller sized bins like 4-inch containers, implement B-Nine (daminozide) at 2,500 ppm seven to 10 times after planting. Do not implement B-Nine once pals are noticeable because this will cause reduced place arises. When pea-sized pals are noticeable, the vegetation will place in roughly three weeks.

2.6.8. Plant protection

1. To control Nematode – Carbofuran 7-8 kg/ha is used at the time of growing.

2. Foliage spot – Carbendazim 2 g/lit or Mancozeb 2 g/lit is used on the other hand.

3. Foliage miner – Chlorpyriphos 20 EC 2 ml/lit.

4. Glasshouse whitefly – Monocrotophos 36 WSC 2 ml/lit or Natures neem oil 3 ml/lit.

2.6.9. Intercultural operations

1. Hand weeding is done whenever necessary.

2."rake" the ground once in 15 times to accomplish easy consumption of standard water, manure and to provide air to the origins.

3. Eliminate older leaves in order to accomplish new leaf growth and good cleanliness.

2.6.10. Yield

The vegetation results in 2 arises / place / 1 month. Collection begins from 3rd 30 times of growing and ongoing up to two years. Under the open situation, 130 -160 flowers / m^2 / season and under greenhouse situation, 175 – 200 flowers /m^2 / season can be found.

2.7. Justification of the study

In recent years, the world has faced challenges such as food scarcity, population explosion, lack of shelter, employment, and natural resource management. To meet the demands of a vast and rapidly growing population, agricultural land is gradually being converted to homestead and other income-generating uses. Commercial flower cultivation could be a significant source of income for many developing countries, including Bangladesh. Bangladesh has a lot of flower potential, both for the domestic market and for export. Different agro climatic conditions can produce various flower varieties throughout the year. Bangladesh has a great opportunity to earn a lot of foreign currency from international markets if flower production and marketing are well developed. It is hoped that if flower cultivation could have been developed with the necessary government support, marketing efficiency could have been achieved in a short period of time.

Among many cut flowers, this study was based on gerbera in the study area farmers preferred to cultivate gerbera because it is a long-lasting plant and people's interests have changed over time, and gerbera now has a high demand. Aside from that, gerbera flower cultivation has the potential to contribute to our Gross Domestic Product (GDP) and create jobs. Gerbera cultivation is helpful to improving our farmers' living standards by increasing their income. In order to increase gerbera production to its maximum potential, it is necessary to identify the factors that cause yield variations and potentialities in order to improve farmers' socioeconomic conditions, increase self-employment, and reduce poverty. Policy interventions may also be necessary accordingly.

This study would add to the field of gerbera cultivation by providing new information and laying the groundwork for future research. The information generated by the study will benefit flower producers, traders, and exporters at various levels. This study generates farm-level data on socio-demographic characteristics of gerbera-producing

farmers, input use and pricing, cost and returns, resource use efficiency of gerbera cultivation, and problems and recommendations related to gerbera production at the farm level. This study adds to the existing body of knowledge about gerbera production, particularly in the area under investigation. This study offers useful suggestions and policy recommendations that may assist the country's development agencies and policymakers in improving rural people's livelihoods. This study discovered the need to conduct and analyze the impact of gerbera production in Bangladesh within the current development context, which will aid policymakers in better understanding the current situation and developing programs to increase cut flower production and improve the livelihood of Bangladesh's rural people. Researchers, on the other hand, believed that the study's findings would provide useful updated information to policymakers and researchers for further investigation.

Objectives of the study

The specific objectives of the study are as follows;

1. To identify the socio-economic profile of Gerbera producing farmers in Jashore district
2. To examine the financial profitability of Gerbera cultivation in the study area
3. To determine the factors affecting Gerbera cultivation
4. To find out the major problems confronted by Gerbera farmers at farm level and suggest some policy guide line

2.8. Outline of the study

This paper contains a total of eight chapters which have been organized in the following sequence. Chapter 1 is introduction including the background, justification and objectives of the study. The review of literature is presented in Chapter 2. Methodology of the relevant study is discussed in Chapter 3. Chapter 4 contains the socio-demographic profile of gerbera producing farmers. Chapter 5 deals with the costs and returns of gerbera production. Chapter 6 describes the factors affecting of gerbera production. Chapter 7 find out the problems and constraints confronted by the farmers in case of gerbera cultivation. Summary, conclusion and policy recommendations to increase gerbera production is discussed in chapter 8.

2.9. Limitations of the study

Given the researcher's limited time, money, and other resources, it was necessary to impose some restrictions, as listed below, in order to make the study meaningful and manageable from a research standpoint:

❖ The investigation was based on the information provided by the growers during their interviews.

❖ In some cases, while collecting data from the target respondents, the researcher encountered unexpected interference from overly interested side talkers.

❖ Due to a lack of time, the study was unable to cover a broad range of topics in order to collect the necessary data to avoid an inverse profit relationship.

❖ The farmers always remained busy in field work so, it was difficult to collect data from them.

CHAPTER II

LITERATURE REVIEW

3.1. Introduction

A review of the literature is an attempt to examine the findings in order to provide proper guidance in the design of future research problems and the validation of new findings. It also assists in the successful completion of the research work by providing various knowledge and information related to the proposed study. The literature and research of major previous works in connection with the current study were searched because this knowledge and information can be used to help design future research problems and validate new findings. However, the review of literature was not limited to Bangladeshi works; it was also extended to other countries in order to gain a broader perspective.

3.2. Gerbera related studies

Grafiadellis *et al*., (2000) worked on "An economic analysis of soilless culture in gerbera production". In this paper, the financial efficiency of the soilless culture system (SCS) for gerbera (Gerbera jamesonii Bol. ex Adlam.) production in heated greenhouses in northern Greece was compared to that of the soil culture system. The assessment was based on budgeting procedures that assumed a 9-year project life. They argued that soilless culture system was more profitable, particularly the plastic bag system with perlite media. Over the course of nine years, producers who used PSS earned an estimated net income of $18,414 dollars. The importance of product price and discount rate in determining accrued benefits was demonstrated using sensitivity analysis. They agree with the conclusion that technological advancements may open up new avenues for increasing greenhouse entry efficiency.

Jalil *et al.,* (2007) experimented on "Export potential of cut flowers in Bangladesh". The study looked into the export potential of some Bangladeshi flowers, including tuberose, rose, gladiolus, gerbera, and marigold. The research used secondary time series data on Bangladeshi cut-flower exports from July 2004 to March 2007. Cut flower exports from Bangladesh are forecasted using linear and exponential models with a 95% confidence interval. The analysis revealed that all of the models' coefficients are highly significant (at 1 percent level). The linear part of the model, i.e. the coefficient is significant, indicating that the change in value of cut flowers exported

from Bangladesh over time was not constant in absolute terms. The analysis found that if the present growth rate continues the value of cut flower exported from Bangladesh would lie between Tk. 204440.77 thousand and Tk. 403130.80 thousand based on linear model or would lie between TK. 327631.5 thousand and TK. 4128406 thousand based on exponential model. They conclude that as a young nation, Bangladesh is striving hard for the future and the government policy is one of inducement and facilitation for promotion investment and export. There is a lot of opportunity to increase export of cut flower from Bangladesh.

Mou, (2012) studied "Profitability of flower production and marketing system of Bangladesh". She attempted to compare the production and profitability of a few different flowers to the production and profitability of competing crops. She also identified Bangladesh's flower marketing value chains and channels. Flowers and vegetables had gross margins of Tk. 1359824.20 and Tk. 46 362.14, respectively, per hectare. She discovered that flower farming has promising results in terms of improving farmer socioeconomic conditions, increasing self-employment opportunities, promoting entrepreneurship in both urban and rural areas, and increasing export trade to earn foreign currency, indicating that it could be a useful tool for poverty alleviation and long-term growth in Bangladesh's economy. She also identified problems and constraints associated with flower production and marketing, and based on those constraints, she made some recommendations that could help the flower industry develop and strengthen.

Sudhagar, (2013) examined "Production and marketing of cut flower (rose and gerbera) in Hosur Taluk". The research was carried out in the Tamil Nadu taluk of Hosur. The study focused on Hosur's high-tech floriculture. He discovered that a new generation of growers is stepping forward to use modern technology to increase production and provide high-quality produce for consumer acceptance, resulting in a higher price. The gross return per acre for gerbera production was 18.72 (Rs. in lakhs), the cost of production was 11.12 (Rs. in lakhs), and the net return was 7.6 (Rs. in lakhs) (Rs. In lakhs). The net profit was Rs. 12.99 lakhs. According to the hi-tech growers, the major issues in cut-flower production included a large investment in cut-flower production (reported by 83.63 percent of the respondents). Cultivation has emerged as a lucrative profession with far greater profit than agri-horticultural crops.

Gamanagatti & Patil (2015) worked on "Protected cultivation technology (PCT) in Karnataka – an economic analysis of Gerbera". Northern Karnataka India was purposively selected. During the 2013-14 growing season, the economics of Gerbera's Protected Cultivation Technology (PCT) were assessed. The 30 sample farmers from the study area were chosen using the proportionate sampling technique. They discovered that the average cost per hectare for establishing a Gerbera PCT unit was Rs. 9778.27 thousand. Gerbera 4799295 numbers in Gerbera flowers yielded a total yield of 4799295 per hectare. Gerbera provided a gross return of Rs. 13233 thousands. At a cost of $1.81, the output-to-input ratio is 1.81. The cost of production per flower was Rs. 1.52 before subsidies, and it was Rs. 1.39 after subsidies. For 10%, the B-C ratio was 1.35, while for 12 and 15%, it was 1.31 and 1.24, respectively. Gerbera has a 3.61-year payback period and a 3.61-year internal rate of return was 29 percent yield has obtained.

Mohiuddin, (2016) completed a study on "Flower business flourish floriculture: a study on Bangladesh". He stated that the flower market is growing at an annual rate of 11%. Bangladesh has a bright future in the flower business and floriculture due to natural advantages such as fertile soil, favorable climate, and other amenities. However, due to insufficient infrastructure, poor packaging, a lack of technical know-how in production and marketing, and an inefficient management system, we are unable to produce and market flowers efficiently in both domestic and international markets. The international flower market is very prosperous, but in order to compete in the flower market, Bangladeshi farmers must develop flower varieties, packing systems, grading systems, processing and distribution system, storage etc.

Islam, (2016) worked on "Impact of flower cultivation on farmers' livelihood in Jhenaidah district" found 76.5 % of the farmers gained medium livelihood improvement through flower cultivation, while 13.9 % had high impact of flower cultivation on farmer's livelihood category. The majority of the farmers 73.9 percent of flower farmers reported medium flower cultivation constraints, while 11.3 percent reported high flower cultivation constraints. According to the Constraint Faced Index (CFI), high labor wages are the first constraint, followed by insufficient credit support. He also stated that the overall impact of flower farming on farmers' livelihoods is moderate and that more research is needed. He suggested that, in order to improve

farmers' livelihoods, respective authorities implement and popularize farmer-based flower cultivation projects on a large scale.

Islam, (2016) worked on "Farmers, attitude towards commercial cultivation of cut flowers". The study was undertaken in Savar upazila under Dhaka district. The majority of farmers (41.3 percent) had a positive attitude toward commercial cut flower cultivation, with 33.7 percent having a more positive attitude and 25% having the most positive attitude. Farmers' education background, agricultural extension media contact, and farmers' category were also found to be significant factors in farmers' attitudes toward commercial cut flower cultivation, with agricultural extension media contact and farmers' category being the most significant contributing factors.

Mehraja *et al.*, (2016) studied "Classification and evaluation of gerbera cultivars". The experiment was conducted to classify and evaluate the available gerbera cultivars (Gerbera jamesonii, Hook) in Bangladesh. They used twenty four gerbera cultivars and those were coded from V1-V24. They found that V8, V9. V10, V11, V12, V15, V16, V19, V20, V21, V22, V23 and V24 were performed as best in terms of different growth, yield also the quality contributing characters. These cultivars (V8-V12, V15, V16, V19-V24) also provided plenty of variation for leaf area (ranges from 215.7 cm2 to 231.1 cm2). They examined that flower head diameter was >10.0 cm (except V8), peduncle diameter was >8.0 mm, standard peduncle length >30.0 cm and petal thickness >0.39 mm (except V8) for these the best performing cultivars (V8-V12, V15, V16, V19-V24).

Hossain & Hossain M, (2016) conducted a study on "Price variation and cost benefit ratio of different flowers produced in Bangladesh". During June 2015 to May 2016, the experiment was carried out at the Agargaon flower market, Shahbag and other retail shops in Dhaka, as well as various flower growing areas in Bangladesh, to investigate the current state of the flower business in Bangladesh. The information was gathered from a variety of wholesalers, retailers, and farmers. The findings revealed that different types of flowers are grown in different parts of the country. In Dhaka city, there are numerous flower markets and shops. Different flowers cost different amounts on different days of the week, months of the year, and special days of the year. The cost of production differed depending on the type of flower.. They also identified that a lot of flowers are produced in Bangladesh, there were some problems prevail in flower production.

Prodhan *et at.,* **(2017)** conducted a study on "Status and Prospect of Gerbera Cultivation in Bangladesh" The goal of the study was to learn more about the Gerbera flower's importance, current status, research accomplishments, production techniques, post-harvest handling, and future prospects in Bangladesh. They discovered that the total area under floriculture in Bangladesh ranges from 4250 to 4570 hectares. 3210 to 3450 ha of land are covered in various flowers, with an estimated property under the baby's room generating decorative vegetation ranging from 1040 to 1120 ha. Lack of mother stock and their high cost, cost of fertilizer and pesticides, lack of scientific knowledge and training, pest and disease attack, and lack of extension work, while insufficient and poorly developed transportation and communication programs, low rate were main problems. A concentrated effort by government entities and non-government agencies to offer appropriate classes to farm owners and traders, to offer appropriate production assistance and storage space facility.

Rakibuzzaman *et al.,* **(2018)** examined "Flower industry in Bangladesh: exploring flower potential". The paper summarizes, flower growers' and traders' current marketing conditions and practices, as well as the feasibility of developmental intervention. The demand for flowers, particularly cut flowers, is increasing in both the domestic and international markets. Bangladesh, like other countries, has the potential to earn foreign currency, but key issues such as limited infrastructure, poor packaging, a lack of technical know-how in production and marketing, and an inefficient management system are the main culprits. It was suggested that action be taken to investigate the possibility of starting a floriculture business to supplement the income.

Anzu-Man-Ara *et al.,* **(2018)** conducted a report on "Development of protective cultivation techniques of gladiolus and gerbera in Bangladesh" under Floriculture Division, Horticulture Research Centre Bangladesh Agricultural Research Institute. During the winter season in Gazipur, the project lasted from May 2017 to September 2018. They looked at how different substrates affected gerbera growth, flowering, yield, and quality. Five-week-old tissue cultured planets of gerbera (GJ-023) with 4-5 leaves were planted in beds, and the experiment was designed with three replications in a Completely Randomized Block Design. The application of GA3 @ 100 ppm was found to produce the most leaves/plant, the most plant spread, the earliest appearance of flowering, and the most sucker/plant of all the treatments. The length of the flower stalk

and the number of flowers/plants were found to be at their highest in this treatment. This treatment had the longest flowering time and the longest vase life.

Brishty, (2018) worked on "Field investigation and survey on diseases of Gerbera (Gerbera jamesonii L.) In Jashore district of Bangladesh". During February to May 2019, two experiments were conducted in Jashore and Dhaka. There were a total of eleven diseases discovered in the field. The most common disease in Jashore, however, was Botrytis cinerea-caused leaf blight. Incidence and severity of disease ranged from 0-56 percent and 0-26 percent, respectively. She stated that the rainy season had the highest incidence and severity, followed by summer and winter. Leaf spot, Leaf blight, Flower blight, and Flower abnormality were the most common diseases found on inspected Gerbera plants. In case of Leaf blight, the highest incidence (50%) was in Patuapara and the lowest (8.33%) was in Chadpur village. However, the highest severity (16%) was observed at Sadirali and lowest was (0.83%) at Mathuapara. In Leaf spot disease, the highest incidence (43.33%) was observed at Kuliya and the lowest was recorded (8.33%) at Belemath. The severity was highest (11.66%) at Godkhali and Nilkonthonogor and lowest (1.33%) at Sharifpur and Mathuapara.

Manjira, (2018) conducted a study on "Comparative profitability and value chain analysis of cut flower cultivation in Jashore and Dhaka district of Bangladesh". This study summarizes the current production and marketing conditions, as well as the practices of cut-flower growers and traders (rose and gerbera). For rose and gerbera total cost, gross return, gross margin, and net return per hectare were Tk. 327019, Tk. 902484, Tk. 648214, and Tk. 575465, respectively, while total cost, gross return, gross margin, and net return were Tk. 538479, Tk. 2116800, Tk. 1646766, and Tk. 1578321. Rose and gerbera production benefit cost ratios were 1:2.76 and 1:3.93 on a full cost basis, respectively, and rose and gerbera production benefit cost ratios were 1:3.55 and 1:4.55 on a cash cost basis, respectively. Despite the fact that both rose and gerbera production were highly profitable, gerbera was more profitable. Inadequate cold storage and seasonality in demand, she claims, are the main constraints for farmers. It is necessary to emphasize technology dissemination activities (varietal, production, etc.) as well as government support for farmers to receive a fair price.

Deshmukh *et al.,* (2019) studied on "Economic feasibility of gerbera (Gerbera jamesoniiL.) Under protected cultivation with special reference to Chhindwara district of Madhya Pradesh". The majority of cut flower growers, they found, have turned it into a side business. The study found that the area and production of gerbera in Madhya Pradesh's Chhindwara district could be greatly expanded. They discovered that the cost of gerbera cultivation was initially higher, but that the returns were also very good due to the high demand in the market. They discovered a favorable Benefit-Cost Ratio (2.94) and concluded that gerbera cultivation was a profitable venture for investors.

Nandhini *et al.*, (2020) conducted a study on "Technical and resource use efficiency in cut flower production in India: an empirical assessment". Hosur block in Krishnagiri district was selected for the study. Rose, Gerbera, and Carnation cut flowers were chosen for the study. With a value of 0.65, the coefficient of adjusted multiple determination ($R2$) was significant. With a value of 0.66, the regression constant was positive. The coefficients of the variables in a log linear production function represented the production elasticity of the resources used. In the case of Rose and Gerbera, there was an overuse of human labor, with MIC exceeding MVP. In case of technical efficiency, the most proportion of the farmers belonged to least efficient category (less than 90%) followed by high efficient category (more than 98%) and lastly with medium efficient category of less than (90 to 98 %). Moreover, higher price fluctuation was the major constraint.

Sagar Maitra *et al*. (2020) worked on "Evaluation of Gerbera (Gerbera jamesonii L.) Cultivars for Growth, Yield and Flower Quality under Protected Cultivation". During 2018-2019, the investigation was conducted. They argued that six gerbera cultivars, were tested for growth, productivity, and floral quality in a forced ventilated polyhouse with a fan-pad cooling system and a micro-climate controlled by the internet of things (IoT). The experiment was replicated four times using Randomized Block Design. Stanza had the highest plant height (45 cm) and the cultivar White House had the most leaves (30.3) during the 100-day after planting. But the cultivar Dana ellene showed its superiority in terms of floral characters like stalk length (62.3 cm), basal girth of the stalk of flower (0.70 cm) and flower diameter (12.8 cm) with more yield. The experiment was carried out to appraise the performance of gerbera cultivars under forced ventilated polyhouse with fan-pad cooling system.

Manisha *et al*., (2021) conducted a study on "Economics of gerbera under polyhouse cultivation in Ranga Reddy district of Telangana State". For one year, the cost and returns of Gerbera in selected polyhouse units (2004 m2) were calculated. The average cost of Gerbera cultivation in a polyhouse unit was Rs.10, 32,518.40, and the average yield in a polyhouse unit was 62,764.80 bunches. The average price per bunch came to Rs. 22.5 per bunch. The gross and net returns were respectively Rs. 14, 12,208.00 and Rs. 1, 98,995.60. The study discovered that growing Gerbera in a polyhouse requires a lot of money. When farmers were given a subsidy, however, Gerbera cultivation under selected polyhouse units was found to be economically viable, as evidenced by a Benefit Cost Ratio of 1.22, Net Present Value of 17.45 lakhs, and IRR of 56 percent.

3.3. Concluding remarks

According to the above discussion and review, the majority of the studies focused on flower cost, return, profitability, marketing, and productivity. Changes in the manufacturing process may have occurred during this time, and the validity of those factors must be revisited as a result of these changes. In addition, the impact of other factors identified by researchers in other countries must be examined in the context of Bangladesh. In Bangladesh, only a few integrated studies on profitability and factors affecting gerbera cut flower production have been conducted. As a result, it is expected that this study will be conducted with those factors in mind. The review of literature was useful in re-designing methodological aspects in order to overcome previous studies' limitations. Based on the findings of the previous studies, the researcher believes that a profitability and factors affecting analysis of gerbera cultivation in Bangladesh within the current development context is necessary, as it will aid policymakers in understanding the current situation and developing programs to increase gerbera production and improve the livelihood of Bangladesh's rural people. According to the review, a few studies on floriculture and gerbera have been conducted. The outcomes of these studies vary greatly for a variety of reasons. There isn't much research on the economics of gerbera cultivation. As a result, the current research aims to collect data on gerbera cultivation in Bangladesh's Jashore district.

On the other hand, researcher believed that the findings of this study would provide useful updated information, which would help the policy makers and researcher for further investigations.

CHAPTER III

METHODOLOGY

4.1. Introduction

The methodology for the study is discussed in this chapter. The appropriate methodology used in the research has a big impact on the reliability of a scientific study. Farm management research typically entails gathering primary data from working farmers. Methodology is primarily concerned with the detailed sequential steps of research work, such as the selection of study areas, study period, data sources, data processing, and analytical techniques. Any systematic study's methodology should be carefully considered. The use of proper methodology is a requirement for good research. The nature of the study and its objectives will determine how primary data will be collected. Because it is less expensive and time consuming, the survey method will be used for this study.

4.2. Selection of the study area

Any study requires a study area. It denotes the study's trustworthiness. Climate, land, and soil conditions are important factors in any research area because they influence production. The choice of a study area is a crucial step. Flowers are only commercially grown in a few areas of Bangladesh. Some districts are less suitable for commercial flower cultivation due to agro-climatic factors. In Bangladesh, Jashore is known as a flower production center. Each season produces a different type of flower. Jashore's geographical location is ideal for flower cultivation. Jessore produces 85 percent of Bangladesh's flowers. Traditionally, flower usage was not common in Bangladesh. There are seventy five villages of five upazilas where flower is cultivated in Jashore district. Among them, Jhikargachha upazila is the most important area for flower cultivation. To achieve the objectives of the present study, preliminary surveys was conducted in two villages (Gandkhali and panisara) of Godkhali Union of Jhikargachha upazila under Jashore district.

Figure 4.1: Identification of the study areas

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

- ❖ Farmers of these villages are involved in gerbera flower cultivation.
- ❖ From the view point of time and available resource, this area is suitable for the study.
- ❖ Easy accessibility and good communication facilities.
- ❖ Researcher's belief about getting well co-operation from the selected respondent.

4.3. Selection of the sample and sampling technique

A farm business survey that covers all farms is extremely difficult to conduct. As a result, sampling is done to select representative gerbera farmers in order to reduce study costs in terms of time and resources.

A total of 100 gerbera flower cultivators were sampled from two villages named Gadkhali and Panisara. Each village provided 50 flower cultivators as a sample. For data collection, a simple random sampling technique was used to select farmers who cultivate gerbera in the study area.

4.4. Preparation of the survey schedule

In this study, the preparation of survey schedules was crucial. A comprehensive survey schedule was created to collect necessary information from the concerned respondent in such a way that all relevant information for gerbera cultivation could be obtained quickly. The interview schedule had been practiced in order to assess their suitability. The schedule was finalized after pre-testing.

4.5. Collection of data

To meet the study's objectives, the necessary data was gathered by personally visiting each farm and interviewing them using a pre-tested interview schedule. The majority of respondents do not keep track of their activities. As a result, collecting actual data is extremely difficult, and the researcher must rely on the respondent's memory. Each respondent was given a brief overview of the study's goals and objectives before going into an actual interview. The question was asked in a systematic and straightforward manner, and the results were recorded on the interview schedule. The interview schedule was checked and verified after each interview to ensure that information for each of the items had been properly recorded. Data was collected in local units to reduce the number of errors. Following that, they were converted to the appropriate standard unit.

Because of the nature of the variables and types of respondents, both qualitative and quantitative data collection procedures were used. The study drew on two types of data: primary and secondary data. Interviewing the chosen respondents will be used to collect primary data. The data was collected over a two-month period. Data has been properly edited and analyzed after it has been collected. BBS, Bangladesh Flower Growers &

Exporter Association (BFA), books, journals, newspapers, articles, and the internet were used to gather secondary data.

4.6. Editing and tabulation of data

After collection of primary data, the filled schedules were edited for analysis. These data were verified to eliminate possible errors and inconsistencies. All the collected data were summarized and scrutinized carefully. For data entry and profitability analysis Microsoft Excel programs was used, SPSS was used for socio-economic profile analysis of the cultivars and STATA programs was used to determine the factors affecting on gerbera cultivation. It might be observed here that information was collected initially in local units and after checking the collected data, it was converted into standard units. Finally, relevant tables were prepared according to necessity of analysis to meet the objectives of the study.

4.7. Analytical technique

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

4.7.1. Descriptive analysis

The most common methods for determining the respondent's socio-demographic profile were tabular and graphical analysis. The cost, returns, and profitability of gerbera cultivation were calculated using the tabular analysis technique. It has a simple calculation, is widely used, and is simple to comprehend. Simple measures like average, percentage, and ratio were calculated using it. Production practices and input use, as well as the cost and returns of gerbera production, were all tabulated.

4.7.2. Production function analysis

The relationship between output and factor inputs is represented by the production function. To estimate the production function, one must first develop its properties, which leads to the specification of a formal functional form.

Cobb Douglas production is one of the most widely used production functions for empirical estimation. C.W. Cobb and P.H. Douglas first used this function in the 1920s to estimate the marginal productivities of labor and capital in American manufacturing industries. They used this function with the constraint that the sum of elasticity's or

regression coefficients should equal one because their main goal was to estimate the shares of labor and capital in total product. Cobb and Douglas applied the function to time series from the 1930s and 1940s at first. Many production function studies for technical units (crops, livestock) and farm-firms in agricultures have since used this form of the function. The popularity of this function can be attributed to the following characteristics:

- It directly provides the elasticity's of production with respect to inputs;
- It allows more degrees of freedom than other algebraic forms (like quadratic function) which allow increasing or decreasing marginal productivities, and
- It simplifies the calculations by reducing the number of regression to be handled in regression analysis.

The original form used by Cobb and Douglas was

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

This forces sum of elasticity's to one. Their later modification was

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

In agriculture, this form of function has not been used in its original form. Neither the sum of elasticity's is kept equal to one nor is the number of variables limited to two. Even then as the basic idea of functional form was provided by Cobb and Douglas, various forms of this function have continued to be called as Cobb-Douglas production function.

The Cobb–Douglas production function, in its stochastic form, may be expressed as

$$Y_i = \beta_1 X_{2i}^{\beta_2} X_{3i}^{\beta_3} e^{u_i} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

Where, Y = Output

X_2= Labor input, X_3= Capital input, u = Stochastic disturbance term,

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

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

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

Thus written, the model is linear in the parameters β_0, β_2, and β_3 and is therefore a linear regression model. Notice, though, it is nonlinear in the variables *Y* and *X* but linear in the logs of these variables. In short, (3.2) is a log-log, double-log, or log-linear model, the multiple regression counter part of the two-variable log-linear model.

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

1. β_2 is the (partial) elasticity of output with respect to the labor input, that is, it measures the percentage change in output for, say, a 1 percent change in the labor input, holding the capital input constant.
2. Here, β_3 is the (partial) elasticity of output with respect to the capital input, holding the labor input constant.
3. Sum of $(\beta_2 + \beta_3)$ gives information about the returns to scale, that is, the response of output to a proportionate change in the inputs. If this sum is 1, then there are constant returns to scale, that is, doubling the inputs will double the output, tripling the inputs will triple the output, and so on. If the sum is less than 1, there are decreasing returns to scale—doubling the inputs will less than double the output. Finally, if the sum is greater than 1, there are increasing returns to scale—doubling the inputs will more than double the output.

Whenever there is a log–linear regression model involving any number of variables the coefficient of each of the X variables measures the (partial) elasticity of the dependent variable Y with respect to that variable. Thus, if there is a k-variable log-linear model,

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

Each of the (partial) regression coefficients, β_2 through β_k, is the (partial) elasticity of Y with respect to variables X_2 through X_k. Assuming that the model (3.2) satisfies the assumptions of the classical linear regression model; we obtained the regression by the OLS. (Acharya, 2010).

4.7.3. Specification of the Cobb-Douglas production function

The input-output relationships of gerbera production was analyzed with the help of Cobb-Douglas production function approach. To determine the contribution of the most important variables in the production process of gerbera production the Cobb-Douglas

production function was transformed into following logarithmic form so that it could be solved by Ordinary Least Squares (OLS) method.

$LnY = a + b_1 lnX_1 + b_2 lnX_2 + b_3 lnX_3 + b_4 lnX_4 + b_5 lnX_5 + b_6 lnX_6 + b_7 lnX_7 + b_8 lnX_8 + Ui$, , , …………….…….…………….. (3.5).

Where, lnY = Yield (stick/ha)

lnX_1 = Human labor (man-days/ha)

lnX_2 = Seedling cost (tk/ha)

lnX_3 = Organic manure (kg/ha)

lnX_4 = Urea (kg/ha)

lnX_5 = TSP (kg/ha)

lnX_6 = Zinc sulphate (kg/ha)

lnX_7 = Irrigation cost (tk/ha)

lnX_8 = Insecticide cost (tk/ha)

a = Intercept, b_1, b_2 -------- b_8 = Coefficients of the respective variables to be estimated, Ui = Error term.

4.8. Profitability analysis

Cost and return analysis is the most common method of determining the profitability of different farm households. In the present study, the profitability of gerbera cultivation is calculated by the following way-

4.8.1. Calculation of gross return

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

Gross Return (GR) = Quantity of the product × Average price of the product

4.8.2. Calculation of gross margin

The difference between gross return and variable costs is known as gross margin. Farmers, in general, prefer a high rate of return over a variable cost of production. The farmers' motivation for using the gross margin analysis is to maximize returns over

variable costs. On a TVC basis, gross margin was calculated. The gross margin per hectare was calculated by subtracting variable costs from gross return. That is,

Gross Margin = Gross return – Variable cost.

4.8.3. Calculation of net return

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

Net Return (NR) = Total return – Total production cost.

4.8.4. Undiscounted benefit cost ratio (BCR)

Average return to each taka spent on production is an important criterion for measuring profitability. Undiscounted BCR was estimated as the ratio of total return to total cost per hectare.

BCR (Full cost basis) = Total Return/Total Cost (TR/TC)

4.9. Problem confrontation index (PCI)

A four point rating scale is used for computing the problem score of a respondent. Each farmer is asked to indicate the extent of difficulty by each of the problem by checking any of the four responses such as 'high', 'medium', 'low' and 'not at all' and weights were assigned to these responses as 3, 2, 1 and 0 respectively.

For making rank order, Problem Confrontation Index (PCI) is computed as used by (Hossein and Miah, 2011). The PCI was computed by using the following formula:

$PCI = P_h \times 3 + P_m \times 2 + P_l \times 1 + P_n \times 0$

Where,

P_h = Total number of farmers expressed problem as 'high';

P_m = Total number of farmers expressed problem as 'medium';

P_l = Total number of farmers expressed problem as 'low'; and

P_n = Total number of farmers expressed problem as 'not at all'.

Thus, PCI of any problem could range from 0 to 300 where 0 indicating 'no' problem confrontation and 300 indicating 'high' problem confrontation and have been arranged in rank order according to their problem indices.

CHAPTER IV

SOCIO-ECONOMIC STATUS OF GERBERA PRODUCING FARMERS

5.1. Introduction

The socioeconomic characteristics of the sample farmers are discussed in this chapter. Farmers' socioeconomic characteristics have a significant impact on production planning. There are many interconnected and constituent characteristics that define an individual and have a significant impact on the development of his or her behavior and personality. The present study looked into the socioeconomic aspects of the sample households. These factors included family size and composition, as well as age distribution. Occupation, education level, women's participation, land ownership pattern, farming category, and so on. A brief discussion of these aspects is given below.

5.2. Age distribution of the sample farmers

Age of farmers have an influence on the production and in the better management of the production system. There were three age groups that were Young age (<35 years), middle age (35-50) and old age (>50 years). The different age groups of the farmer are shown in Figure 5.1 It was found that the highest number of the respondents (48%) belongs to the middle age, (37%) old age and 15% respondents were in the young age. This finding imply that majority of the sample farmers were in the most active age group of 35-50 years indicating that they provided more physical efforts for work of gerbera farming. This age group is supposed to have enormous vigor and risk bearing ability
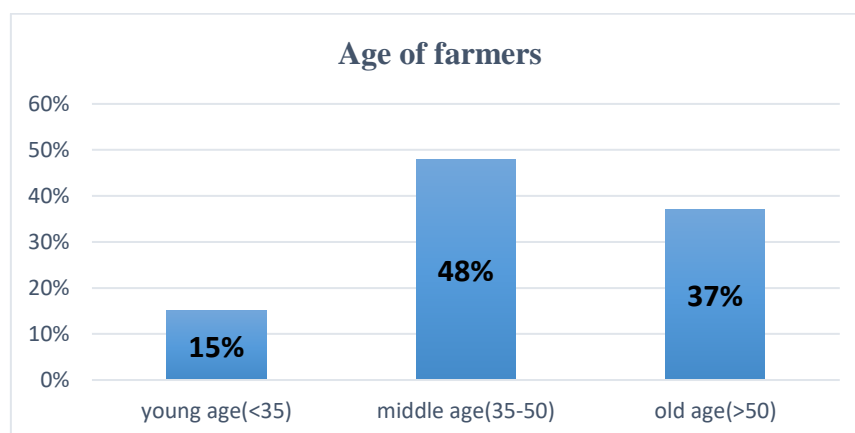
Figure 5.1: Age category of gerbera producing farmers

Source: Field survey, 2020

5.3. Educational status of the gerbera producing farmers

Education is generally regarded as an index of social improvement of a community. It plays a critically important role in reducing poverty and inequality, improving health and enabling the use of knowledge. Education means efficiency. Education of farmers helps to increase skill and productivity. Education plays an important role in accelerating the pace of agricultural development and it greatly influences the new technology and scientific knowledge regarding farming. It is evident from Figure 5.2 that out of 100 gerbera farmers 39% had primary education, 34% had secondary education, 10% had higher secondary education, 6% higher studied, only 4% could write their name and 7% farmers were illiterate.

Education level of farmers

	primary	secondary	higher secondary	higher studies	write name	illiterate
%	39%	34%	10%	6%	4%	7%
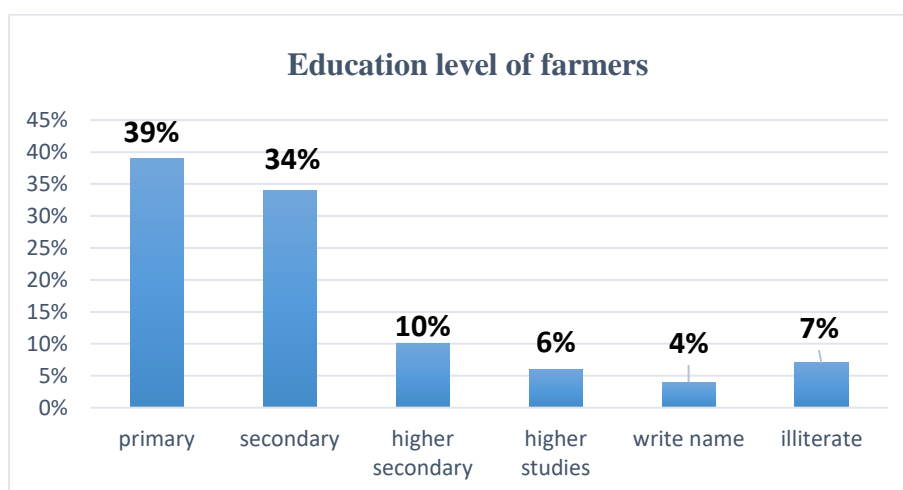
Figure 5.2: Educational category of the gerbera growing respondents

Source: Field survey 2020

5.4. Family size of the sample farmers

Data presented in Figure 5.3 indicate that most of the respondent's family (66%) belonged to medium size family (5-8) category, (1-4) considered as small size family (24%) while only about 10% of the respondents belonged to large family size (>8) category. The average family size in total was 4.85. Where 2.45 was the average male member and average female member was 2.10.
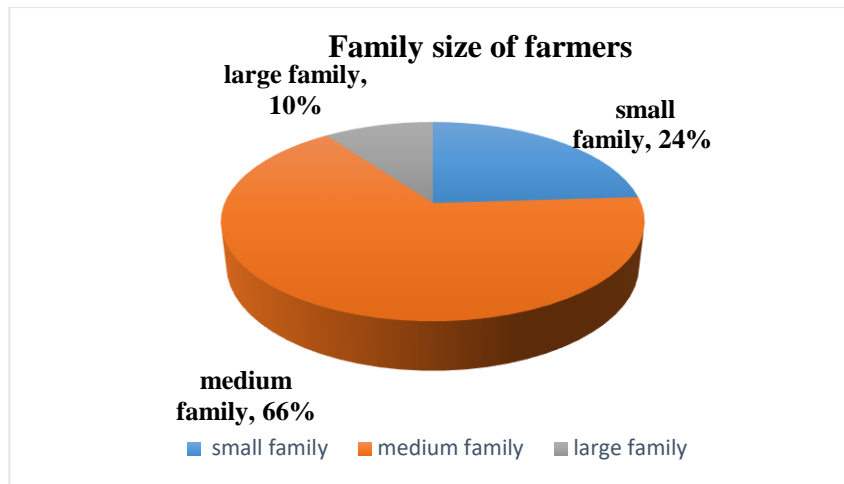
Figure 5.3: Family size of the gerbera growing farmers

Source: Field survey, 2020

5.5. Age distribution and gender of the sample farmers

The sex category was divided into two groups here, such as- male and female. The relationship between age and sex of the study area is presenting in Table 5.1.

Table 5.1: Gender wise age distribution of the sample farmers

Age	Gender	Percentage (%)
Below 35 years	Male	15
	Female	3
35-50 years	Male	40
	Female	10
Above 50 years	Male	30
	Female	2
Total		100

Source: Field survey, 2020

5.6. Earning member and farming experience

Farming Experience is important for efficiently gerbera production. Average earning member was 1.98 (No) and average farming experience 16.25 years of the gerbera cultivators was found during the study period.

5.7. Occupational status of gerbera producing farmers

The work in which a man is engaged for more or less throughout the year is known as the occupation of that person. Selected farmers of the study area were engaged in various other occupations along with gerbera cultivation. The main and subsidiary occupations of selected farmers are presented in Table 5.2. Female workers contribution is very low in all types of occupation for religious view. Gerbera cultivation was the main occupation about 54% of the respondents.

Table 5.2: Occupational status of gerbera farmers

Occupation	Percentage (%)
Gerbera Cultivation	54
Gerbera + Other Flower	14
Gerbera + Crops	9
Gerbera + Livestock	5
Gerbera + Fish Culture	3
Gerbera + Business	6
Gerbera + Labor	7
Gerbera + Service	2
Total	100

Source: Field survey, 2020

5.8. Gerbera land ownership pattern of selected sample farmers

Most of the agricultural lands in Bangladesh are divided and sub-divided into small plots mainly due to law of inheritance. The ownership patterns of gerbera producing farmers were classified into three categories single, joint and leased. In gerbera farming about 78 percent of gerbera farmers were single owner, 2 percent were belonged to joint ownership and those of 20 percent had leased ownership. (Table 5.3)

Table 5.3: Gerbera land ownership category of the respondents

Category	Percentage (%)
Single Ownership	78
Leased	20
Joint	2
Total	100

Source: Field survey, 2020

5.9. Economic situation of the gerbera cultivars

Yearly income has increased greatly after gerbera cultivation. In the study area income ranges from 5 lac to above 20 lac. So, the yearly income category of the respondents were divided into less than 10 lac, 10-20 lac and above 20 lac. Only 21% farmer's yearly income was less than Tk. 10 lac. 65% farmers' yearly income was between TK. 10 lac to TK. 20 lac. 14% farmers' yearly income was greater than TK. 20 lac. (Table 5.4)

Table 5.4: Economic situation of the farmers

Yearly Income	Percentage (%)
Less than 10 Lac	21
10 Lac to 20 Lac	65
Above 20 Lac	14
Total	100

Source: Field survey, 2020

5.10. Credit facilities of the respondent

Available amount of funding is an important factor for any kind of farming. The sources of credit facilities for gerbera producing farmers include Banks, NGOs, Relatives and Friends. 38% of the respondents took credit and another 62% did not take any credit or loan. (Figure 5.4). Among them 9 farmers had taken loan from banks, 11 had taken loan from NGOs, 18 farmers from friends and relatives. Bangladesh Krishi Bank had given loan at 4% interest rate. Different NGOs had given loan ranges from 10-15 % interest rate.

CREDIT FACILITIES OF THE RESPONDENTS

Credit   No Credit

38%

62%
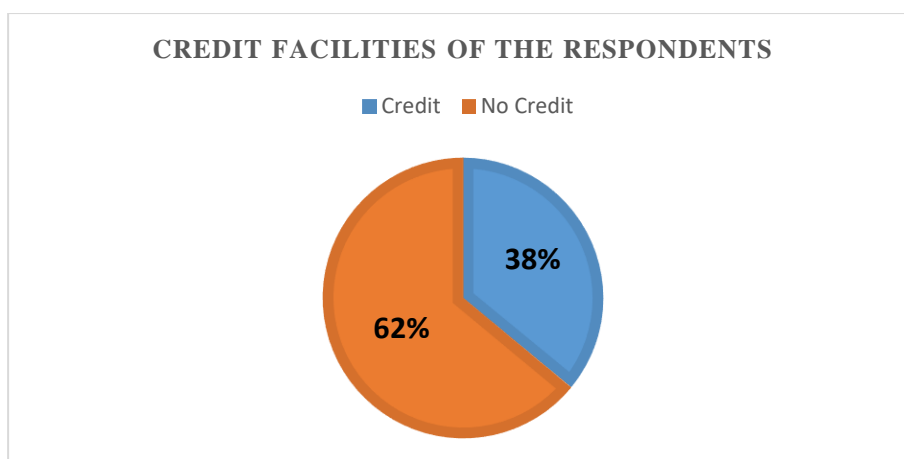
Figure 5.4: Credit facilities of the sample farmer

Source: Field survey, 2020

5.11. Farm size category of the sample farmers

In the present study the size of land holdings of gerbera producing farmers are classified into different categories marginal farmer (<0.05 ha), small farmer (>0.5-1 ha), medium farmer (>1-2.5 ha) and large farmer (>2.5 ha) (Zaman, 2013). Size of land holdings includes own land, homestead area, gerbera land, pond area, leased in, leased out, mortgage in and mortgage out as reported by the sample farmers. Total land holdings = (own land + cultivated land + homestead + pond + leased in + mortgage in) – (leased out +mortgage out). 24 percent farmers were under marginal category, 40 percent were small farm category, 36 percent were medium category and no one were from large category farmer.

Table 5.5: Farming category of the respondents

Land Holdings and Category	percentage
Marginal sized farm (0-0.5 ha)	24
Small sized farm (>0.5-1 ha)	40
Medium sized farm (>1-2.5 ha)	36
Large sized farm (>2.5 ha)	0
Total	100

Source: Field survey, 2020

5.12. Training facilities of the respondents

Training is important for the efficient production of gerbera flower as it is not our indigenous flower. Different organizations government and non-government like Bangladesh Agricultural Development Corporation (BADC), Rural Reconstruction Foundation (RRF), Jagoroni Foundation etc. provide training facilities for the gerbera farmers. 62% of the sample farmers took training and another 38% had no training on gerbera production. (Figure 5.5)
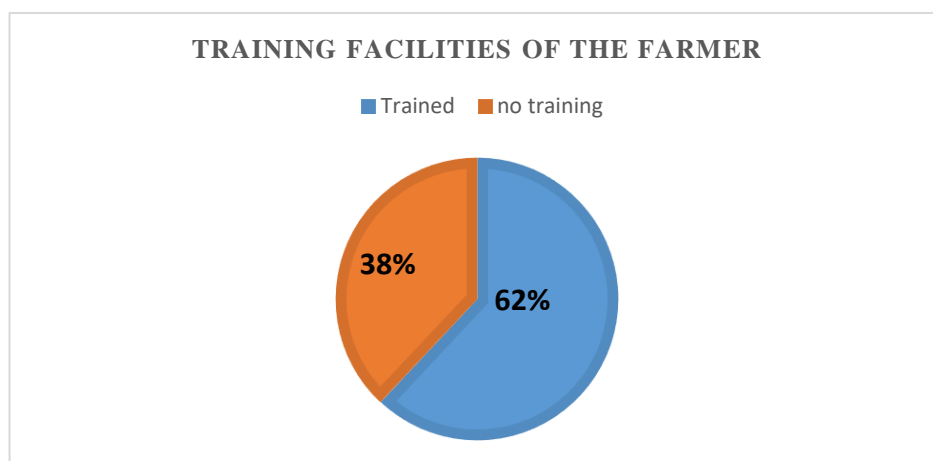
Figure 5.5: Training facilities of the sample farmers

Source: Field survey, 2020

5.13. Expenditure of gerbera cultivators

The yearly expenditure of gerbera farmers differs from one another. In the present study, the expenditure of farmers were categorized as food, education, clothing, health, house repair, festive etc.
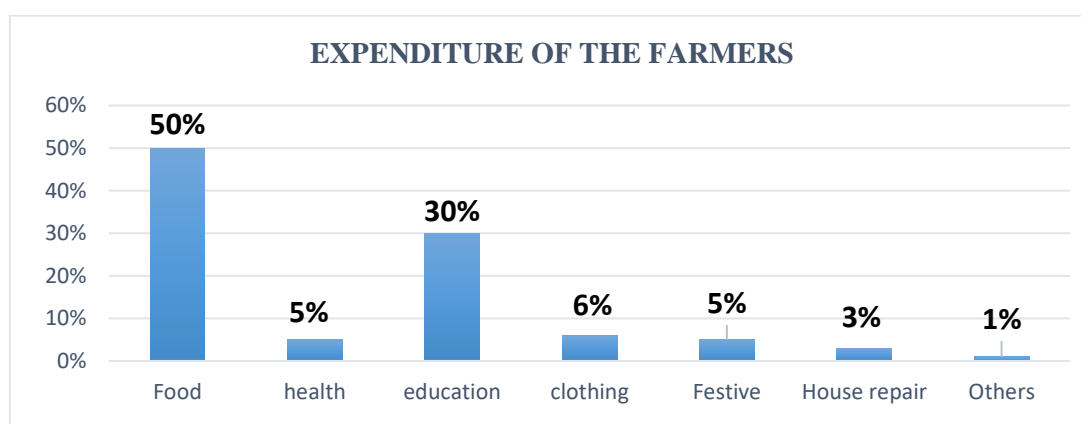
Figure 5.6: Expenditure of gerbera farmers

Figure **5.6** represents that, gerbera producing farmer's expenditure were 50 percent, 30 percent, 6 percent, 3 percent, 5 percent, 5 percent and 1 percent from food, education, cloth, house repair, medical purpose, festival and others respectively. The percentage of food expenditure is higher than any other expenditure.

5.14. Conclusion

This chapter analyzed the socioeconomic attributes of the sample farmers. The findings of analysis clearly indicate the socioeconomic characteristics from each other in respect of age distribution, education, occupation, ownership pattern, income etc.

CHAPTER V

COST AND RETURN FROM GERBERA PRODUCTION

6.1. Introduction

Cost is important in every production process because it helps farmers make the best decisions. The main focus of this chapter is on cost estimation and analysis for gerbera production. The costs were divided into two categories: variable costs and fixed costs. The majority of the inputs were valued at current market rates, as well as government rates in the study area at the time of the survey, or the prices at which farmers purchased the inputs. However, for some unpaid inputs, such as family labor, a non-cash price was paid, making pricing extremely difficult. The rule of opportunity cost was applied in these cases. From the perspective of farmers, the financial return on gerbera production was calculated. For the study period, all returns were accounted. Below is a brief description of how the individual costs and returns in this study were calculated. The cost items were divided into the following categories for the sake of analysis.

6.2. Variable costs of gerbera

6.2.1. Human labor cost

Various activities and management of the selected farms, such as land preparation, weeding, sorting, grading, harvesting, and so on, require human labor. Human labor was divided into two categories: hired labor and family labor. Calculating the cost of hired labor is simple. A man-day was defined as 8 hours of work in this study. The average rate was used to reduce the amount of complexity. Labor cost varies with respect to different seasons. In the study area it varied from 450 to 500 Tk. per man-days. Thus the computed average rate was Tk. 475 per man-days for gerbera cultivation. Use of human labor and its relevant cost incurred are shown in Table 5.1. The per hectare labor cost (hired) of gerbera was Tk. 42750 which constituted 9.23 percent of total variable cost.

6.2.2. Land preparation cost

Land preparation cost incurred was shown in table 5.1. The per hectare land preparation cost for gerbera was Tk. 4225 which constituted 0.91 percent of total variable cost.

Gerbera plant required well drained soil and constriction of this kind bed was slightly costly.

6.2.3. Cost of seedling

The price of a seedling per unit varied from location to location and from time to time. However, the cost was calculated using the actual price paid by the farmers. Gerbera seedlings cost on average Tk.40 per piece. The average cost of gerbera seedling per hectare was estimated to be Tk. 201080, accounting for 43.43 percent of total variable cost (Table 5.1). Few farmers obtained seedlings from local nurseries, but the majority purchased gerbera seedlings from India.

6.2.4. Cost of organic manure

Manure (cow dung) was a common organic fertilizer for flower production. In the study area, there was no set price for buying manure. Farmers used manure that they had purchased. During the study period, the cost of manure was calculated using the current market price, which was Tk. 1 per kg. Per hectare cost of using manure was calculated at Tk. 2547 for gerbera cultivation which accounted for 0.55 percent of total variable cost (Table 5.1)

6.2.5. Cost of fertilizer

Fertilizer is an important input for gerbera cultivation. Gerbera farmers applied various kinds of fertilizer such as Urea, TSP, MOP, ZnSO4, Gypsum, Boron etc. Uses of these fertilizers influence in increasing the growth of flower. The cost of fertilizer was estimated by using the prevailing market rate which was actually paid by the farmers. The prices of these fertilizers were assumed to be same in all categories of farms. The average prices of urea, TSP, MPO, $ZnSO_4$, gypsum & boron were Tk. 16 per kg, Tk. 24 per kg, Tk. 24 per kg, Tk 140 per kg, Tk 30 per kg, Tk. 45 per kg respectively in the study area. The estimated costs of fertilizer are shown in table 5.1. It was observed that gerbera farmers incurred cost of Tk. 26576 for urea, Tk.3552 for TSP and Tk. 12456 for MOP, TK. 1120 for $ZnSO_4$, TK. 4200 for gypsum, TK. 300 for boron. Which constituted 5.74 percent, 0.77 percent, 2.69 percent, 0.24 percent, 0.91 percent, and 0.06 percent of total variable cost respectively.

6.2.6. Cost of insecticides

Costs of Insecticides incurred are shown in table 5.1. The average per hectare costs of insecticides for gerbera was Tk. 40890 which constituted 8.83 percent of total variable cost.

6.2.7. Cost of irrigation

Water is needed at the appropriate time for the proper growth of gerbera. Drip irrigation is done once in 2-3 days for 15-20 minutes. So, cost of irrigation was computed on the basis of prevailing market rate. Average per hectare irrigation cost of gerbera was calculated TK 43109 which was 9.31 percent of total variable cost (Table 5.1).

6.2.8. Cost of polyhouse for gerbera

The cover of a polyhouse is made of polythene, making it a smaller version of a greenhouse. A polyhouse is less expensive than a greenhouse. This was similar to Europe's well-designed and temperature-adjustable poly net or greenhouse. It was, however, more specialized and long-lasting than the greenhouse built with local equipment in Godkhali, Jashore, Bangladesh's flower capital. Ultra violet stabilized low density polyethylene was used to cover the structure. In the net house, there was a method for lowering temperatures. Similarly, there was a system that used water to create steam. Despite the fact that it is a tropical area, a modern gerbera field has flourished. Some excellent young people were monitoring the overall activities of those farms. The average cost of a poly house for gerbera per hectare was Tk. 57683, accounting for 12.46 percent of total variable costs (Table 5.1).

6.2.9. Interest on operating capital

Interest on operating capital was determined on the basis of opportunity cost principle. The operating capital actually represented the investment on different farm operation over the period because all the cost was not incurred at the beginning or at any single point of time. The cost was incurred throughout the whole production period; hence, at the rate of 9 percent per annum interest on operating capital for six months was computed gerbera production (Interest rate was taken according to the bank rate prevailing in the market during the study period). Interest on operating capital was calculated by using the following standard formula (Miah, 1992).

Interest on Operating Capital (IOC) = Alit

Al= Total investment,   t = Total time period of a cycle

i= interest rate which was 9 percent per year during study period

The interest on operating capital of gerbera was estimated at Tk. 19938.96 which constituted 4.31 percent share of total variable cost (Table 6.1)

Table 6.1: Per hectare variable cost of gerbera cultivation

Cost Items	Units	Quantity (unit/ha)	Price (Tk/unit)	Cost (TK)	% of total variable cost
Labor (hired)	Man-days	90	475	42750	9.23
Land preparation	Tk			4225	0.91
Seedling	No	5027	40	201080	43.43
Organic manure	Kg	2547	1	2547	0.55
Urea	Kg	1661	16	26576	5.74
TSP	Kg	148	24	3552	0.77
MOP	Kg	519	24	12456	2.69
ZnSO4	Kg	8	140	1120	0.24
Gypsum	Kg	120	35	4200	0.91
Boron	Tk			300	0.06
Polyhouse	Tk			57683	12.46
Irrigation	Tk			43109	9.31
Insecticides	Tk			40890	8.83
Transportation	Tk			2600	0.56
Interest on operating capital (IOC)	Tk			19938.96	4.31
Total variable cost				463027	100.00

Source: Field survey, 2020

6.2.10. Total variable cost

In the study area, the total variable costs varied from year to year. It was observed that the total per hectare variable cost for cultivation was Tk. 463027 which comprised of 83.75 percent of total cost (Table 6.1).

6.3. Fixed costs

6.3.1. Land use and family labor cost

Farmers used the land in accordance with the terms of the lease agreement. The term leasing cost refers to the cost incurred by gerbera farmers in obtaining a land lease for gerbera production for a specific period of time.

The cost of leasing varies depending on the location, soil fertility, topography of the soil, and distance from water sources, among other factors. The single most expensive item in the study areas was leasing. The opportunity cost concept was used to calculate the value of one's own land. The rental value of gerbera land per hectare was estimated at Tk.68445, accounting for 76.20 percent of the total fixed cost. Family labor cost was 21375 which was 23.80 percent of total fixed cost.(Table 5.2).

Table 6.2: Per hectare fixed cost of gerbera cultivation

Fixed cost items	Cost (Tk)	% of total fixed cost
Land use cost	68445	76.20
Family labor (45 man-days)	21375	23.80
Total fixed costs	89820	100.00

Source: Field survey, 2020

6.3.2. Total fixed cost

In the study area it was estimated that per hectare total fixed cost for year round gerbera cultivation was Tk. 89820 which comprised of 16.25 percent of total cost (Table 6.2).

6.4. Total cost

The total costs was calculated by adding total variable cost and total fixed cost. In the study, per hectare total cost of gerbera cultivation was calculated at Tk. 552847 (Table 6.3).

Table 6.3: Per hectare total cost of gerbera cultivation

Cost items	Cost (Tk./ha)	Percent of total cost (%)
a. Total variable cost	463027	83.75
b. Total fixed cost	89820	16.25
Total cost (a+b)	552847	100.00

Source: Field survey, 2020

6.5. Returns of gerbera cultivation

6.5.1. Gross return

Per hectare gross return was calculated by multiplying the total amount of production by their market prices. In the study area, per hectare average yield of gerbera was 213338 (stick/ha) and its money value was Tk. 1920042.

Table 6.4: Gross margin and benefit cost ratio of gerbera cultivation

Sl. No.,	Items		Amount tk/ha
A.	Gross returns (GR) (yield* price)		1920042
	Yield(stick/ha)	Price(tk./stick)	
	213338	9	
B.	Total variable costs (TVC),		463027
C.	Total costs (TVC+TFC),		552847
D.	Net return (GR-TC),		1367195
E.	Gross margin (GR-TVC),		904168
F.	Benefit-cost ratio (BCR) = GR/TC, (Full cost basis)		3.47

Source: Field survey, 2020

6.5.2. Net return

Farmer's income is the general term for net return. Net return is an important factor to consider when evaluating the profitability of gerbera production. The difference between gross return and total costs is known as net return. Gerbera production has a net return of Tk. 1367195 per hectare, indicating that it is a profitable business for farmers (Table 6.4).

6.5.3. Gross margin

Farmers typically seek the highest possible return on their variable production costs. It's possible that the difficulty in estimating fixed costs of production is the reason. As a result, gross margin analysis was used to determine the relative profitability of gerbera cultivation. Gerbera cultivation's gross margin was estimated to be Tk. 904168 (Table 6.4).

6.5.4. Benefit cost ratio (BCR)

Benefit cost ratio was calculated by dividing gross return by total cost. It implies return per taka invested. It helps to analyze financial efficiency of the farm. It was evident from the study, the benefit cost ratio on full cost basis of gerbera cultivation was 3.47 implying that Tk. 3.47 would be earned by investing Tk. 1.00 for gerbera production. (Table 6.4).

6.6. Concluding remarks

Farmers are getting benefit from gerbera cultivation because they earn more money. Though gerbera cultivation requires a higher initial investment than any other flower, it is gradually gaining popularity in the country due to its high yield potential and high demand in the international market. Farmers in the study stated that higher yield and income encouraged them to continue growing gerberas.

CHAPTER VI

FACTORS AFFECTING YIELDS OF GERBERA CULTIVATION

7.1. Introduction

The purpose of this chapter is to identify and quantify the effects of the major variables on the production of gerberas. To estimate the contribution of key variables on the gerbera cultivation production process, the Cobb-Douglas production function was chosen. The model's estimated values are shown in Table 6.1.

7.2. Functional analysis for identifying the factors affecting production

The maximum output that can be produced with given inputs is specified by a production function, which is a relation or a mathematical function. Eight explanatory variables for gerbera were chosen to estimate the quantitative effects of inputs on output, keeping in mind the study's objectives and the effect of explanatory variables on gerbera cultivation output.

The management factor was left out of the model because defining and measuring it is nearly impossible, especially in this study, where a farm operator is both a laborer and a manager. On the basis of some preliminary estimation, other independent variables such as water quality, soil condition, time, and so on, which could have influenced farm enterprise production, were excluded from the model. A brief description of the explanatory variables used in the model is provided here.

7.3. Estimated values of the production function analysis

- ❖ F-value was used to measure the goodness of fit for different types of inputs.
- ❖ Coefficient of multiple determination (R^2) indicates the total variations of output explained by the independent variables included in the model.
- ❖ Coefficients having sufficient degrees of freedom were tested for significance level at 1 percent, 5 percent and 10 percent levels of significant.
- ❖ Stage of production was estimated by returns to scale which was the summation of all the production elasticity of various inputs.
- ❖ The estimated coefficients and related statistics of the Cobb-Douglas production function for gerbera cultivation are shown in Table 7.1.

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

Explanatory variables	Coefficient	Standard error	t- value
Intercept	3.709 ***	0.452	8.19
Human, labor (X_1)	0.436 ***	0.079	5.48
Seedling (X_2)	0.048 *	0.027	1.76
Organic manure (X_3)	-0.0093 NS	0.024	-0.39
Urea (X_4)	0.209 ***	0.043	4.78
TSP (X_5)	0.022 NS	0.033	0.67
$ZnSO_4$ (X_6)	0.047 *	0.024	1.94
Insecticides(X_7)	0.109 NS	0.110	0.99
Irrigation(X_8)	0.114 **	0.051	2.23
R^2		0.97	
Adjusted R^2		0.96	
Return to scale		0.97	
F-value		499	

Source: Field survey, 2020
Note: *** Significant at 1 percent level
** Significant at 5 percent level
* Significant at 10 percent level and
NS: Not significant

7.4. Interpretation of the results

Effect of human labor (X_1)

From the Table 7.1 it can be seen that the value of the coefficient was positive and significant at 1 percent level for gerbera which indicates that 1 percent increase in the

use of human labor keeping other factors constant would increase the yield of gerbera by 0.436 percent.

Effect of seedling (X$_2$)

From the Table 7.1, it was found that the value of coefficient of seedling was positive and significant at 10 percent level for gerbera which indicates that at 1 percent increase in the number of seedling keeping other factors constant would increase the yield of Gerbera by 0.048 percent.

Effect of organic manure (X3)

From the Table 7.1, it was found that the value of coefficient of the use of organic manure was negative and insignificant for gerbera. The value of the coefficient was -0.0093 indicating that it has no severe effect on the production of gerbera.

Effect of urea (X$_4$)

It was observed from the regression that the coefficient of the use of urea was positive and significant at 1 percent level which indicates that at 1 percent increase in the use of urea keeping other factors constant would increase the yield of gerbera by 0.209 percent. (Table 7.1)

Effect of TSP (X5)

It was found from the table 6.1 that the value of the coefficient of the use of TSP was positive and insignificant. The value of the coefficient was 0.022 indicating that it has no severe effect on the production of gerbera.

Effect of ZnSO$_4$ (X$_6$)

It was observed from the regression, that the coefficient of the use of ZnSO$_4$ was positive and significant at 10 percent level of significance which indicates that at 1 percent increase in the use of ZnSO$_4$ remaining other factors constant would increase the yield of Gerbera by 0.047 percent. (Table 7.1)

Effect of insecticides (X$_7$)

From the Table 7.1 it can be seen that the value of the coefficient was positive and insignificant. The value of the coefficient was 0.109 indicating that it has no severe effect on the production of gerbera.

Effect of irrigation (X_8)

It was observed from the regression analysis that the coefficient of the irrigation was positive and significant at 5 percent level of significance which indicates that at 1 percent increase in the application of irrigation remaining other factors constant would increase the yield of gerbera by 0.114 percent. (Table 7.1)

7.5. Coefficient of multiple determinations (R^2)

The values of the coefficient of multiple determination for gerbera was found to be 0.97 which implied that about 97 percent of the total variation in the yield (stick/ha) could be explained by the included explanatory variables of the model. So, we can also say the goodness of fit of this regression model is better since R^2 indicates the goodness of fit of the regression model. (Table 7.1)

7.6. Adjusted R^2

The term adjusted means adjusted for the degrees of freedom. The adjusted R^2 for gerbera cultivation was found to be 0.96 which indicated that about 96 percent of the variation of the yield were explained by the explanatory variables included in the model. (Table 7.1)

7.7. Returns to scale in gerbera cultivation

The summation of all the production coefficients of gerbera cultivation was 0.97. It means, production function for gerbera cultivation exhibits decreasing returns to scale. This means that, if all the variables specified in the model were increased by 1 percent, yield would also be increased by o.97 percent for gerbera. (Table 7.1)

7.8. F-value

The F-statistic was computed to denote the overall goodness of fit of any fitted model. The F-value for the gerbera cultivation was estimated at 499 which was highly significant at 1 percent level means that the explanatory variables included in the model were important for explaining the variation in yield of gerbera cultivation. (Table 7.1)

7.9. Concluding remarks

It was evident from the Cobb-Douglas production function model, that the included key variables had significant and positive effect on gerbera cultivation except the insignificant effect of organic manure, TSP, insecticides. So there was a positive effect of key factors in the production process of year round gerbera cultivation.

CHAPTER VII

PROBLEMS CONFRONTED BY GERBERA FARMERS

8.1. Introduction

For thousands of cut flower farmers in Bangladesh, gerbera cultivation is becoming more popular as a source of income. Flower farmers, on the other hand, are socially, economically, and educationally behind the times. In this study, an attempt was made to identify and analyze the major problems faced by farmers that act as major roadblocks in the operation of gerbera cultivation. The issues were divided into two categories: production-related issues and marketing-related issues.

8.2. Problem confrontation index (PCI)

There were various problems faced by the farmers during production of gerbera in the study areas. The researcher identified the major problems confronted by the farmers. The farmers were asked to give their opinion on 9 selected problems which were identified during data collection. They are,

- ❖ Natural Calamities
- ❖ Huge investment
- ❖ Non availability of quality indigenous seedling
- ❖ Lack of cold storage and underdeveloped market
- ❖ Lack of scientific knowledge and training
- ❖ Fluctuations of demand
- ❖ Disease and pest attack
- ❖ Insufficient of credit facilities
- ❖ Lack of government support

A four point rating scale was used for computing the problem score of a respondent. Each farmer was asked to indicate the extent of difficulty by each of the problem by checking any of the four responses such as 'high', 'medium', 'low' and 'not at all' and weights were assigned to these responses as 3, 2, 1 and 0 respectively. Thus, the problem confrontation score was obtained by adding weights of responses of the problems and therefore.

For making rank order, Problem Confrontation Index (PCI) was computed and used by Hossein and Miah, 2011. The PCI was computed by using the following formula:

$$PCI = P_h \times 3 + P_m \times 2 + P_l \times 1 + P_n \times 0$$

Where,

P_h = Total number of farmers expressed problem as 'high'

P_m = Total number of farmers expressed problem as 'medium'

P_l = Total number of farmers expressed problem as 'low' and

P_n = Total number of farmers expressed problem as 'not at all'

Thus, PCI of any problem could range from 0 to 300, 0 indicating 'no' problem confrontation and 300 indicating 'high' problem confrontation. The computed PCI of the 9 problems ranged from 75 to 298 (against a possible range from 0 to 300) and have been arranged in rank order according to their problem indices which appears in Table7.1.

Table8.1: Problem confrontation index for gerbera cultivation

Problems (N=100)	Extent of problem confrontation				PCI	Rank
	High (3)	Medium (2)	Low (1)	Not at all (0)		
1. Natural Calamities	98	2	0	0	298	1
2. Huge investment	86	6	4	4	274	2
3. Non availability of quality indigenous seedling	76	10	11	3	259	3
4. Lack of cold storage and underdeveloped market	75	11	10	4	257	4
5.Lack of scientific knowledge and training	48	37	8	7	226	5
6. Fluctuations of demand	38	26	11	25	177	6
7.Disease and pest attack	25	32	8	35	147	7
8. Insufficient of credit facilities	16	25	22	37	120	8
9.Lack of government support	10	7	31	52	75	9

Source: Field survey, 2020

Majority of the farmers pointed out that natural calamities was the main problem in the study areas in gerbera cultivation. Cyclone Amphan had severely affected flower farmers in jashore, who had incurred a loss of an estimated Tk over 50 crore. Heavy rain, storm, cyclone affects gerbera polyhouse very badly. 98 percent of the farmers claimed it as a high problem. Another 2 percent confronted it as medium problem. In this case the computed PCI was 298 [(98×3) + (2×2) + (0×1)] against a range from 0 to 300 was considered as 1st rank problem.

Gerbera cultivation required massive investment for construct polyhouse, raw materials, equipment's. Our neighbor nation Indian government give 30 to 80 percent subsidy to the gerbera farmer depends on which states they belong to but it is sorry to say there is no specific subsidy for gerbera cultivation in our country. Out of 100 farmers, 86 farmers confronted huge initial investment at high extent, 6 farmers confronted at medium extent, 4 farmers confronted at low extent and about only 4 farmers did not confronted this problem. In this case, the computed value of PCI was 274 [(86×3) + (6×2) + (4×1)] against a possible range from 0 to 300 and hence was considered as the 2nd ranked problem.

Quality seedling and special polythene for construction of polyhouse in not available in our country. For that reason the gerbera farmer of our country collect it from India. So, the cost become high. PCI index ranked it 3rd major problem.

Cold storage are key requirements in the post-harvest storage and distribution function of perishable commodities. Flower is perishable products. For storage imported seedlings, tissue cultured seedlings, unsold flowers, grading, sorting etc. Recommended temperature for storing most flower is roughly 1 degree Celsius and recommended humidity is 90-95%. There is a cold storage in Jhikorgacha upozila which is far away from the Godkhali market. Scientific cold storage and market infrastructure is not available in the local market. PCI index ranked it 4th problem.

Commercial Gerbera farming is a new practice in Bangladesh. In case of producing quality gerbera flower farmer have to maintain proper temperature, humidity. Water logging is harmful for this flower. Quality Gerbera price is higher than lower quality Gerbera. There is a shortage of trained manpower to handle commercial floriculture activities such as production, post-harvest handling, product development and biotechnology. Most of the farmers keep a little knowledge about modem technology.

It is evident from the table that forty eight percent of farmers faced the problem of proper knowledge and training as high. PCI index ranked it as 5th problem.

Gerbera price fluctuates with demand over the year. Thousands of tonnes of flower have been perished as the growers could not sell their products due to COVID-19 situation as all celebrations and outdoor events were cancelled. It's a major cause to reduce the price. PCI index ranked it 6th problem.

The main diseases for gerbera plants were Powdery Mildew, Pythium Root Rot, Rhizoctonia Crown Rot, and White Fly, which were considered 7th major problems in PCI index.

Insufficient credit is a big problem for farmers. Gerbera cultivation needs a lot of credit. In the study area farmers do not get sufficient loan from the banks. Banks are reluctant to give loan to farmers. As a result they take loan from different NGOs and money lender at high interest rate. PCI index ranked it 8th major problem. Government support is not available for Gerbera cultivation. Lack of government subsidy is ranked 9th major problem in PCI index.

Other problems

The modern marketing system's lifeblood is transportation. For the movement of agricultural products from the producer's field to different markets, the communication network in the study areas was not properly developed. Some villages are a long way from the nearest market. Transporting their flowers from different flower markets was difficult due to a lack of communication. Theft of flowers from the fields by thieves was another issue reported by gerbera growers. They also mentioned that flower spoilage was an issue to consider. Because gerbera is a highly perishable product, proper market information is essential for quick disposal. Almost all of the growers agreed that Bangladesh needed an exclusive flower market built on modern lines with all of the necessary infrastructure. The majority of respondents expressed a desire to improve general infrastructure and establish cold storage facilities. The majority of the farmers claimed that they didn't have enough regular customers and that there was a lot of cut flower waste.

8.3. Concluding remarks

The aforementioned issues are, of course, interconnected, and thus must be addressed holistically through an integrated program for the overall development of cut flower cultivation. The problems that farmers face were ranked according to the value of the Problem Confrontation Index (PCI). Natural calamities, large investment requirements, a lack of indigenous planting materials, a lack of cold storage, and seasonal demand were reported as the main constraints for gerbera production by the majority of farmers.

SUMMARY CONCLUSION AND RECOMMENDATION

9.1. Summary

Since time immemorial, the flower industry has played a critical role in Bangladesh's economy. This sector has received a lot of attention because of its multiple uses, including satisfying people's aesthetic needs, creating more jobs, ensuring higher rates of return for rural people, and facilitating the earning of more foreign exchange.

The broad agriculture sector, which includes crops, livestock, fisheries, and forestry, contributed 12.65% to the overall Gross Domestic Product (GDP) (BBS 2020). Bangladesh's ecology is conducive to the growth and production of flowers. With the help of modern technology, flower production is increasing every day. In 2019-20, flower production increased to 21,501 MT, up from 2,353 MT in 2008-09. The study's specific objectives were formulated in this context to determine an economic analysis of gerbera cultivation in selected areas of the flower capital city. Jashore. The specific objectives were as follows:

1. To identify the socio-economic profile of Gerbera producing farmers in Jashore district
2. To examine the financial profitability of Gerbera cultivation in the study area
3. To determine the factors affecting Gerbera cultivation
4. To find out the major problems confronted by farmers at farm level and suggest some policy guide line

There were a total of 100 Gerbera flower farmers who work all year. Gerbera farmers were chosen from two villages Godkhali and Panisara in the Jhikargachha Upazila under Jashore District. The survey method was used to collect production data, while simple random sampling was used to select the gerbera farmers. To achieve the study's goals, both tabular and statistical techniques were used. The researcher calculated profitability using the standard Benefit Cost Ratio method and the Cobb-Douglas Production Function for factors affecting the analysis.

With respect to socioeconomic features of the sample farmers, the findings revealed that gerbera producing farmers were classified into three age groups. Out of the total

sample farmers 15 percent belonged to the age group of below 35 years, 48 percent belonged to the age group of 35-50 years and 37 percent fell into the age group of above 50. The average family size in total was 4.85. Where 2.45 was the average male member and average female member was 2.10. Average farming experience was 16.25 years. Out of 100 sample gerbera farmers, 39%, 34%, 10%, 6%, 4% and 7% had primary education, secondary level education, higher secondary level education, higher studies education, write name and illiterate. Out of 100 gerbera farmers 15% were female farmers. The main occupation of the majority of the sample farmers 54% were gerbera cultivation. About 78% of gerbera farmers were single owner, 20% gerbera farmers were belonged to leased ownership and 2% had joint ownerships. About 21% of gerbera farmer's average yearly income were less than 10 lac, 65% had income between 10 to 20 lac, and 14% had income above 20 lac. 62% Gerbera farmers were trained. 40% were small farmer, 36% were medium farmer and another 24% were from marginal category farmer.

To determine the profitability of gerbera cultivation both the inputs and outputs were valued at market price during the study period. For analytical advantages, the cost item were identified as human, labor, land preparation, seedling,, organic, manure, fertilizers, insecticides, irrigation, land use cost,, interest on operating capital, poly-house cost was identified for gerbera. Cost and returns were worked out to estimate profitability of gerbera production. Per hectare total cost, gross return, net return and gross margin were Tk. 552847, Tk. 1920042, Tk. 1367195 and Tk. 904168. Undiscounted benefit cost ratio of gerbera was 3.47 (full cost basis).

In this study, Cobb-Douglas production function model was used to determine the effects of key variable inputs. The most important explanatory variables were included in the model to explain the gross yield of gerbera cultivation. Most of the variables in the gerbera production function were significant in explaining the yield (stick per ha) except the insignificant effect of organic manure, TSP and insecticides. The coefficient with expected sign indicates the selected inputs contributed positively to the yield. Production function for gerbera cultivation exhibits decreasing returns to scale (0.97). This means that, if all the variables specified in the model were increased by 1 percent, yield (stick/ ha) would also increase by 0.97 percent. The F-value for gerbera cultivation was 499 which were highly significant at 1 percent level.

This study also identified some of the problems and constraints associated with gerbera cultivation. The cultivation problems were categorized into production and marketing problems. The findings revealed that natural calamities ranked 1st problem. Other problems were seasonal demand, huge investment requirement, lack of cold storage, lack of scientific knowledge, unavailability of indigenous production materials and price fluctuations were the main constraints for the gerbera production.

9.2. Conclusion and policy recommendation

Thus, the study concludes that cultivation of Gerbera under polyhouse is highly capital intensive. But cultivation of Gerbera under selected polyhouse units was found to be economically viable as indicated by Benefit cost ratio of 3.47, Net present value of around 19.20 lakhs. If the problems they are facing can be solved, keeping in view the changes in climatic conditions the farmers can be encouraged to bring more area under poly house Gerbera cultivation. Yield and production will increase if modern inputs and production technology are made available to farmers in a timely manner, allowing farmers to increase their income and improve their living standards. Year-round gerbera cultivation has a lot of room for improvement in terms of yield per hectare. On the other hand, because Bangladesh's production costs are lower than those of other flower-exporting countries, there is a huge opportunity for Gerbera flower in the export market. Bangladesh has a competitive advantage due to its favorable climate and topography, all of which contribute to the sector's success. We can seize markets both at home and abroad by taking advantage of the favorable environment and comparatively better opportunity.

As part of the current study, which serves as a formulating strategy for enhancing gerbera production and developing the cut flower industry, the following recommendations are made to improve the productivity, efficiency, and effectiveness of gerbera cultivation:

- ❖ To protect the polyhouse of Gerbera from cyclone and heavy rain they have to build strong infrastructure. They demand that if we have the strong indigenous infrastructure material in our country it will help to protect the polyhouse.
- ❖ A quality indigenous planting materials supply system should be developed like (BARI⸺>DAE/BADC/Private Sector/Large NGO⸺>Flower Farmers) for increasing flower production and to stop of bringing planting materials from

India. To reduce the production cost of gerbera appropriate (quality) polyethylene should be manufactured.

❖ Though government already provides subsidies on fertilizer such as urea and other inputs needed for flower cultivation. They have to give subsidy on Gerbera cultivation as the initial investment is quite high.

❖ As farmers are not willing to take training but to boost production, a scientific method of cultivation should be implemented. Farmers should be given training, adequate extension services, information, and the tools they need to deal with new and changing circumstances.

❖ Flower seed, corms, and unsold flowers should all be kept in separate cold storage areas. Farmers will be able to get a better price if they use specialized cold storage for flowers because they will be able to refuse to sell cut flowers if the price is too low. Scientific modern cold storage should be made available to gerbera farmers. Market infrastructure should be established for developing marketing chain of the flower.

❖ To overcome the demand and price fluctuation during COVID-19 pandemic situation they demand that government should give special financial package for the country's flower growers and the people engaged in the sector.

❖ Floriculture loan should be arranged for the farmers with a low rate of interest. For this government and non-government organizations have to work together.

❖ With proper government support, a farmers marketing group association can be formed. Freight policy in Bangladesh is not favorable towards exporting Gerbera flowers, government should change the policy to make it favorable to small flower farmers.

REFERENCE

Acharya, S. (2010). Agricultural marketing in India. (4th ed.). Oxford and IBH Pub. Co. Pvt. Ltd. Pp: 123-130.

Annual Export Receipts 2018-2019 to 2020-2021, Statistics Department of Bangladesh Bank

Anzu-Man-Ara, Kabita and S. M. Sharifuzzaman. 2018. Development of Protective Cultivation Techniques of Gladiolus and Gerbera in Bangladesh. A report of Competitive Research Grant Sub- Project under National Agricultural Technology Program-Phase II Project (NATP-2), Bangladesh Agricultural Research Council (BARC), Farmgate, Dhaka, Bangladesh, Project ID 668.

Bangladesh Flower Growers and Exporters Association Report (2019). https://www.bdtradeinfo.com.

BBS, (2020). Agricultural Statistics of Bangladesh. Bangladesh Bureau of Statistics, Ministry of Planning, Government of Peoples Republic of Bangladesh, Dhaka.

BBS, (2021). Agricultural Statistics of Bangladesh. Bangladesh Bureau of Statistics, Ministry of Planning, Government of Peoples Republic of Bangladesh, Dhaka.

BER, (2021). Bangladesh Economic Review 2021 - Finance Division, Ministry of Finance-Government of the People's Republic of Bangladesh.

BFS, (2019). Flowers Prospects. Documentary Paper, Dhaka, Bangladesh. BFS: Bangladesh Flower Society.

Brishty, U. R. (2018). Field investigation and survey on diseases of gerbera (*Gerbera jamesonii L.*) in Jashore district of Bangladesh. Doctoral dissertation, Department Of Horticulture, Sher-E-Bangla Agricultural University, Dhaka-1207.

Deshmukh, G., Jhade, R. K., & Alawa, S. L. (2019). Economic feasibility of gerbera (*Gerbera jamesonii L.*) under protected cultivation with special reference to Chhindwara district of Madhya Pradesh. *International Journal of Chemical Studies*, 7(2): 1765-1768.

Dhaka Tribune report (2019).

https://archive.dhakatribune.com/business/2019/02/24/floriculture-business-showing-robust-growth

EPB, (2019). HS Code Wise Report of 20015-2019, Dhaka, Bangladesh. EPB: Export Promotion Bureau.

Gamanagatti, P. B., & Patil, B. L. (2015). Protected cultivation technology (PCT) in Karnataka–an economic analysis of Gerbera. *Eco. Env. & Cons*. 21 (2): 891-897.

Grafiadellis, I., Mattas, K., Maloupa, E., Tzouramani, I., & Galanopoulos, K. (2000). An economic analysis of soilless culture in gerbera production. *HortScience*, *35*(2): 300-303.

Hossain, M. S., Miah, M. A. M. (2011). Poor farmers' problem confrontation in using manure towards integrated plant nutrition system. *Bangladesh Journal of Extension Education*, *23*(1&2): 139-147.

Islam, I. B. (2016). Impact of flower cultivation on farmer's livelihood in Jhenaidah district. Doctoral dissertation, Dept. Of Agricultural Extension & Information System, Sher-E-Bangla Agricultural University, Dhaka-1207.

Islam, M. A. (2016). Farmer's attitude towards commercial cultivation of cut flowers, Doctoral dissertation, Dept. Of Agricultural Extension & Information System, Sher-E-Bangla Agricultural University, Dhaka-1207.

Jalil, M. A., Islam, A. H. M. S., & Sabur, S. A. (2007). Export Potential of Cut Flower in Bangladesh. *International Journal of Innovative Research and Development*, 12(4): 107-111.

JCF. (2012). Jagorani Chakra Foundation – http://jcf.org.bd/

Laboni, S. A., Promy, J. A., & Abdullah, S. Z. (2019). Export potentiality of flower industry: a case study on Bangladeshi flower industry. *North American Academic Research*, *2*(11): 251-271.

Hossain, M. D., Hossain, M. M., Mahfouz, Z. U., Moon, M. H. (2016). Study on price variation and cost benefit ratio of different flowers produced in Bangladesh. *Journal of Sylhet Agricultural University*. 3(1): 59–65.

Hossain, M. S. and M. A. M. Miah (2011). Poor farmers' confrontation in using manure towards integrated plant nutrition system. Bangladesh Journal of Extension Education, 23 (1&2): 139-147.

Maitra, S., Shankar, T., Sairam, M., Pine, S. (2020). Evaluation of gerbera (Gerbera jamesonii L.) cultivars for growth, yield and flower quality under protected cultivation. *Indian Journal of Natural Sciences*, 10(60): 20271-20276.

Manisha, V., Lavanya, T., Kumari, R. V., Supriya, K. (2021). Economics of gerbera under polyhouse cultivation in Ranga Reddy district of Telangana State. *The J. Res. PJTSAU*. 49 (1&2): 60-64.

Manjira, S. (2018). Comparative profitability and value chain analysis of cut flower cultivation in Jashore and Dhaka district of Bangladesh. M. S. thesis, Department Of Agricultural Economics, Sher-e-Bangla Agricultural University, Dhaka-1207.

Mehraja, H., Taufiqueb, T., Parvinb, S., Shamsuzzohab, M., Uddinb, A. J. Classification and evaluation of gerbera cultivars. *Journal of Bioscience and Agriculture Research*, *9*(02): 812-819.

Mohiuddin, M. (2016). Flower business flourish floriculture: a study on Bangladesh. *International Journal of Business and Management Invention*. *5*(10): 09-13.

Mou, N. H. (2012). Profitability of flower production and marketing system of Bangladesh. *Bangladesh J. Agril. Res*. 37(1): 77–95.

Nandhini, S. U., Thulasiram, R., Amarnath, J. S. Technical and resource use efficiency in cut flower production in India: an empirical assessment. *Plant Archives*. 20(2): 5077-5082.

Prodhan, S., Sarker, N. I., Islam, M. S., Ali, M. A. (2017). Status and prospect of gerbera cultivation in Bangladesh. *International Journal of Horticulture*, *1*(1): 4110-4115.

Rakibuzzaman, M., Rahul, S. K., Jahan, M. R., Ifaz, M. I., Uddin, A. J. (2018). Flower industry in Bangladesh. *International Journal of Business, Social and Scientific Research*, *7*(1): 50-56.

Royal FloraHolland statista (2020).https://www.statista.com/statistics/829385/leading-import-countries-of-royal-floraholland-by-revenue

Sudhagar, S., Phil, M. (2013). Production and marketing of cut flower (Rose and Gerbera) in Hosur Taluk. *International Journal of Business and Management Invention*, 2(5): 15-25.

Sagar, M., Tonmoy, S., Manisha, S., Sandip, P., (2020). Evaluation of gerbera cultivers for growth yield and flower quality under protected cultivation. *Indian journal of natural science,* 10(60): ISSN 0976-0997

Vahoniya, D., Ranjan Panigrahy, S., Patel, D., & Patel, J. (2018). Status of floriculture in India: with special focus to marketing. *Int. J. Pure App. Biosci*, *6*(2), 1434–1438. https://doi.org/10.18782/2320-7051.6487

Zaman, D. (2013). Economic analysis of rose cultivation in some selected areas of Jashore district in Bangladesh. M. S. thesis. Department of Agricultural Economics, Sher-E-Bangla Agricultural University, Dhaka 1207.

APPENDIX

SOME COMMONLY USED ABBREVIATIONS AND SYMBOLS

BBS	Bangladesh Bureau of Statistics
BCR	Benefit Cost Ratio
BER	Bureau of Education and Research
BRAC	Bangladesh Rural Advancement Committee
BFS	Bangladesh Flower Society
JCF	Jagorani Chakra Foundation
et al.	Et alia (for others)
etc.	Et cetra
FY	Financial Year
GDP	Gross Domestic Product
Ha	Hectare
Kg	Kilogram
NGO	Non-Government Organization
SPSS	Statistical Package for the Social Science
STATA	South Texas Art Therapy Association
Tk.	Taka, Bangladeshi currency
USA	United States of America
%	Percentage
>	Greater Than
<	Less Than

Department of Agricultural Economics

Sher-e-Bangla Agricultural University

An Interview Schedule on

Financial Profitability Analysis of Gerbera Flower Cultivation in Some Selected Areas of Jashore District

Specimen No.:

1. Identification of the Farmer:

Name of the Farmer: …………………………………………………..

Village: ………………………………. Union…………………………..

Upazila…………………………………..., District: ………………………..

2. Family size: ……………Male: …….Female…….,

Code: 1 Small-(1-4), 2 Medium-(5-8), 3 Large-(above 8)

3. Socio-economic Information:

A. Family details:-

SI	Query	Answer	Code
			Code
1	Household head		1=Farmer,Wife/husband=2,Son/Daughter=3,Father/Mother=4,Brother/Sister=5,Others=6
2	Age		1= Young(<35)years, 2=Middle(35-50)years, 3=Old(above 50)years
3	Sex		1=Male, 2=Female
4	Educational level		1=Write name, 2=Primary, 3=Secondary, 4=Higher secondary, 5=Higher studies, 6=illiterate
6	Earning members		1=1 person, 2=2persons, 3=3 persons, 4=above 4
7	Occupation		Gerbera production=1, Gerbera+Other flower=2, Gerbera+Crops=3, Gerbera+Livestock=4, Gerbera+Fish culture=5, Gerbera+Labor=6, Gerbera+Business=7, Gerbera+Service=8,
8	Total yearly income		1=(< 10 lac), 2=(10 lack-20 lac), 3=(> 20 lac)
9	Land ownership pattern		1=Own, 2=Joint, 3=Leased
10	Farming experience		Years

B. Farm size / Size of land holdings:

Land Type	Area in Decimal	Area (ha)	Total land (1+2+3+5)-(4+6)	Farming category
1.Own land (homestead+pond+other cultivated land)				
2.Gerbera land				
3.Leased In				
4.Leased Out				
5.Mortgage In				
6.Mortgage Out				

Total farm size (0-0.5)ha= marginal farm, (>0.5-1)ha= small farmer, (>1-2.5)ha=medium and (>2.5)ha=large farmer

C. Yearly Income

Sl. No.	Income Sources	Amount of Income (Tk.)
1.	Other flower	
2	Crops	
3.	Livestock Rearing	
4.	Business	
5.	Service	
6.	Foreign Earnings	
7.	Others	

D. Have you received any training on gerbera flower cultivation?

Yes: ………………….. No: ……………………... (Put tick mark)

E. Sourced of Credit Facilities:

Did you take loan from others?

Yes: ……………………. No: ……………………. (Put tick mark) if yes---

Sources	Amount (Tk.)	Interest Rate	Installment Period
Banks			
NGOs			
Friends & Relatives			

4. Cost and return calculation of Gerbera:

A. Human Labor Requirement & cost

Name of items	No. of labor (quantity)		Days	Total
	Family	Hired		
Seedbed preparation & Sowing				
Manure & fertilizer application				
Weeding, pest management				
Irrigation				
Harvesting				
Security payment				
Wages (tk/day)				

B. Materials & inputs used

Inputs	Unit Price	Gerbera flower	
		Amount (kg/unit)	Taka/unit
Seedling			
Organic Manure			
Fertilizer			
a. Urea			
b. TSP			

c. MOP				
d. Gypsum				
e. ZnSO$_4$				
f. Boron				
Poly House				
Insecticides				
Irrigations				
Transportation				

C. Machinery Inputs

Purpose of machinery inputs		Unit	Cost/unit	Total
Land preparation (power tiller)	Owned			
	Hired			
Carrying (Van)	Owned			
	Hired			
Others				

5. In which month Gerbera flower is cultivated? …………………….

6. Amount of seedling per decimal……………….

7. Month of Gerbera harvesting…………………….

8. No. of harvested flower per decimal …………………

9. Income from gerbera cultivation

Number of pieces sell	Price/piece	Sales place

10. Return from gerbera cultivation …………………………..

11. Problem Faced by Farmers (put tick marks)

	Extent of problem confrontation			
Problems	**High** **(3)**	**Medium** **(2)**	**Low** **(1)**	**Not at all** **(0)**
1. Natural Calamities				
2. Huge investment				
3. Non availability of quality indigenous seedling				
4. Lack of cold storage and underdeveloped market				
5.Lack of scientific knowledge and training				
6. Fluctuations of demand				
7.Disease and pest attack				
8. Insufficient of credit facilities				
9.Lack of government support				

Other problems:

…………………………………………..

………………………………………….

…………………………………………..

Figure: Some Pictures during Data Collection

Figure: Some Pictures during Data Collection