USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) BY FLOWER FARMERS OF JASHORE DISTRICT

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CERTIFICATE

This is to certify that the thesis entitled **"Use of Information and Communication Technologies (ICTs) By Flower Farmers of Jashore District"** submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science in Agricultural Extension and Information System**, embodies the result of a piece of bona fide research work carried out by **Tanjir Ahmed**, Registration No**. 14-05918** under my supervision and guidance. To the best of my knowledge, no part of the thesis has been submitted for any other degree or diploma.

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

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“DEDICATED TO MY

RESPECTED PARENTS”

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TANJIR AHMED

ABSTRACT

The study was conducted to determine the extent of use of ICTs by the flower farmers and to determine the extent to which the selected factors influence their use of ICTs for production and market-related information in selected areas of Jhikargacha upazila under Jashore district. Three unions namely Panisara, Godkhali, Nabharan of Jhikargacha upazila were randomly selected as the research area. Data were collected from 106 randomly selected flower farmers from the study areas, through personal interview by the researcher himself during 20 December, 2020 to 27 February, 2021. Data were analyzed by Multiple Regression analysis using SPSS 23.0. Data indicates that the highest proportion (45.3%) of the flower farmers moderate use ICT based applications, while (35.85%) had less ICT based applications and less than one-fifth (18.9%) had high use of ICT based applications for their flower production and market related information. Results indicates that annual family income, extension media contact, ICT ownership and ICT use skill were significantly contributed to their use of ICTs while age, level of education, farm size, family member, organizational participation, perceived benefit use were found non-significant predictors of ICTs use. All the factors jointly explained 74.3% (R^2 = 0.743) of the variances of the dependent variable**.** Thus, the study concludes with the recommendation to enable favorable environment to promote use of ICT based applications in receiving flower production and market related information**.**

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ABBREVIATIONS

AEO Agriculture Extension Officer
BBS *Bangladesh Bureau of Statistics*
FAO Food and Agriculture Organization
GO Governmental Organisation
GDP Gross Domestic Product
GPS Global Positioning Systems
IT Information Technology
ICT Information and Communication Technology
NGO Non-Governmental Organisation
SPSS Statistical Package for Social Science

CHAPTER I

INTRODUCTION

1.1 Background of the Study

Bangladesh with a population of over 170 million within a territory of 144 thousand Km^2 is one of the densely populated countries in the world. About 80% of the total population lives in the rural areas whose livelihood are centered on agriculture and related activities (Bangladesh Bureau of Statistics, BBS; 2011). The total area of Jashore district is 2,606.94 Km^2 of which 23.39 Km^2 is riverine. The district lays between 22º48' and 23º22' North Latitudes and between 88º51' and 89º34' East Longitudes (BBS; 2011).

The study was conducted in Godkhali of Jhikargacha upazila in Jashore district under Khulna division. Jhikargacha has a total area of 307.96 Km^2. According to 2011 census, population was 2,98,908 with 43,439 units of households. Average literacy rate was 27.9% which was lower than the national average of 32.4% (BBS, 2011). The annual average temperature fluctuates between 11.20 °C to 37.1 °C (Islam and Miah, 2003) These climatic factors may be favourable for flower production in Godkhali. This area is well known for large scale cultivation of flowers in Bangladesh. Flower is also cultivated in different parts of the world.

Floriculture is a popular practice in some African countries e.g., Kenya, Uganda and Ethiopia (Gudeta, 2012). Most of the people of African countries are poor and are used to cultivate flower for low wage income. The marginal farmer cannot maintain the minimum standard of living and most of them are victimized. In order to keep the right of the farmers they build association. The global value chain (GVC) analysis of floriculture industry in Kenya demonstrates that apart from industrial development, labor agency should be incorporated in GVC (Riisgard, 2009). Labor should be segregated from the producer at production node, so that retailer chains offer more space for labor than conventional auction strand. He also found that labor organization's power to influence the existing governance structure of GVC is still constrained. Social standards stipulate that labor organizations are not contingent upon governance structure. Furthermore, cost-saving and timely ordering by retailers exert additional pressure on suppliers and could enhance labor flexibility

instead of strengthening labor organizations. The flower cultivation in Bangladesh is different from that in Africa.

Bangladesh being gifted with appropriate soil quality, favorable climatic condition and cheap labor has potential for producing floriculture products like wide varieties of flowers, foliage, ornamental plants of international standard (Chowdhury and Khan, 2015). Because of lower production cost as a result of reduced price of labor, the farmers are able to offer lower price of this cash crop to consumers. Bangladesh started flower or ornamental plant production in mid 1980's on commercial basis in Jashore District which produces nearly 70% of country's total production (Islam and Rahman, 2013). Despite the huge potential, this industry has not been considered as a thriving industry in agricultural sector's value added in gross domestic product (GDP). Around 1,20,000 people are involved in flower cultivation to earn their livelihood in Godkhali. Roughly, Bangladesh spends around 3 million Bangladesh Taka (Tk.) for importing ornamental plants to meet domestic demand (Mou, 2006). On the other hand, it could utilize 15,14,000 acres of fallow land for exporting this cash crop (BBS, 2011).

Floriculture industry in agricultural sector has the potential to create employment opportunities especially for women by expediting income generating activity. Several qualitative studies (Mou, 2006; Islam and Rahman, 2013) are available in this line of research in existing literature but this is the first paper to analyze the socio-economic profiles of farmers engaged in flower cultivation in Jashore district, based on face to face interview and primary data. Thus, this paper aims to fulfill the existing gap in the literature. The main objective of our study was to observe the impact of floriculture on the socio-economic profiles in Godkhali region of Jashore.

Information and communications technology (ICT) is an extensional term for information technology (IT) that stresses the use of communications and the integration of telecommunications (telephone lines and wireless signals) and computers, as well as necessary enterprise software, storage and audiovisual, that enable users to access, store, transmit, and manipulate information. (Benard and Dulle, 2017). This can also be referred to as the digital infrastructures like Mobile, Computers, Laptops, Internet, Youtube, Facebook, Twitter etc. which generate information to others (Kuhlmann, 2005).

Digital and other electronic technologies are transforming our economies, societies and people's lives. Technology has had an especially profound impact on the information and communications activities that have always been central to sustainable development. Information communication technology (ICT) facilitate communication and information processing by electronic means that includes radio, television telephone, mobile phone, computers and the Internet. (Ajani, 2014)

ICT covers the vast area of information technology, communication technology and the telecommunication technology. ICT is also a combination of physical backbone and intellect. Computer systems, network machineries, software, wire and wireless connectivity systems, broadcast hardware and many other hardware and accessories are the physical backbone. The trained human behind the backbone are the intellect (Digital World, 2016). Impact can be defined as positive and negative, primary and secondary long-term effects produced by a developmental intervention, directly or indirectly, intended or unintended (Garbarino and Holland, 2009).

Bangladesh is an agriculture based developing country. Improved technologies are the means for increasing yield and thereby agricultural production. Proper utilization of agricultural information and technologies is the way to increase agricultural production. The present population of Bangladesh is approximately 16.8 million (BBS, 2021) and it is likely to reach 218 million by 2050 (Streatfield and Karar, 2008).

Since the contribution of GDP in Bangladesh economy is prone to fluctuation, the utilization of ICT to overcome the existing challenges may bring sustainable solution. The contribution of agriculture to the GDP was 18.36 percent in 2009-10 FY and it fell to 16.33 percent in the 2013-14 FY (BDNews24.com, 2015). To feed the huge population in such fluctuating trend traditional technological interventions are not adequate. Utilization of all available technologies including ICT will be helpful to face the challenges of supplying agricultural produce to the increasing population when land resources are diminishing continuously. This strategy of the government indicates that proper utilization of ICT is a must for advancing the country as a dignified nation. ICT has the potential to play very important role in agricultural development programs. The wide use of ICT may result spectacular development in the agricultural sector. Although ICT has an enormous effect and potential on the

agricultural development little research has been conducted regarding the impact of ICT in agriculture particularly in Bangladesh.

1.2 Statement of the Problem

Agriculture sector is a dynamic sector specially in Bangladesh. The rapidly emerging ICT sector in Bangladesh is playing significant role in the development of the whole country in many ways. Radical Agricultural development is also taking place due to use of ICT in agriculture. In this research, radio agricultural programs, TV agricultural Programs, mobile phone/smart phone/telephone, computer/laptop/tablet/ multimedia/ Internet, Krishi Call Centre/Farmers help Line and agricultural assistance services of mobile phone companies were taken as ICT media for examining the impact of using ICT by the farmers.

1.3 The Research Questions

Based on the above approach, this study was conducted on the basis of the following research questions:

1. What are the selected factors that influence flower farmers to use ICT in flower production?
2. What extent do flower farmers use ICT tools for flower production?
3. To what extent the selected factors influence farmers' use of ICT for flower production?

1.4 Objectives of the Study

Considering the importance of Information and Communication Technologies (ICT) in flower cultivation, the following objectives were selected to study the impact of using ICT by the flower farmers of Jhikargacha upazila under Jashore district:

i. To describe the selected characteristics of the flower farmers. The characteristics were:
    - Age
    - Level of education
    - Family size
    - Farm size
    - Annual family income
    - Organizational participation
    - ICT ownership
    - Extension media contact
    - ICT use skill
    - Perceived benefit of using ICT

ii. To determine the extent of ICT use by the flower farmers for flower production,

iii. To explore the contribution of the selected characteristics of the farmers to their use of ICT for flower production.

1.5 Scope and Significance of the Study

Utilization of ICT materials in agriculture has already been started in Bangladesh. The apparent benefit of these technologies is also being felt. This study will reveal the impact of ICT among the flower farmers of Jhikargacha upazila under Jashore district which also influences the socio-economic development. ICT offers a variety of programs both for the social development and economic development (Kumar and Sankarakumar, 2012).

The findings of this research will be especially applicable in the selected area of Jhikargacha upazila under Jashore district. However, the findings may also be applicable in other areas of Bangladesh where similar conditions like this area prevail. That area is perfect for flower cultivation. The farmers, extension personnel,

researchers, planners and policy makers will be largely benefited by this research work. Thus, the findings of the study will be of remarkable significance in the field of agricultural sector of Bangladesh specially flower cultivation.

1.6 Assumptions of the Study

An assumption is the supposition that an apparent fact or principle is true in the light of the available evidence (Goode and Hatt, 1952). The researcher had taken the following assumptions into consideration during carrying out the study.

1. The respondents had enough capability to provide proper response to the questions furnished in the interview schedule.
2. Views and opinions provided by the respondents included in the sample were representative of the whole population of the study area.
3. The items, questions and scale of measurement of the variables were reasonably authentic to represent the actual condition of the respondents.
4. The findings of the study would give a clear concept of the use of ICT.
5. The data furnished by the respondents were free from bias.
6. The researcher was capable to adjust with the social and cultural environment of the study area. So, the respondents could provide their information correctly.
7. The respondents should have given accurate and current information.

1.7 Limitations of the Study

It is necessary to impose certain limitations to make the research manageable and meaningful. Thus, during the entire research the most challenging limitations were:

1. The research was confined to the three Unions (Panisara, Godkhali, Nabharon) of Jhikargacha upazila under Jashore district.
2. Data were collected from a small group of respondents taken as the sample of the study because of time and resource constraints.
3. The sample size was determined at five percent (5%) level of precision of the population. It would be better if it could be determined at < 5% level of precision of the population.

4. The research was carried out taking unequal number of respondents in study and control group.
5. Further research is essential for identifying other sources of bias although efforts were taken to minimize spill-over effects.
6. Only ten socio-demographic characteristics of the farmers were selected as independent variables.
7. The researcher had to face many difficulties in conducting the research as assessment of impact is very complex especially in case of measuring the impact of ICT as it has very rapid changing nature.

1.8 Definition of Terms

Information and Communication Technologies (ICT): ICT stands for Information and Communication Technologies and is defined as technologies involved in collecting, processing, storing, retrieving, disseminating and implementing data and information using microelectronics, optics and telecommunications and computers.

Age*:* Age of a respondent referred to the span of life and it was measured by the number of years from his/her birth to the time of interviewing.

Level of education*:* Level of education referred to the formal education received up to a certain level in a formal educational institution (school, college or university).

Family size*:* Family size referred to the number of members of the respondent's family including himself/herself. The head of the household, his wife, children, parents and other permanent dependents who jointly lived and ate together during interview was considered as the family members

Farm size: It referred to that land area from which farmers may gain through effective use of that target land. Such as homestead land including pond area, own land under own cultivation, land taken from others on sharecropping, land given to others on sharecropping, land taken on lease etc.

Annual family income*:* Annual income referred to the total earnings of a respondent and his/her family members from agricultural and non-agricultural sources (business, services, daily labour, etc.) during the previous year. In this research, one score was assigned for each thousand taka.

Organizational Participation*:* Organizational Participation referred to the duration or nature of the participation such as union parishad, chamber of commerce, youth club, cultural organization, bazar committee, flower association.

ICT Ownership*:* ICT ownership means the nature of ownership of mobile phone, computer and internet by the flower farmer of Jashore district.

Extension Media Contact*:* It referred to the nature of communication like individual contact, group contact, mass media contact.

ICT use skill*:* ICT use skill refers to the skills of using different ICT devices like mobile phone, computer. or similar devices.

Perceived benefit of using ICT*:* It refers to as the extent benefit that a user perceives by using any ICT devices like mobile phone, computer or Internet.

UISC*:* UISC stands for Union Information Service Centre. It referred to a place for providing digital support service where farmers and other person can get any digital service. In this the center where people can get various types of information related to government, livelihood and private services. Local entrepreneurs run these centers and these centers are hosted by UPs and supported by central administration.

Call Centre: Krishi Call Centre is an initiative of Ministry of Agriculture (MoA) which is run with the direction of Agriculture Information Service (AIS) in Bangladesh where agricultural experts are engaged to provide immediate and effective solution of any problem concerned with livestock, fisheries and agricultural production asked by the farmers over phone.

Weather app and farming related app*:* It refers to the use of ICT based application and farming related apps like Krishoker Janala, Kamari, BAMIS portal.

CHAPTER II

REVIEW OF LITERATURE

The Chapter deals with a review of the related literatures having relevance with the present study. The purpose of the Chapter was to present a review of the relevant previous studies done in brief and to construct a framework that will be appropriate for having clear conception of the research. There is scarcity of studies pertaining to the systematic impact analysis of ICT on different agricultural aspects of the farmers. Besides, only some limited studies investigating the relationships of the characteristics of individuals with the impact of ICT came into observation of the researcher. Hence, relevant literatures directly depicting the present research was not readily available. However, the researcher made utmost efforts to collect the necessary information through extensive search of the available literatures and formulated a conceptual framework at the end of this chapter. Only a few studies relevant with the present research has been presented in this chapter under the heads of general review of impact of ICT and relationship of selected characteristics of the farmers with the impact of ICT.

2.1 General Review on Use of ICT

2.1.1 TV and Radio

It was revealed in a study that agricultural productivity was increased because of radio programmes in the Philippines (UNESCO, 1996). Dodds (1999) reported that more than 50% of the 21,000 farmers experienced increase in crop yields through extension and education by radio programmes in Zambia.

Shepherd (2000) reported that the vegetable farmers could fix their price according to the rate of vegetable price being broadcast by their local radios and at lower prices than that of the farmers who did not accept the broadcast in Indonesia. The broadcast prices were the starting point in negotiating with traders the following day. It was also observed from the study that price differences were also reduced across markets due to availability of information to different markets in Albania.

Djankov et al. (2001) reported that independent radio broadcasting services were found to be positively and significantly correlated with a range of development

outcomes which included improved lives and better functioning markets. But the results are not always similar.

2.1.2 Mobile Phone/Telephone/Telecommunication

Bayes (2001) observed that there was a perceptible influence of mobile phone services on production, marketing, and other important economic decisions confronting rural households in Bangladesh. It was also observed in the study that farm output prices were increased and farm input prices were decreased through the mechanism of information diffusion with the help of mobile phones.

Xiaolan and Akhter (2009) conducted a study to examine the impact of a mobile phone technology enhanced service delivery system on agricultural extension service delivery India. They carried out the impact analysis on the basis of randomized survey data taking potential systematic selection bias through double difference techniques and reflexive comparisons in consideration. It was observed that there were indirect benefit of the ICT enhanced service delivery system in the dimensions of greater awareness and knowledge in agriculture technology and information of the farmers. Farmers' attitudes towards trying new technologies in future was also improved.

Mittal and Tripathi (2009) on the use and impact of mobile phones and mobile-enabled services on agricultural productivity it was found that some of the farmers who used mobile phones for at least some agricultural activities reported about significant productivity gains. Some increase in convenience and cost savings were reported by almost all small farmers due to use of mobile phones to get information like input availability or market prices. Positive impacts were found in only 1 of the 6 focus groups involving IKSL subscribers. On the contrary, positive impacts from the use of service were noticed among all the focus groups involving RML subscribers in Maharashtra. A diverse set of benefits including yield and price improvements due to mobile phone usage was also observed among the farmers of Maharashtra. Moreover, it was reported by all interviewees that positive economic benefits were generated by the mobile phone. It was reported in the study that potential losses could be substantially prevented through prompt reaction to information about weather and crop disease. Improved yields through adoption of new seed varieties and cultivation practices were also reported. Seed and crop losses were prevented with the help of weather information.

The benefits were quantified by a few farmers which were in the range of 5-25 percent of earnings. It was also observed that the mobile phone enabled the farmers to describe plant diseases from the field to the experts and to coordinate better with the hired labour.

Martin and Abbott (2011) reported that nearly half of the respondents (49%) indicated impacts of use of mobile phone on effectiveness, or increased productivity in rural Uganda. Access to agricultural advice, as well as access to agricultural inputs, such as labor, seeds, plant cuttings, livestock, loans from VEDCO or NAADS; consultation with veterinarians; and increased access to market information resulted in increased production.

Moreover, nearly 22% of respondents indicated the impact of mobile phones during agriculture emergencies. The overall health and productivity of the livestock and crops of the respondents was increased due to continual consultation with veterinarians and agricultural experts through mobile phones. Besides, about 53% respondents reported about their increase in income.

Forestier et al. (2002) showed that the farmers received better prices for their crops with the help of rural telephony which led to significant increase in their earnings. ITU (1999) found that the farm income of the farmers was doubled as they were able to check prices regularly by telephones in rural Thailand and Columbia.

De Silva (2008) revealed that a project in Maharashtra, India named "Warana Unwired" where the small but relevant information was sent to the sugarcane farmers via text messages on mobile phones had created a significant change in the incomes of the sugarcane farmers in the area.

Soysa (2008) carried out another study on traceability in the agriculture value chains. In this study it was observed that incomes of the gherkin farmers in Sri Lanka were improved because of using a simple mobile phone application to reduce waste through a simple feedback system. In this system, text messages were sent to the farmers on a daily basis giving details of amount of gherkins rejected and the reasons for rejection in order to take immediate action to rectify the issue. Before the use of mobile phones by the farmers the information search costs of this activity were prohibitively high which resulted in significant losses to the farmer. Again in another research it was revealed that farmers' income and access to finance were increased and they were

more benefitted than the other players through supply chain efficiencies because of use of several m-ARD apps (Qiang et al., 2012).

Mittal et al. (2010) found that income impact of 5–25 percent of income was observed among the farmers in India due to the SMS service Reuters Market Light (RML) which provided personalized information to subscribed farmers on daily spot market prices, localized weather forecasts, and agro advisories tailored for one crop and the stage in the crop cycle.

Parker and Weber (2011) reported that the efficiency of mandis was improved and farmers were empowered to sell crops more profitably due to the SMS service Reuters Market Light (RML) in India.

Again, in another study which was conducted to find out whether there was any difference in prices received by the farmers in Maharashtra who had used RML and those who had not using randomized control trials, no significant differences were found in price received between the treatment and control groups but it was also revealed that farmers were influenced by RML to change their crops to improve profitability by 14-20 percent (Fafchamps and Minten, 2011).

Kirui et al. (2013) conducted a study on the impact of mobile phone-based money transfer, especially in agriculture to examine the impact of MMT services on household agricultural input use, agricultural commercialization and farm incomes among farm households in Kenya. It was observed in the study that mobile phone-based money transfer services significantly increased level of annual household input use by $42, household agricultural commercialization by 37% and household annual income by $224.

Significant correlations were found between telecommunications and indicators of socio-economic development in another study conducted by (Souter et al., 2005) in three countries (India, Tanzania and Mozambique). Bayes et al. (1999) reported that in case of Village Pay Phones in Bangladesh livestock mortality rates were reduced due to the farmers' better access to extension officers through the use of mobile phones.

In another study it was revealed that the rural women were provided with mobile information to support goat rearing as part of a microfinance loan in Tamil Nadu which had more positive result (Balasubramanian et al., 2010).

Mangst (2008) also reported that information regarding weather forecasts, where to get the best catch, local market information was communicated through mobile phone among the farmers in Tanzania. It was also revealed that mobile phones were also used by them to coordinate pick-up of catches.

Aker (2008) reported that significant reductions in grain-price dispersion net of transport costs across markets was observed because of use of mobile phones among the grain sellers in Niger. However, there are different results also.

2.1.3 Internet

UNDP (2001) carried out a study and found that farmers' incomes were dramatically increased by receiving information about crop status, weather, global market prices and training through an internet network among the farmer organizations in Chile.

Regional market price fluctuations were reduced and average yields were increased due to information providing on market prices and cropping techniques through the Internet kiosks established by the public sector in India (Goyal, 2010a).

ICTA (2009) that dairy farmers were helped to achieve self-sufficiency in milk production by introducing web and mobile technologies in Sri Lanka. It was found out by the government that the milk production was low due to low pregnancy rates of the milking cows. The low pregnancy rates remained because timely artificial insemination and breeding services were not available due to the lack of communication between farmers and public sector service providers.

These gaps were bridged through the attempt of ICTA by introducing mobile phone based SMS messages and touch-button computers installed at the milk collection centers where farmers used to gather every morning to sell their milk. In this system a number of “just-in-time” services were provided along with access to artificial insemination agents so that pregnancy could be induced and thus increase milk production. But the results are not always positive.

Smith et al. (2004) conducted a research to explore the adoption, usage patterns, and perceived benefits of computers and the Internet among the Great Plains farmers. The study revealed that about half of those farmers who used the Internet for farm-related business had reported zero economic benefits from it.

2.1.4 Call Center/ Telecenter

AIS (2013) reported that the farmers are provided with the instant solutions to their problems related to agriculture, fisheries and livestock by the specialists in the relevant fields in Krishi Call Centre over phone in Bangladesh.

Banglar Krishi (2015) that the farmers are benefited by the instant solutions to their different problems regarding diseases and insects of crop, cultivation practices, fertilizer management, different agricultural aspects, livestock and fisheries from the experts and field level specialists over phone from Krishi Call Centre operated by Agriculture Information Service (AIS) under the Ministry of Agriculture (MoA).

McGuire (2015) it was reported that the farmers are benefited by e-krishok created by BIID in Bangladesh where the services based agriculture information are transferred to the farmers over mobile phones through the government infrastructures which are already in existence. Farmers are also benefited by the agricultural information provided by Miaki, a private entity in Bangladesh.

Ashraf et al. (2015) conducted a research to find out the impact of ICT on indigenous peoples' quality of life at Ruma village of Bandarban district in Bangladesh. They found that positive contribution was made by ICTs as perceived by the participants of Grameen phone Community Information Centers (GPCIC), a shared ICT access facility where participants can access a wide range of ICT services, e.g. Internet, voice communication, video conferencing, and locally relevant and customized information services on topics such as agriculture, education, health, legal, environment and politics. It was mentioned by the participants that enhancement of about a wide range of issues pertaining to their quality of lives took place through the programs set by the GPCIC.

Katalyst (2012) that the farmers were able to access the timely and accurate information and become more knowledgeable about opportunities to improve agricultural practices, production, and farm investment decisions with the help of

Grameenphone Community Information Centre (CIC) and the helpline services in Bangladesh. It was observed that the vast majority (90%) of the beneficiaries were benefitted by preventing near-certain losses through the access to information which assisted them to counter and remedy the identified pest, disease, and animal health concerns. It was also revealed that farmers achieved benefits ranging from BDT 1,000 (approximately USD 12) to upwards of BDT 20,000 (USD 240). Again, Dey et al. (2008) conducted a research in two telecentres: one of them was Palli Tathya Kendra at Joyag, Noakhali initiated by D-Net and another one was Grameen Phone Community Information Centre (CIC) located at Shaturia Upazila, Manikganj in Bangladesh. It was observed in the study that the farmers' information needs could be made through the use of mobile phones and telecentres by them. Use of mobile phone by some of the farmers enabled them to get cheaper fertilizers.

Arfan et al. (2013) conducted another study to investigate the comparative effectiveness of Punjab Agriculture Helpline (PAH) and other information sources for meeting information needs of farming community. It was observed that all respondents (100%) were getting information regarding agricultural technology from Punjab Agriculture Helpline. Electronic media especially Punjab Agriculture Helpline had significant importance in providing agricultural information to the farmers. It was also reported that Punjab Agriculture Helpline was an efficient way of getting information as perceived by the farmers.

2.1.5 ICT Media

Islam and Gronlund (2010) found that the need for market information of the farmers of Natore district in Bangladesh was fulfilled by the contents of Pallinet (an agricultural market information service) and they were in general satisfied with the service. It was observed in the research that the farmers were empowered as the Pallinet service enabled them to know the conditions in the surrounding markets more confidently than before. It was also revealed from the research that they were benefited through realizing higher income, either by relocating to other markets or by gaining improved bargaining power over the middlemen.

In this regard, it was obtained from the research findings that produce were relocated to other markets at least once after receiving price information from Pallinet by 34

percent of the users. It was reported by more than half of the farmers that their profit margin were improved to some extent with the help of Pallinet. Besides, it was considered by 36 percent respondents that they were helped by the service in increasing their profits from selling their produce by around 10 to 20 percent. It was also observed that the prevailing power of the middlemen over the farmers was disrupt to some extent.

Dhaka and Chayal (2010) conducted research in Bundi district of Rajasthan, India to analyze experience of farmers using ICT services for agricultural information. It was revealed in the study that direct access to information was considered as important benefit and it was given the highest priority by the farmers. It was perceived by the farmers that the ICT services were able to disseminate knowledge intensive information like market intelligence, weather forecast, early warning and management of disease and pests, production practices, post-harvest management, etc.

It was reported by the farmers in the research that their quality of decision making was improved through obtaining alternative solutions to a set of problematic situations with the help of ICT. It was also found in the study that the market information including daily updates on the prices of agricultural commodities in the local markets of the surrounding district was perceived as the most relevant ICT services by the farmers. The farmers were able to sell their commodities at those markets where their agricultural products would command the best prices.

ICT could provide more extensive, equitable, relevant, participative and cost effective education and empowerment for smallholder self-development. It was also revealed from the study that some ICT pilot programmes were successful and replicable in the other states of the country but any one of those programmes could not become successful in Jammu & Kashmir (J&K) state (Jamwal and Padha, 2009).

Munyua et al. (2009) that the use and application of modern ICTs could contribute in the development of small-scale agriculture in Africa. Some emerging ICTs such as Geographic Information Systems (GIS) and decision support systems, mobile mapping and hand-held personal computers (personal digital assistants/PDAs), precision agriculture and mobile (cellular) phone applications, community radio station, radio frequency identification tags, World Space satellite radio and access to the Internet and web-based applications facilitated the farmers to concentrate on high-

value agricultural (HVA) products, to focus on improvement in productivity, to consider the options for commercial agriculture, to pay increased attention to new markets and marketing strategies, and to increase agricultural production through biotechnology.

It was also revealed from the study that the cellular phone facilitated the farmers and entrepreneurs to access the market links. The study further revealed that farmers were provided with extension information through a telephony information service, the National Farmers Information Service (NAFIS) in English and Kiswahili using audio format in Kenya. Besides, farmers and traders had access to information on commodities being sold, their prices and the identity of their buyers and extension messages through other cellular phone applications providing market information and electronic trading platforms such as Tradenet.biz. Mobile phone also facilitated the farmers to pay farm workers and purchase farm inputs as an electronic money transfer channel. It was reported in Kenya that market information was offered to the farmers using voice mail through Interactive Voice Response (IVR) by Kenya Agricultural Commodity Exchange (KACE). It was also observed that farmers could subscribe to real-time information on agricultural and fish prices through their cell phones in Senegal.

Lio and Liu (2006) revealed in a study that there was a significant positive impact of ICT on agricultural productivity. It was also observed that information and communication infrastructure influenced the adoption of modern industrial inputs in agricultural production in that study. Meera et al. (2004) carried out a research to examine the performance of three ICT projects in India. It was observed in the research that under Warana project the farmers of the region were getting the information on the tonnage of sugarcane, payment details, etc. sent from the sugar administration building within a day which they required to get as soon as possible.

It was revealed from another study that the greater efficiency in the arbitrage of prices and less concentration of market power within segments of the value chain was the main effect of ICT use in rural and agricultural markets. It led to greater supply of produce from producers to growing markets, reduced dependence on transportation for market transactions, and lower price variability (Jensen, 2010).

It was observed in a study that farmers gained additional benefit of Rs 3,820/- by reducing fertilizer and pesticide inputs, and getting extra yield being able to receive advice on planting, monitoring and harvesting crops and on pesticide and fertilizer usage based on digital photos taken by the farmers themselves through the project e-Sagu of the International Institute of Information Technology (IIIT) in Hyderabad, India (IIIT, 2009).

Gandhi et al. (2009) that an assessment was conducted to compare the adoption rates between villages that used the Digital Green system (a nonprofit organization that disseminates agricultural practices using video as a medium) with rates in villages that used a Training and Visit extension approach. It was observed that at least one new agricultural practice was adopted by 85 percent of the farmers, whereas in the control villages it was adopted by only 11 percent of the farmers.

Mwakaje (2010) that the ICT user farmers obtained higher prices than the farmers who did not use ICT for accessing market information in Rungwe District, Mbeya Region, Southwest Tanzania.

Nielsen and Heffernan (2006) examined the relationship between new and existing knowledge regarding animal health and production among 85 poor farmers in 13 communities in Bolivian Altiplano, who utilized the El Promotor, a multi-media, interactive programme. They observed that there was uptake of knowledge due to utilization of the ICT programme. It was revealed in a study that the farmers were able to improve their production, linkages to profitable markets, and reduce poverty by accessing agricultural knowledge and information through ICTs (such as, Telecenter, cell phones, radio) in Tanzania (Lwoga and Ngulube, 2008).

2.2 Contribution of the Selected Characteristics of the Farmers to Their Use of ICT

2.2.1 Age and Use of ICT

Reza (2007) reported that there was no significant relationship between the age of the farmers and their perceived impact of ICT use. Shin and Evans (1991) reported in another study that positive significant relationship was observed between age and impact of use of communication technologies. Kafura (2015) reported that there was

negative significant relationship between the age of the farmers and the level of use of different ICT tools for agricultural purposes by them.

Ahmed (2012) it was observed that there was no significant relationship between age of the farmers and ICT utilization in agriculture by them. It was also reported by Ali (2011) that age of the farmers had no significant relationship with the adoption of mass media based information for decision-making in vegetable cultivation.

Ogutu et al. (2014) who reported that there was significant positive correlation between the age of the farmers and their participation in ICT based market information service projects for accessing to agricultural market information. Again, in another research it was reported that age was related with the utilization of ICT in Kasulu, Magu, and Sengerema in Tanzania (Nielinger, 2003).

Meera et al. (2004) reported that there was negative correlation between the age of the farmers and the frequent use of the internet services by them leading to the impact of ICT among them in all three ICT projects. But it was also observed in their study that the intranet services were quiet frequently used by the younger farmers. Nevertheless, there was no association between age of the farmers and the frequent use of ICT services by them in iKisan project.

Okello et al. (2012) noticed that the age of the farmers was a significant factor inversely influencing the use of ICT tools by them. It was observed in the study that the use of ICT tools for agricultural transactions was greater among the younger farmers.

Anastasios et al. (2010) it was revealed that age of the farmers had no contribution to the adoption of ICT by the farmers. Again, it was revealed in another study that there was no significant influence of the age of the farmers on the use of different communication media in adoption of improved farm practices (Ahmed,1977).

Pandian (2002) observed that there was direct positive effect of the age of the farmers on the impact of Video Education on knowledge retention. Ndag, et al. (2008) reported that the younger farmers had more exposure to ICT usage and courses than the older farmers. In another study it was observed that at least two types of ICT media were used by most of the respondents aged between 21 to 60 than the respondents of other ages (Mwakaje, 2010).

2.2.2 Level of education and use of ICT

Reza (2007) reported that there was a positive significant relationship between the level of education of the farmers and the impact of use of ICT as perceived by them.

Ahmed (2012) that there was no significant relationship between education of the farmers and ICT utilization in agriculture by them. It was also revealed in another study that any significant difference was not observed in the use of ICT for market access across different education levels of the farmers (Mwakaje, 2010).

Ali (2011) that education of the farmers had no significant relationship with the adoption of mass media based information for decision-making in vegetable cultivation. However, in another research it was revealed that there was positive association between the education of the farmers and frequent use of information services by them and thus the impact of ICT among them in the Gyandoot and Warana ICT projects. It was observed in the study that the intranet services were quiet frequently used by more educated farmers. Nonetheless, education was not associated with the frequency of using ICT services in iKisan project (Meera et al., 2004).

Okello et al. (2012) that the level of literacy of the farmers was a factor positively influencing the use of the ICT tools and mobile phone for agricultural transaction purposes by them. Again, in another research it was also revealed that educational level of the farmers positively influences the use of ICTs to access agricultural information by them (Das, 2014). Anastasios et al. (2010) it was revealed that education of the farmers was an influential factor predicting the adoption of ICT by the farmers.

Lio and Liu (2006) reported that certain socioeconomic characteristics such as higher levels of education and skills are prerequisites for the effective driving of agricultural productivity by new ICT. ICTs are more likely to be adopted and better-informed decisions on agricultural practices are more likely to be taken by the educated farmers (Agwu et al., 2008; Taragola and Van Lierde, 2010).

Ndag et al. (2008) observed that the higher educational achievement of the farmers had contribution to their greater exposure to ICT usage and courses. Again, in another research it was revealed that there was direct positive effect of the education of the farmers on the impact of video education on knowledge retention (Pandian, 2002).

2.2.3 Family size and use of ICT

Ahmed (2012) it was observed that family size of the farmers had no significant relationship with ICT utilization in agriculture by them. Okello et al. (2012) found in a study that the household size of the farmers was a factor negatively influencing the use of the mobile phone for agricultural transaction purposes by them.

2.2.4 Farm size and use of ICT

Okello Using ICT et al. (2012) revealed that the farmers in Kirinyaga district in Kenya who produced market-oriented export vegetables had a higher likelihood of using ICT tools for agricultural transaction.

In a different study it was observed that the farmers producing large quantities of crops used ICT to access market information and therefore they were able to sell a lot more and receive relatively better prices which had a positive impact on poverty alleviation (Mwakaje, 2010).

De Silva and Ratnadiwakara (2008) carried out a case study of smallholder vegetable farmers in rural Sri Lanka to find out the specific role of information and communication technologies (ICT) in reducing transaction costs in agriculture by enabling timely and affordable communication. The researchers revealed from the study that the subsistence farmers hardly used any ICT for obtaining information and demonstrated that if farmers had used the phone at various points in the agricultural value chain their information search costs could have been reduced significantly enabling greater farmer participation in commercial farming.

Reza (2007) noticed that farm size of the farmers had a positive significant relationship with their perceived impact of ICT use. Pandian (2002) that there was direct negative effect of the farm size of the farmers on the impact of video education on knowledge retention. Kafura (2015) that the farm size of the farmers had no significant relationship with the level of use of different ICT tools for agricultural purpose by them. In a different study it was revealed also that farm size of the farmers had no significant relationship with utilization of ICT in agriculture by them (Ahmed, 2012).

Ali (2011) that there was strong negative relationship between the farm size of the farmers and the adoption of mass media based information for decision-making in

vegetable cultivation. But there were some different findings also. In different studies it was revealed that there was a strong positive relationship between farm size and adoption of farm technologies and ICT based information system (Alvarez and Nuthall, 2006; Caswell et al., 2001).

Meera et al. (2004) also observed that there was no association between the landholding of the farmers and the frequency of using ICT services by them which depicted that irrespective of the landholding size, all farmers were using the ICT services. It was also interpreted in the study that the land holding size of the farmers did not influence the frequency of using ICT services by them and thereby the impact of ICT use.

Das (2014) that farm size of the farmers positively influences the use of ICTs to access agricultural information by them. Again, in another research it was revealed that the farming experience of the farmers was a factor affecting the use of ICT tools by them (Okello et al., 2012).

2.2.5 Annual family income and use of ICT

Reza (2007) noticed that annual income of the farmers had a positive significant relationship with their perceived impact of ICT use. Pandian (2002) that there was positive significant effect of the annual income of the farmers on the impact of video education on the knowledge retention by the farmers.

Ali (2011) that income levels of the farmers are more likely to affect the adoption of mass media based information for decision-making in vegetable cultivation. Anastasios et al. (2010) that the annual income was the most influential factor predicting the adoption of ICT by the farmers.

Mwakaje (2010) reported that significant difference was observed between ICT use and the level of income of the respondents. It was noticed that more than one type of ICT were used by the farmers with high incomes and thereby remaining in better position for accessing market information than the farmers with less income using only one type of ICT. Lio and Liu (2006) it was revealed that farmers in richer countries began to utilize new ICT (especially the Internet) much more effectively to get enhanced agricultural productivity.

2.2.6 Use of ICT media in agriculture

The literatures pertaining to use of ICT media in agriculture related to impact of ICT were very much limited. The researcher only found two literatures regarding this issue. It is yet to get any more findings related to use of ICT media in agriculture and impact of ICT.

Reza (2007) observed that there was positive significant relationship between the use of ICT materials by the farmers and their perceived impact of ICT use. In a different study, it was revealed that there was significant positive correlation between the use of ICT device (mobile phone) by the farmers and their participation in ICT based market information service projects for accessing to agricultural market information (Ogutu et al., 2014).

2.2.7 Service taking from Agricultural Service Centre and Use of ICT

The literatures regarding service taking from agricultural service centers related to impact of ICT were very much limited. The researcher only found three literatures regarding this issue. It is yet to get any more findings related to service taking from agricultural service centers and impact of ICT.

Okello et al. (2014) found that use of ICT-based MIS by the farmers to get the market information services was positively influenced by the farmer's belonging to a farmer organization. Ahmed (2012) observed that the extent of visit to ICT centers for agricultural purposes by the farmers had significant positive relationship with the ICT utilization in agriculture by them. In a different study, it was revealed that the farmers receiving agricultural information regularly from TV, radio, newspapers, other farmers, government agricultural extension services, traders, input dealers, seed companies and relatives were found to have highly variable perceived quality and relevance of the information received from the sources and lacked access to consistent, reliable information for many of their needs and often were dependent on a combination of traditional knowledge, experience and guesswork to make decisions while it was observed that they received better quality of information regarding agriculture because of mobile phone access than other sources (Mittal et al., 2010).

2.2.8 Agricultural knowledge and use of ICT

Reza (2007) found that there was positive significant relationship between agricultural knowledge of the farmers and the impact of use of ICT as perceived by them. Agricultural knowledge of the farmers had no significant relationship with the utilization of ICT in agriculture by them (Ahmed, 2012).

Qiang et al. (2012) that farmers' access to knowledge and information had contribution to the expansion of their capacity through the use of ICT media. In another study it was observed that knowledge of the farmers had a significant positive relationship with the use of communication sources by them in improving cultural practices (Karim, 2005).

2.2.9 Problems faced in using ICT in agriculture and use of ICT

Lwoga (2010) reported that the better dissemination of agricultural knowledge in the local communities through community radio and thereby the improvement of agricultural activities of the farmers was constrained by language restriction.

Chilimo (2008) revealed that a number of problems in using ICT media like telecenters and rural radio in dissemination of information and knowledge for sustainable agricultural practices in Tanzania constrained the farmers from meeting their information needs which specially included high cost of ICTs, illiteracy, distance to the telecentre, language barrier, lack of electricity, frequent power cuts, sustainability issues and lack of awareness of most of the telecenter managers about the farmers' information needs. Again, it was observed in a different study that the spread of ICT technology among the farmers were hindered by a number of factors namely cost, availability, knowledge and reliability.

Another problem namely lack of electric power in many rural areas was a dictating factor regarding the spreading of ICT among the farmers (Mwakaje, 2010). Hassan et al. (2009) that the five main problems in their study less affected the entrepreneurs who were more exposed to ICT usage and courses.

United Republic of Tanzania (2005) reported that there were many factors namely high cost of ICT services in rural locations compared to urban locations, low literacy rates, low incomes and limited number of service providers, inappropriate legal and

regulatory framework for the expanding market, inadequate telecom infrastructure and ICT expertise which had contribution to the low use of Internet.

Mwakaje (1999) that there were limitations of using radio sets for market information dissemination in Tanzania. The price information was disseminated only once a day and for a very short period of time which was hard for the farmers to time it regularly. It was also observed in the study that another problem which was lack of dry batteries and other maintenance aspects of the radios affected the regular use of radio sets by the farmers for receiving price announcement.

2.3 Conceptual Framework of the Study

The relationship between the experimental variables and the main focus of the study can be clearly depicted with the help of conceptual framework of the study. In this study, the researcher made an attempt to assess the use of ICT among the farmers of Jhikargacha upazila under Jashore district as the main focus of the study. It was conceptualized in the research that the use of ICT among the farmers may be influenced and affected by the interacting forces of many socio-economic, personal and other types of characteristics of the farmers. Hence, the experimental variables of the study were some selected characteristics of the farmers as mentioned earlier. To make the process conspicuously interpretable a conceptual framework has been presented in a schematic diagram in Fig 2.1

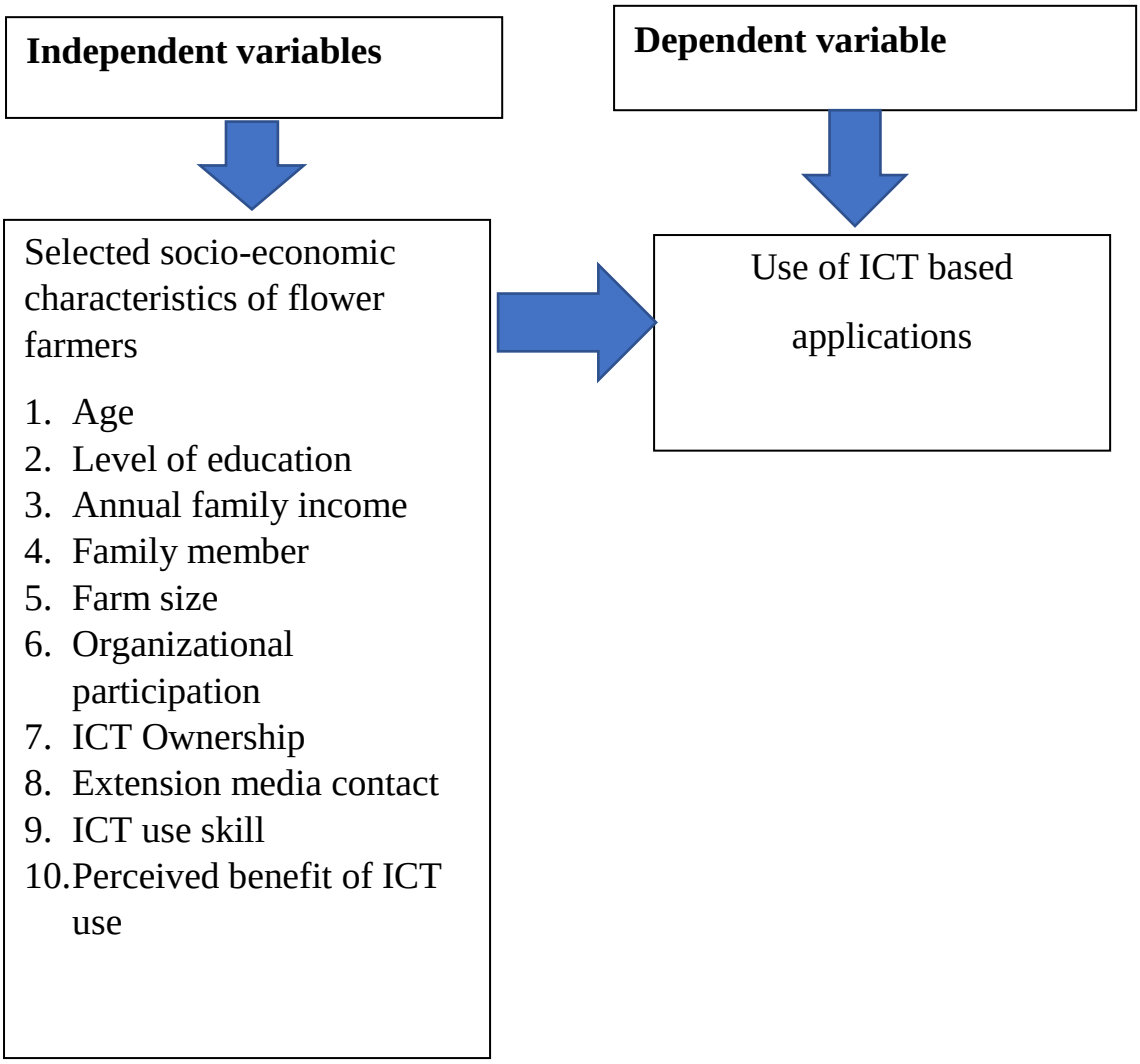

Figure 2.1 Conceptual framework of the study

CHAPTER III

METHODOLOGY

This Chapter describes the procedures and methods used in this study. This chapter is divided into three sections. The first section describes the overview of research design. The second section describes the measurement of variables. Finally, the third section describes the methods applied in data analysis.

3.1 Research Design

3.1.1 Locale of the study

Jashore district is selected purposively as it is potential district of Bangladesh for flower cultivation. Among six upazilas in Jashore district, Jhikagacha upazila was selected purposively. The study was conducted in three unions namely Panisara, Godkhali, and Nadharan. These unions were selected purposively because most of the farmers from this area are flower farmers. Prior to selecting these unions, a thorough discussion with the concerned GOs and NGOs personnel and local elites was conducted by the researcher to contact targeted flower farmers.

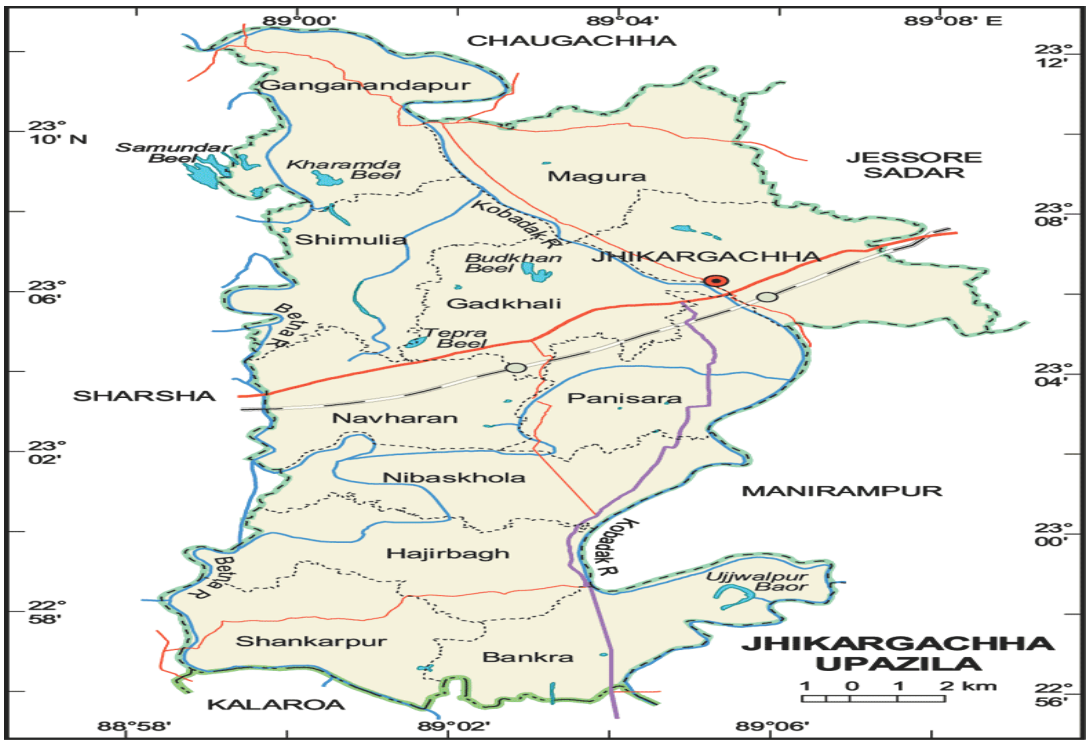

Figure: 3.1 A map of Jashore district showing study area (Jhikargacha upazila)

3.1.2 Population and sampling frame

Flower farmers of Panisara, Godkhali, and Nabharan unions of Jhikargacha upazila under Jashore district constituted the population of the study. The list of all the flower farmers of the study area was collected. Thus, a total of 1024 flower farmers were constituted the population of this study. Data were collected from the sample rather than whole population due to time and fund constraints. Flower farmers were selected randomly and proportionately from the villages as the sample by using a random number table. Thus, 106 flower farmers were selected as the sample for this study using an online sample determination application. Data collection was conducted only once they willingly agreed to participate in the survey voluntary. Distribution of population, sample size and pre-test sample are shown in Table 3.1.

Table 3.1 Population and sample of this study

Union	Population	Sample size	Pre-test sample
Panisara	493	50	5
Godkhali	206	30	3
Nabharan	325	26	3
Total	1024	106	11

3.1.3 Instrument for data collection

Since the reasons for study were to test the hypotheses and measure the variances, a cross-sectional survey strategy was operationalized for this study. Henceforth, data was gathered utilizing an organized meeting plan. Remembering the targets, the study adjusted approved estimation things from earlier investigations, at whatever point conceivable. The beforehand prepared interview schedule was prettied and vital adjustments were completed. In most instances, closed form questions were used. Approved estimation of each construct with their literature sources was exhibited in an English version of the interview schedule as joined in Appendix-A.

3.1.4 Collection of data

Data for this study were collected through personal interview by the researcher himself period from 20 December, 2020 to 27 February, 2021. The interview schedule prepared earlier by the researcher was used to gather information. All possible efforts were made to explain the purpose of the study to the respondents to get valid and pertinent information from them. Interviews were conducted with the respondents at their flower cultivation land. While starting the interview with any respondent, the researcher took all possible care to establish rapport with them so that they did not feel uneasy or hesitant to furnish proper responses to the questions and statements in the schedule. The questions were explained and clarified whenever any respondent felt difficulty in understanding properly. None of the flower farmers was interviewed from the reserve list during final collection of data.

3.1.5 Variables of the study

Two variables were used for this study:

1. Dependent variable: It is a variable that is the result or outcome or effect of other variables. This variable is often known as criterion or outcome variable. The dependent variable's value depends on the other variables' value, that is, independent variable. In this study, use of ICT based applications for flower production and marketing by the flower farmers was considered as the dependent variable.

2. **Independent variable**: It is a variable that the researcher can control over or manipulate to predict other variable (i.e., dependent variable). Therefore, this variable is often called as predictor variable or causal variable. In an experimental setting, a researcher wants to manipulate the variable or introduce new variable to see its effect on the dependent variable. In this study age, level of education, family member, annual income, farm size, organizational participation, ICT ownership, extension media contact, ICT use skill, perceived benefit of using ICTs were considered as independent variables.

3.2 Measurement of Variables

Variables are two types. These are discussing in the below:

3.2.1 Measurement of independent variables

3.2.1.1 Age

Age of the flower farmers refers to the period of time from his birth to the time of interview. It was measured in terms of actual years on the basis of his response to item No. 1 of the interview schedule (Appendix A).

3.2.1.2 Education

The education of a respondent was measured by the number of years of successful schooling. A score of one (1) was assigned for each year of schooling completed. For example, if a respondent completed study up to class five, his education score was assigned as 5.

Education status of a respondent who could sign only was assigned a score of 0.5 while illiterate fish farmers were assigned a score of 0. Besides, if a respondent did not go to school but studied at home and if his knowledge status was equivalent to a formal school education.

3.2.1.3 Family size

Family size of the respondent farmers was measured by counting the total number of family members of the respondent on the basis of his/her response. The head of the household, his wife, children, parents and other dependents who jointly lived and ate together during interview was considered as the family members. One score was given for each family member

3.2.1.4 Annual family income

Annual family income of the respondents was measured on the basis of total yearly income of the respondent himself/herself plus other family members. One score was assigned to each ‘1000’ taka annual income of a respondent. The annual income was measured by using the following formula:

Total Annual Income = A+B+C

Where, A = Annual income from agriculture

B = Annual income from livestock, poultry and fisheries

C = Annual income from service, business, labour and others

3.1.1.5 Farm size

Farm size of a respondent referred to the total area of land on which he cultivate the flower, the area being in terms of full benefit to him. The term refers to the flower cultivated land either owned by the respondent or share-land lease or taking from other including homestead area.

3.2.1.6 Organizational participation

Organizational participation means the responded flower farmers duration or nature of the participation of his or her whole life. Different types of organization he or she nominated as members. Executive committee officer score 3 for one year, committee member two for one year and general member one for one year of participation. This variable appears in item number 8 in the interview schedule as presented in Appendix -A.

3.2.1.7 Extension media contact

Extension media contact exposure was measured as one's extent of contact to different information sources. Each respondent was asked to indicate his nature of contact for each of 14 selected media with five alternative responses was prepared for the respondents. Following scores were assigned for each of 14 media.

Extent of exposure	Score Assigned
Never	0
Rarely	1
Occasionally	2
Often	3
Regularly	4

Thus, the communication exposure scores of flower farmers could range from 0 to 56. Where '0' indicated no exposure and 56 indicated very high media contact. This variable appears in item 10 in the interview schedule as presented in Appendix-A.

3.2.1.8 ICT Ownership

The ICT Ownership score of a respondent was computed on the basis of his access of the number and type of ICT devices. This considered both self and shared access. Scores for ICT possession were assigned as follow:

Nature of Ownership	Score Assigned
Self	1
Shared access	.5
No access	0

ICT ownership score was determined by summing the scores of all the three ICT devices. Thus, the score could range from 0 to 1, where 0 indicated no access and 1 indicated the self-access of ICT tools.

3.2.1.9 ICT use skill

ICT use skill was computed on the basis of a respondent's ability to use various ICT applications by himself. Respondents' responses were captured by using a five-point rating scale (1-5) ranging from 'strongly disagree' to 'strongly agree' against five statements.

Assigned items	Score
Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

Benefit of using ICT tools score was determined by summing the scores of all 5 items. Thus, the score could range from 0 to 25, where '0' indicates strongly disagreement and '25' indicates strongly agreement.

3.2.1.10 Perceived benefit of using ICT

Benefit of using ICT tools score of a respondent was computed on the basis of his belief on how they were benefitted by using ICT devices for flower production

activities. Respondents' responses were captured by using a five-point rating scale (1-5) ranging from 'strongly disagree' to 'strongly agree' against five statements.

Assigned items	Score
Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

Benefit of using ICT tools score was determined by summing the scores of all 5 items. Thus, the score could range from 5 to 25, where '5' indicates strongly disagreement and '25' indicates strongly agreement.

3.2.2 Measurement of dependent variable

3.2.2.1 Use of ICT based applications

ICTs use score of the respondent was measured by the extent of using different ICT applications for flower production purposes. The scores were assigned as follows:

Use of ICT tools	Score
Never	0
Rarely	1
Occasionally	2
Often	3
Regularly	4

Use of ICT tools use score was determined by summing the scores of all 7 items. Thus, the score could range from 0 to 28, where '0' indicates no and '28' indicates highest use of ICT tools.

3.3 Data Analysis

3.3.1 Editing

Raw data were properly reviewed for omitting errors. The researcher made a careful scrutiny when he completed an interview so that all data were included to facilitate coding and tabulation.

3.3.2 Coding and tabulation

The researcher consulted with the research supervisor and co-supervisor, to make a detailed coding plan. All responses were given in the numerical score. The respondent responses were transferred to a spread sheet of SPSS to facilitate tabulation. In accordance with the objectives of the research, all of the data were tabulated.

3.3.3 Categorization of data

For coding operation, the collected data were classified into various categories. These categories were developed for each of the variables. The procedures and categorization of a particular variable were further discussed in the chapter 4 in detail.

3.3.4 Method of data analysis

The data were analyzed in accordance with the objectives of the research work. The statistical measures such as range, means, standard deviation, number and percentage distribution were used to describe the variables. The analysis of data was performed using statistical treatment with SPSS v.23 (Statistical Package for Social Sciences) computer program. In order to estimate the contribution of the selected factors that might influence fish farmers in the use of ICT tools in receiving farm-related information, linear regression analysis was used. Throughout the study the 0.05 level of probability was used as the basis of rejection or accepting a null hypothesis. If the computed value of was equal to or greater than the designated level of significance (p), the null hypothesis was rejected and it was concluded that there was a significant contribution of the concerned variable to the used ICT. Whenever the computed value was rejected. It was concluded that there was no contribution of the concerned variables to the use of ICT tools for flower production and market related information.

CHAPTER IV

RESULT AND DISCUSSION

In this Chapter, the findings of the study and interpretation of the results have been presented. Data obtained from respondents through interview were measured, analyzed, tabulated and statistically treated according to the objectives of the study. These are presented in four sections. In the first section, independent variables have been discussed. The second section dealt with factors which influences using ICT tools of flower farmers for their flower production, in third section discuss with dependent variables.

4.1 Respondents Characteristics and Descriptive Statistics

In this section the descriptive statistics are presented in Table 4.1.

4.1.1 Selected characteristics of the flower farmers

Ten characteristics of the flower farmers were selected for the study. These selected characteristics were age, level of education, annual family income, family member, farm size, organizational participation, ICT ownership, extension media contact, ICT use skill, perceived benefit of using ICT. The salient features of the selected characteristics of the flower farmers have been presented in Table 4.1.

Table 4. 1 The salient features of the selected characteristics of the flower farmers

Sl. No.	Characteristics	Measuring unit	Range		Mean	SD
			Possible	Observed		
1.	Age	Year	-	24-66	39.33	9.73
2.	Level of education	Year of schooling	-	0-12	5.57	3.76
3.	Family Member	No of member	-	3-8	4.5	1.08
4.	Farm Size	Ha	-	0.26-1.13	.64	.18
5.	Annual family income	000 Tk	-	40-200	96.26	28.10
6.	Organizational participation	Score	-	10-35	11.16	3.86
7.	ICT ownership	Score	1-3	1-3	1.80	.41
8.	Extension media contact	Score	0-56	18-38	25.04	4.20
9.	ICT use Skill	Score	0-25	15-22	18.65	.95
10.	Perceived benefit of using ICT	Score	5-25	14-20	19.32	1.28

4.1.1 Age

The range of score of the flower farmers was found between 24 to 66 and the average of score was 39.33 years with the standard deviation of 9.73. Age classification was done according to the People's Republic of Bangladesh; the flower farmers were classified into three categories based on their age: young aged (up to 35 years), middle aged (36 to 50 years) and old aged (above 51 years). The categories and the distribution of the flower farmers according to their age are shown in Table 4.2.

Table 4.2 Distribution of the flower farmers according to their age

Category	Number	%	Average	SD
Young aged (up to 35 years)	44	41.5	**39.33**	**9.73**
Middle aged (36 to 50 years)	46	43.4		
Old aged (Above 51 years)	16	15.1		
Total	**106**	**100**		

Categorization was done based on youth classification of Bangladesh. Data presented in Table 4.2 indicates that the highest proportion (43.5%) of the flower farmers were in middle aged category, 41.5% of flower farmers were of young aged and the rest 15.1% of flower farmers are of old aged category. However, data also revealed that (84.9%) of the flower farmers in the study area were of middle to young aged. This study found that middle to young aged flower farmers is more interested and engaged in flower production and their high use of ICT in flower production.

4.1.2 Level of education

The range of education score of the flower farmers was found between 0 to 12 and the average of education was 5.57 with the standard deviation of 3.76. Flower farmers were classified into five categories based on their education: cannot read and write (0), can sign only (0.5), primary level (1-5), secondary level (6-10) and above secondary level (above 10). The categories and the distribution of the flower farmers according to their education are shown in Table 4.3.

Table 4.3 Distribution of the flower farmers according to their education

Category	Number	%	Average	SD
Can't read and write (0)	9	8.5	**5.57**	**3.76**
Can sign only (0.5)	20	18.9		
Primary level (1-5)	28	26.4		
Secondary level (6-10)	44	41.5		
Above secondary	5	4.7		
Total	**106**	**100**		

Categorization was done based on schooling in educational institutions calculated from the collected data. Data presented in Table 4.3 indicates that the highest proportion (41.5%) of the flower farmers fall under the category of secondary level of education, whereas 26.4% of the flower farmers fall under the category of primary level, 18.9% fall under can sign only, 8.5% of the flower farmer fall under the can't read and write category and only 4.7% fall under above secondary category. The findings indicate that (67.9%) of the flower farmers education level varied from primary to secondary levels. Thus, it can be said that the high education level, more interested and used of ICT for flower production.

4.1.3 Annual family income

The range of flower farmers income score of the farmers was found between 40 to 200 TK (in thousands TK) and the average of income was 96.26 TK (in thousand TK) with the standard deviation of 28.10. Flower farmers were classified into three categories based on their income source: low income (up to 65 thousand TK), medium income (65-124 thousands TK) and high income (above 124). The categorization and the distribution of the flower farmers done according to their income both agricultural and non-agricultural income source are shown in Table 4.4.

Table 4.4 Distribution of the flower farmers according to their annual family income

Category	**Number**	**%**	**Average**	**SD**
Low income (<65)	15	14.2	**96.26**	**28.10**
Medium income (65-124)	73	68.8		
High income(>124)	18	17		
Total	**106**	**100**		

Data presented in Table 4.4 indicates that the highest proportion (68.9%) of the flower farmers had medium income, 17% of the flower farmers had high income and there was 14.2% of the farmers who had low income. Respondent's income comes from both agricultural and non-agricultural income source but most incomes come from flower production.

4.1.4. Family member

Family member score of the respondent farmers was ranged from 3 to 8 member. The average score was 4.50 and standard deviation was 1.08. On the basis of the family member, the respondent flower farmers were classified into three categories as shown in Table 4.5.

Table 4.5: Distribution of the flower farmers according to their family member

Category	Number	%	Average	SD
Small (< 4)	11	10.3	**4.50**	**1.08**
Medium (5-6)	80	75.5		
Large (>6)	15	14.2		
Total	**106**	**100**		

Data presented in Table 4.5, the highest proportion (75.5%) of the flower farmers had medium number of family member that means medium numbers of family members are interested to the flower production and market Development factors. Others the large number of family member farmers (14.2%) and small number of family members (10.4%).

4.1.5. Farm size

Farm size of the respondent farmers was ranged from 0.26 to 1.13 ha. The average score was 0.64 and standard deviation was 0.18. On the basis of the farm size, the respondent flower farmers were classified categories as shown in Table 4.6.

Table 4.6: Distribution of the flower farmers according to their Farm Size

Category	Number	%	Average	SD
Small (< .21)	0	0	**0.64**	**0.18**
Medium (.21-1)	104	98.1		
Large (1..01-<3)	2	1.9		
Total	**106**	**100**		

The highest proportion (98.1%) of the flower farmers had medium farm size that means medium numbers of land sizes family are interested to the flower production

and market development factors. Others the large number of family member farmers (1.9%) and there is no small size of farm size.

4.1.6. Organizational participation

Organizational participation of the respondent farmers observed scores was ranged from 10.00-35.00. The average score was 11.16 and standard deviation was 3.86**.** On the basis of the organizational participation, the respondent flower farmers were classified into three categories as shown in Table 4.7.

Table 4.7 Distribution of the flower farmers according to their organizational participation

Category	**Number**	**%**	**Average**	**SD**
Less (< 11)	91	85.8	**11.16**	**3.86**
Moderate (11-14)	9	8.5		
High (>14)	6	5.7		
Total	**106**	**100**		

Majority of the respondents (85.8%) participation in organizations were found less while only 5.7% of the them were involved highly and hold positions in different organizations. Field data showed the targeted respondents were basically involved in flower association like Bangladesh Flower Society. However, their participation in other local organizations were found less.

4.1.7. ICT ownership: The observed ICT ownership score of the respondents ranged from 1.00-3.00. The average ownership score was 1.80 and the standard deviation was 0.41**.** Based on the possible range of ICT Ownership score (1-3). The categories and distribution of the respondents were shown in Table 4.8

Table 4.8 Distribution of the flower farmers according to ICT ownership

Category	**Number**	**%**	**Average**	**SD**
Small (< 1.75)	60	56.6	**1.80**	**.41**
Medium (1.75-2.25)	28	26.4		
Large (>2.25)	18	17.0		
Total	**106**	**100**		

As in Table 4.8 in the case of ICT ownership 56.6% of the respondents had low ownership (only mobile phone), 26.4% of the respondents had medium ownership and 17% of the respondents had high ownership for their flower production and market related information.

4.1.8. Extension media contact

The observed extension media contact scores of the respondents ranged from 18-38. The average extension media contact score was 25.04 and the standard deviation was 4.20. The categories and distribution of the respondents were shown in Table 4.9

Table 4.9 Distribution of the flower farmers according to extension media contact

Category	Number	%	Average	SD
Low (< 23)	35	33	**25.04**	**4.20**
Medium (23-27)	46	43.4		
High (>27)	25	23.6		
Total	**106**	**100**		

As in Table 4.9 in the case of extension media contact, 43.4% of the respondents had medium media contact, 33% of the respondents had low media contact and 23.6% of the respondents had high media contact for their flower production and market related information

4.1.9. ICT use skill

The observed skill of ICT use scores of the respondents ranged from 15-22. The average ICT use skill score was 18.65 and the standard deviation was .95. Based on the possible range of ICT use skill score (0-25). The categories and distribution of the respondents were shown in Table 4.10.

Table 4.10 Distribution of the flower farmers according to ICT use skill

Category	Number	%	Average	SD
Low (< 18.5)	47	44.3	**18.65**	**.95**
Medium (18.5-19.5)	43	40.6		
High (>19.5)	16	15.1		
Total	**106**	**100**		

As in Table 4.10 in the case of use of ICT skill 44.3% of the respondents had low ICT skill (operate mobile phone, text message, capture photo and post), 40.6% of the respondents had medium ICT skill and 15.1% of the respondents had high ICT skill for their flower production and market related information.

4.1.10. Perceived benefit of Using ICT

The observed perceived benefit of ICT use scores of the respondents ranged from 14-20. The average ICT use skill score was 19.32 and the standard deviation was 1.28**.** The categories and distribution of the respondents were shown in Table 4.11.

Table 4.11: Distribution of the flower farmers according to perceived benefit of using ICT

Category	**Number**	**%**	**Average**	**SD**
Low (< 16)	6	5.7	**19.32**	**1.28**
Medium (16-19)	25	23.6		
High (>19)	75	70.8		
Total	**106**	**100**		

As in Table 4.11 in the case of perceived benefit of using ICT 70.8% of the respondents had high perceived benefit, that means high perceived benefit of flower farmer are interested in flower production, 23.6% of the respondents had medium perceived benefit and there was 5.7% low perceived benefit of using ICT for their flower production and market related information.

4.2 Use of ICT based applications

The observed use of ICT based applications scores of the respondents ranged from 6-19. The average ICT use skill score was 10.93 and the standard deviation was 3.44. The categories and distribution of the respondents were shown in Table 4.12.

Table 4.12 Distribution of the flower farmers according to use of ICT based applications

Category	**Number**	**%**	**Average**	**SD**
Low (< 9)	38	35.8	**10.93**	**3.44**
Medium (9-13)	48	45.3		
High (>13)	20	18.9		
Total	**106**	**100**		

As in Table 4.12 in the use of ICT based applications 45.3% of the respondents had medium ICT based applications, 35.8% of the respondents had low ICT based applications and 18.9% of the respondents had high ICT skill for their flower production and market related information.

Use of ICT based applications:

Sl No	Items	Extent of use					
		Regularly (4)	Often (3)	Occasionally (2)	Rarely (1)	Never (0)	Use index
1	Mobile Phone	106	0	0	0	0	424
2	Computer or related devices like tabs, laptops	0	8	20	72	6	136
3	Internet	27	73	3	3	0	336
4	Union Information Service Center (UISC)	0	0	18	49	39	85
5	Call Center	0	0	14	40	52	68
6	Weather app	0	0	13	34	59	60
7	Farming Related apps	0	2	11	33	60	61

4.3 Contribution of the Selected Factors to Farmers Use of ICT for Flower Farming

In order to determine the contribution of the selected socio-economic characteristics of flower farmers to their use of ICTs, regression analysis was carried out which is presented in Table 4.13.

Table 4.13 Multiple Regression co-efficient of the selected characteristics of the flower farmers to their use of ICT for flower production

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	R^2	Adj. R^2	F
		B	Std. Error	Beta					
Use of ICT	(Constant)	-2.413	.759		-3.181	.002	.743	.716	27.52
	Age	-.003	.004	-.501	-.607	.545			
	Level of education	.000	.010	.003	.037	.970			
	Annual family income	.005	.002	.291	3.204	.002**			
	Farm size	-.338	.238	-.129	-1.423	.158			
	Family member	-.004	.026	.009	.163	.871			
	Organizational participation	.044	.074	.039	.599	.551			
	Extension media contact	.374	.134	.228	2.787	.006**			
	Perceived benefit use	.050	.126	.026	.395	.694			
	ICT ownership	1.876	.300	.523	6.263	.000**			
	ICT use Skill	.468	.159	.174	2.949	.004**			

*Significant at 5% **Significant at 1%

Among the ten variables, four (4) variables namely annual income, extension media contact, ICT ownership, ICT use skill were found to be contribute significantly to farmers use of ICT for flower production (Table 4.13) while the rest of the variables showed no significant contribution. All the factors jointly contribute 74.3% of the variances of the adoption (R^2 = 0.743). Each predictor may explain some of the variances in respondents' use of ICT by chance. The adjusted R^2 value (0.716) penalizes the addition of extraneous predictors in the model, but values of 0.716 still show that the variances in respondents' use of ICT can be attributed to the predictor variables rather than by chance and that both are suitable models (Table 4.13). In summary, the models suggest that the respective authority should consider the respondents Annual income, Extension media contact, ICT ownership, ICT use skill for flower production and market related information of flower farmers.

4.3.1 Contribution of annual family income to farmers use of ICT

The relationship of annual income in the use of ICT by the farmers by testing the following null hypothesis; "there is no contribution of annual family income to farmers in use of ICT.

The p-value of the concerned variables was found .002. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

a. The contribution of annual income was at 1% significance level.
b. So, the null hypothesis could be rejected.

Annual family income of the flower farmer's annual income had positive influence to their ICT use behavior for farming. significant at $p<0.002$. It could be said that sometimes ICT based applications were not accepted by low income farmers due to device ownership issue. Moreover, they might face obstacles sometimes to take new decision for going outside from ICT practices considering benefit.

4.3.2 Contribution of extension media contact to farmers use of ICT

From the multiple regression, it was concluded that the contribution of extension media contact by the flower farmers by testing the following null hypothesis; “there is no contribution of extension media contact to farmers use of ICT.

The p-value of the concerned variables was found .006. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

a. The contribution of the extension media contact was at 1% significance level.

b. So, the null hypothesis could be rejected.

Extension media contact for ICT practices had positively contributed to farmers extent of ICT use. This implies that with the increased extension media contact, the flower farmers will increase with their use of ICT based applications. In other words, farmers tend to use ICT applications for farming are expected to be well extension professionals as well as their access to farming information are high.

4.3.3 Contribution of ICT ownership to farmers use of ICT

From the multiple regression, it was concluded that the contribution of ICT ownership by the flower farmers by testing the following null hypothesis; “there is no contribution of ICT ownership to farmers use of ICT.

The p-value of the concerned variables was found .000. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

a. The contribution of the extension media contact was at 1% significance level.

b. So, the null hypothesis could be rejected.

Flower farmer’s ICT ownership had positive influence on their use of ICT for farming. This implies that more the ICT ownership the more the ICT use by respondents. In fact, device ownership is an important pre condition of ICT use. Despite many farmers or farmer group access to ICT at sharing basis, high ownership certainly creates more opportunity for ICT use.

4.3.4 Contribution of ICT use skills to farmers use of ICT

From the multiple regression, it was concluded that the contribution of ICT use skill by the flower farmers by testing the following null hypothesis; “there is no contribution of ICT use skill to farmers use of ICT.

The p-value of the concerned variables was found .004. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

a. The contribution of the extension media contact was at 1% significance level.

b. So, the null hypothesis could be rejected.

ICT use skill had positive influence to farmers use of ICT. This implies that with the increased ICT use skill, farmers use of ICT based applications for farming related purpose are also increased. There are numerous research studies that have proven the linkage between the ICT skills and ICT use. Despite, ICT skill are not always related or lead to higher ICT use, without having ICT skills or know how, ICT use intensity will be much less. Therefore, it can be concluded that farmers having ICT use skills are the frequent users ICTs.

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This Chapter presents summary of findings, conclusions and recommendations of the study.

5.1 Summary of the Study

The title of the study was *"Use of Information and Communication Technologies (ICTs) By Flower Farmers of Jashore District"*. The present study was undertaken with the objectives to determine and describe the socio-economic characteristics of the respondent flower farmers, to know the extent of use of ICT by flower farmers for flower production, to explore the contribution of selected factors to the extent of use of ICT for flower production and to find out the problem faced by flower farmers during ICT tools use. The selected characteristics of the flower farmers were age, level of education, annual family income, family member, farm size, organizational participation, ICT ownership, extension media contact, ICT use skill, perceived benefit of using ICT, use of ICT based applications. Three unions of Jhikargacha upazilla under Jashore district namely Panisara, Godkhali and Nabharan were selected as research area. The respondents of the study were the medium to smallholder flower farmers. The sample of flower farmers was drawn from a population of 106. Data were collected from 20 December, 2020 to 27 February, 2021 using a questionnaire interview schedule.

The major findings of the study are summarized below.

5.1.1 Selected factors that influence farmers use of ICT tools in flower production

Findings in respect of the eleven selected factors that influence flower farmer's use of ICT tools in flower production and market related information are summarized below:

Age

The range of age of the flower farmers was found between 24 to 66 years and the average of age was 39.33 years with the standard deviation of. 9.73. Age classification was done according to the People's Republic of Bangladesh; the flower farmers were classified into three categories based on their age: young aged (up to 35 years), middle aged (36 to 50 years) and old aged (above 51 years).

Level of Education

The range of education of the flower farmers was found between 0 to 12 and the average of education was 5.57 years with the standard deviation of 3.76. Flower farmers were classified into five categories based on their education: cannot read and write (0), can sign only (0.5), primary level (1-5), secondary level (6-10) and above secondary level (above 10).

Annual Family Income

The range of flower farmers income of the farmers was found between 40 to 200 TK (in thousands of TK) and the average of income was 96.26 TK (in thousand TK) with the standard deviation of 28.10. Flower farmers were classified into three categories based on their income source: low income (up to 65 thousand TK), medium income (65-124 thousands TK) and high income (above 124). the highest proportion (68.8%) of the flower farmers had medium income, 17% of the flower farmers had high income and there was 14.2% of the farmers who had low income. Respondent's income comes from both agricultural and non-agricultural income source but most incomes come from flower production.

Family Member

Family member of the respondent farmers was ranged from 3 to 8 member. The average score was 4.50 and standard deviation was 1.08, highest proportion (75.5%) of the flower farmers had medium number of family member that means medium numbers of family members are interested to the flower production and market Development factors. Others the large number of family member farmers (14.2%) and small number of family members (10.3%).

Farm Size

Farm size of the respondent farmers was ranged from 0.26 to 1.13 ha. The average score was 0.64 and standard deviation was 0.18, highest proportion (98.1%) of the flower farmers had medium farm size that means medium numbers of land sizes family are interested to the flower production and market development factors. Others the large number of family member farmers (1.9%) and there is no small size of farm size.

Organizational Participation

Organizational participation of the respondent farmers observed scores was ranged from 10.00-35.00. The average score was 11.16 and standard deviation was 0.38, Majority of the respondents (85.8%) participation in organizations were found les while only 5.7% of them were involved highly and hold positions in different organizations. Field data showed the target respondents were basically involved in flower association like Bangladesh Flower Society. However, their participation in other local organizations were found less.

ICT Ownership

ICT ownership scores of the respondents ranged from 1.00-3.00. The average ownership score was 1.80 and the standard deviation was 0.41**.**

More than half of the respondents (56.6%) had low ownership (only mobile phone), 26.4% of the respondents had medium ownership and 17% of the respondents had high ownership for their flower production and market related information.

Extension Media Contact

Extension media contact scores of the respondents ranged from 18-38. The average extension media contact score was 25.04 and the standard deviation was 4.20. 43.4% of the respondents had medium media contact, 33% of the respondents had low media contact and 23.6% of the respondents had high media contact for their flower production and market related information.

ICT Use Skill

Skill of ICT use scores of the respondents ranged from 15-22. The average ICT use skill score was 18.65 and the standard deviation was 0.95. 44.3% of the respondents had low ICT skill (operate mobile phone, text message, capture photo and post), 40.6% of the respondents had medium ICT skill and 15.1% of the respondents had high ICT skill for their flower production and market related information.

Perceived Benefit of Using ICT

Perceived benefit of ICT use scores of the respondents ranged from 14-20. The average ICT use skill score was 19.32 and the standard deviation was 1.28**,** 70.8% of the respondents had high perceived benefit, that means high perceived benefit of flower farmer are interested in flower production, 23.6% of the respondents had medium perceived benefit and there was 5.7% low perceived benefit of using ICT for their flower production and market related information.

5.1.2 Use of ICT based applications

Use of ICT based applications scores of the respondents ranged from 6-19. The average ICT use skill score was 10.93 and the standard deviation was 3.44. 45.3% of the respondents had medium ICT based applications, 35.8% of the respondents had low ICT based applications and 18.9% of the respondents had high ICT skill for their flower production and market related information.

5.2 Conclusions of the Study

Findings of the present study and the logical interpretation of other relevant facts interested the researchers to draw the following conclusions:

1. Flower farmers' annual income had a positive influence to their extent of ICT use. It had the significant (significant at $p<0.002$) contribution on their flower production.
2. It was concluded that farmers' extent of ICT-based applications could be increase with the increase rate of extension media contact, their ICT ownership status and their ICT use skill. Therefore, for ICT-based interventions, respondents having high skills and access to ICTs, and willing to receive farming information regularly should be targeted.

5.3 Recommendation of the Study

5.3.1 Recommendation for policy formulation

On the basis of the findings revealed from the study, the following recommendations are put forwarded that might guide the policy formulation:

1. The annual family income of the flower farmers had positive and significant relationship with the use of ICT. Thus, it may be said that high use of ICT was found in the case of highly income flower farmers.
2. Extension media contact had a significant contribution on their use of ICT tools and almost all the respondents either had direct or indirectly contact with the extension media. Therefore, more media enabled applications should be designed and implemented so that flower farmers can contact to those applications and receive updated market information.
3. ICT ownership had a significant contribution on their use of ICT tools and almost all the respondents either had direct or indirectly use of mobile, Internet and other access. Therefore, more access enabled applications should be designed and implemented so that flower farmers can sharing to those applications and receive updated market information.

5.3.2 Recommendation for further study

1. The study was conducted Jhikargacha upazila of Jashore district. Similar studies should be conducted in other parts of the country to get a clear picture of the whole country which will be helpful for effective policy formulation.
2. The present study was undertaken to explore contribution of ten selected factors to flower farmer's use of ICT tools. Therefore, it could be recommended that further studies should be designed considering other agricultural and nonagricultural activities and including other characteristics of the flower farmers that might affect the use of ICT tools.
3. It is difficult to determine actual use of ICT tools by the farmers. Measurement of use of ICT tools by the flower farmers is not free from questions. Therefore, more reliable measurement of concerned variable is necessary for further study.
4. Research should also be undertaken to identify to other factors causing hindrance to the use of ICT tools in flower production and market related Information.

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An Interview Schedule On, *"**Use of Information and Communication Technologies (ICTs) By Flower Farmers of Jessore District**".*

Name of the Respondent:

Village:

Union:

P.O:

District:

1. **Age**: What is your age?.....years

2. **Level of Education**

Please indicate your educational qualification by putting (√) mark.

a) cannot read and write

b) can sign only

c) studied up to ……class

3. **Family Size**: Please mention the number of your family members……

4. **Farm Size**: Please mention your farm size:

Sl No	Types of Land	Area of land (local unit)	Area of land (ha)
1	Homestead area		
2	Own land under own cultivation		
3	Own land given to/taken from other on Jessore		
4	Own land taken from other on lease		
5	Own land given to others on lease		
6	Others		

Total: (Add farm size calculation formula here with): ……

5**. Annual Family Income**: Please mention your last year annual family income

Sl No	Source of Income	(Thousand Taka)
	A) Agricultural Sources	
1	Crop	
2	Livestock	
3	Poultry	
4	Fisheries	
	Sub-total(A)	
	B) Non-agricultural Sources	
5	Service/Job	
6	Business	
7	Remittance	
8	Labour	
9	Others	
	Sub-total(B)	
	Total (Sub-total(A)+Sub-total(B))	

6. **Please mention your last year income from flower production**:
……. (Thousand Taka)

7. **Organizational participation**: Please mention in the nature and duration of your participation in the following organizations.

Sl No	Name of the Organization	Duration/Nature of the Participation (Years)			
		No Participation	Ordinary Members	Executive Committee Member	Executive Committee Officer
1	Union Parishad				
2	Chamber of Commerce				
3	Youth Club				
4	Cultural Organization				
5	School Committee				
6	Religious Committee				
7	Bazar Committee				
8	Flower Association				
9	Others				

8. **ICT Ownership**: Please mention your ICT ownership status

Sl No	Items	Nature of ownership		
		Self	Shared access	No access
1	Mobile Phone			
2	Computer			
3	Internet			

9. **Extension Media Contact**:
Please indicate your frequency of contact with the following media.

Sl No	Name of Extension Media	Nature of Communication				
a)	**Individual Contact**	Regularly (4)	Often (3)	Occasion ally (2)	Rarely (1)	Never (0)
1	Neighbours/friends and family/progressive farmers	(7-8 times/ month	(5-6 times/ month)	(3-4 times/ month)	(1-2 times/ month)	0 ()
2	Sub Assistant Agricultural Officer(SAAO)	(7-8 times/ year	(5-6 times/ year)	(4-5 times/ year)	(3-4 times/ year)	0 ()
3	Agricultural Extension Officer (AEO/UAO)	(5-6 times/ year	(4-5 times/ year)	(3-4 times/ year)	(2-3 times/ year)	0 ()
4	NGO Workers	(3-4 times/ month	(2-3 times/ month)	(5-6 times/ year)	(4-5 times/ year)	0 ()
5	Input dealers (e,g. irrigation, pesticide, fertilizer)	(3-4 times/ month	(2-3 times/ month)	(5-6 times/ year)	(4-5 times/ year)	0 ()
6	Market actor (e,g. traders, wholesalers, retailers)	(3-4 times/ month	(2-3 times/ month)	(5-6 times/ year)	(4-5 times/ year)	0 ()
b)	**Group Contact**					
7	Participation in group contact	(7-8 times/ year)	(5-6 times/ year)	(4-5 times/ year)	(2-3 times/ year)	0 ()
8	Participation in demonstration meeting	(4-5 times/ year)	(3-4 times/ year)	(2-3 times/ year)	(1-2 times/ year)	0 ()
9	Participation in field day	(4-5 times/ year)	(3-4 times/ year)	(2-3 times/ year)	(1-2 times/ year)	0 ()

10	Participation in training	(4-5 times/ Life)	(3-4 times/ Life)	(2-3 times/ Life)	(1-2 times/ Life)	0 ()
c)	**Mass Media Contact**					
11	Listening farm radio programme	(5-6 times/ week)	(4-5 times/ week)	(3-4 times/ week)	(1-2 times/ week)	0 ()
12	Watching Agricultural programme in TV	(4-5 times/ week)	(3-4 times/ week)	(2-3 times/ week)	(1-2 times/ week)	0 ()
13	Agri call center (e,g. 16247)	(7-8 times/ Year)	(5-6 times/ Year)	(3-4 times/ year)	(1-2 times/ year)	0 ()
14	Social Media (e,g. Facebook,Twitter, YouTube)	(7-8 times/ Year)	(5-6 times/ Year)	(3-4 times/ year)	(1-2 times/ year)	0 ()

10. **ICT use skill**:
Please mention your skills of using different ICT devices:

Sl No	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
1	I am good at using ICT device like mobile phone					
2	I can browse Internet using mobile phone /computer					
3	I can use social media without anyone helps					
4	I can operate computer or similar device like Tab or Laptop for my work					
5	I can operate mobile phone to send text,capture photos and post					

11. **Perceived benefit of using ICT**: Please mention your agreement and disagreement with the following statements.

Sl No	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
1	ICT help me to communicate better to persons (e,g., extension workers, input dealers) important for my farming/business					
2	I can able to know market condition better using ICTs					
3	Use of ICTs make my product selling process cashier					
4	ICTs significantly reduces my travel time and information search cost for farming and marketing					
5	Overall (e,g. mobile phone/computer/Internet) help my farming					

12. **Use of ICT based applications**: Do you use any ICT-based application/tool (e,g. mobile phone,computer,Internet) ***Yes/No***

If ***Yes***, please how frequently you use the following applications for contacting others for farming and marketing purposes.

Sl No	Items	Extent of use				
		Regularly (4)	Often (3)	Occasionally (2)	Rarely (1)	Never (0)
1	Mobile Phone					
2	Computer or related devices like tabs, laptops					
3	Internet					
4	Union Information					

	Service Center (UISC)					
5	Call Center					
6	Weather app					
7	Farming Related app (e,g, Kishoker Janala, Bisscope)					

Thanks for your co-operation

Contact No. of the respondent: ……

_____

Signature of the interviewer