

NORWEGIAN UNIVERSITY OF LIFE SCIENCES



The Department of International Environment and Development Studies, Noragric, is the international gateway for the Norwegian University of Life Sciences (UMB). Eight departments, associated research institutions and the Norwegian College of Veterinary Medicine in Oslo. Established in 1986, Noragric's contribution to international development lies in the interface between research, education (Bachelor, Master and PhD programmes) and assignments.

The Noragric Master thesis are the final theses submitted by students in order to fulfil the requirements under the Noragric Master programme "International Environmental Studies", "Development Studies" and other Master programmes.

The findings in this thesis do not necessarily reflect the views of Noragric. Extracts from this publication may only be reproduced after prior consultation with the author and on condition that the source is indicated. For rights of reproduction or translation contact Noragric.

© Sadia Jahan Moon, June 2013

Sadia_4000@yahoo.com

Noragric

Department of International Environment and Development Studies

P.O. Box 5003

N-1432 Ås

Norway

Tel.: +47 64 96 52 00

Fax: +47 64 96 52 01

Internet: <http://www.umb.no/noragric>

Declaration

I, Sadia Jahan Moon, declare that this thesis is a result of my research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for award of any type of academic degree.

Signature.....

Date.....

DEDICATION

This work is dedicated to my parents

Professor Dr Md. Abdul Momen Miah

and

Professor Doctor Nurjahan Begum

Acknowledgements

At the commencement, I bow to Almighty Allah for giving me the opportunity for this study and helping me to finish my thesis.

I would like to express my sincere gratitude to my respected teacher and supervisor Dr. Trygve Berg for allowing me to work with him as a Master's student. He was always very positive and encouraging to my research work. I am very grateful for his valuable guidance, endless efforts and support. His constructive criticism on the thesis assisted me greatly for its improvement. He was also very kind and sympathetic with the critical situation of taking care of my daughter and family. Special thanks to study coordinator Ingunn Bohmann for her generosity and logistic support, as well as to find out the way to go ahead and complete my study. All kind of facilities and supports from Department of International Environment and Development Studies - Noragric are gratefully acknowledged.

My heartiest gratitude is owned to my parents for their unconditional love and endless inspiration. I would also like to thanks my mother-in-law for her love and blessings.

I am indebted to all those farmers, this research would not be possible without their active participation. Special thanks to all the staffs from BAUEC for their assistance to conduct the research.

At last but not the least, thanks are due to my beloved husband Dr. Md. Ashraful Islam for his support, patience and positive attitude and my lovely daughter Inaayah Ashraf for her sacrifice.

Sadia Jahan Moon

Abbreviations

AEO	Agriculture Extension Officer
BAU	Bangladesh Agricultural University
BAUEC	Bangladesh Agricultural University Extension Center
DAE	Department of Agricultural Extension
FGD	Focus Group Discussion
ICT	Information and Communication Technology
MoA	Ministry of Agriculture
NAEP	New Agricultural Extension Policy
NARS	National Agricultural Research System
NGO	Non Government Organization
SAAO	Sub Assistant Agriculture Officer
TFP	Total Factor Productivity
ToT	Transfer of Technology
UAO	Upazila Agriculture Officer

Abstract

The main focus of the study was to find out the use of Information and Communication Technology (ICT) mediated extension service by the farmers for increasing farm productivity. Six ICT centers were established during 2010 in 6 villages under working area of Bangladesh Agricultural University Extension Center (BAUEC) for supplying farm information to the farmers. Since then farm information has been provided to the farmers by using ICT facilities. Motivation campaign was conducted among the farmers of BAUEC about utility of ICT center. Data were collected by using structured questionnaire and check list from a randomly selected sample of 120 out of 900 farmers of BAUEC. One-fifth (20 percent) of the farmers were highly aware about the role of ICT, 45.8 percent having medium awareness while 34.2 percent of the farmers had low awareness about the role of ICT in dissemination of farm information. The initial response of the farmers seems positive and encouraging since ICT is a new initiative in extension work. Majority (75 percent) of the farmers considered the benefit/outcome of using ICT in agriculture as medium to high, while 25 percent of the farmers opined the benefit as low. It was found that the farmers using ICT in farming activities have increased 5.91 percent of their farm productivity (rice production) in compare to immediate past year while farmers having no exposure to ICT have also increased 3.90 percent of farm productivity. This can apparently be assumed that the ICT alone can contribute 2.01 percent increase of farm productivity. The awareness of the farmers was found to have positive significant correlation with benefit of using ICT in agriculture. Among the characteristics, level of education, training exposure and extension media contact of the farmers were highly correlated with benefit of using ICT in farming. The other characteristics of the farmers had no significant relationships with their use of ICT in getting farm information. The majority of the respondents were young to middle aged while all of them have varying levels of literacy and average family size. Considering the farm size and annual income, large majority of the farmers were resource-poor and having good amount of farming experience. The farmers mostly preferred local sources while professional sources were less preferred for getting farm information. The farmers were found to have poor involvement in various socio-cultural organizations while moderate extent of training exposure. The management of ICT centers and technical 'know how' of BAUEC extension personnel were the problems faced by the farmers in using ICT for useful farming information. Strengthening of monitoring and supervision of ICT centers and motivational campaign could minimize majority of the problems to a reasonable extent has been opined by the farmers.

TABLE OF CONTENTS

Items	Page
Declaration	IV
Acknowledgements	VI
Abbreviations	VII
Abstract	VIII
Table of contents	IX
List of tables	XII
List of figures	XIII
List of appendices	XIII

Chapter	Page		
1	Introduction	1	
	1.1	General background about Bangladesh agriculture	1
	1.2	Extension system in Bangladesh	3
	1.3	Introduction of ICT mediated extension system	4
	1.4	Justification of the study	7
	1.5	Research questions	8
	1.6	Objectives of the study	10
	1.7	Assumptions of the study	10
	1.8	Limitations of the study	11
	1.9	Definition of terms	11
2	Methodology	15	
	2.1	Locale of the study	15
	2.2	Research design	18
	2.3	Population and sample of the study	19
	2.4	Data collection instruments	19
	2.5	Variables of the study	20
	2.6	Measurements of independent variables	20

	Chapter	Page
	2.6.1 Age	20
	2.6.2 Level of education	20
	2.6.3 Family size	21
	2.6.4 Farm size	21
	2.6.5 Farming experience	21
	2.6.6 Annual income	22
	2.6.7 Training exposure	22
	2.6.8 Organizational participation	22
	2.6.9 Extension media contact	23
	2.6.10 Awareness about role of ICT	24
	2.7 Measurement of dependent variable	24
	2.8 Statement of hypothesis	25
	2.9 Data analysis	26
3	Results and Discussion	27
	3.1 Awareness about role of ICT	27
	3.2 Benefits of ICT in increasing farm productivity	28
	3.2.1 Information about existence of ICT centre	29
	3.2.2 Qualitative changes in farming activities	30
	3.2.3 Food security	31
	3.2.4 Household food security	31
	3.2.5 Selling of farm produce	33
	3.2.6 Increase of farm productivity due to use of ICT	33
	3.2.7 Over all increase of farm productivity	34
	3.3 Characteristic profile of the farmers	35
	3.3.1 Age	35
	3.3.2 Level of education	36
	3.3.3 Family size	37
	3.3.4 Farm size	39
	3.3.5 Farming experience	40
	3.3.6 Annual income	41

Chapter		Page
	3.3.7 Extension media contact	42
	3.3.8 Training exposure	43
	3.3.9 Organizational participation	44
	3.4 Relationship between the variables	46
	3.4.1 Level of education of the farmers and their benefit of using ICT in increasing farm productivity	46
	3.4.2 Training exposure of the farmers and their benefit of using ICT in increasing farm productivity	48
	3.4.3 Extension media contact of the farmers and their benefit of using ICT in increasing farm productivity	49
	3.4.5 Relationships between benefit of using ICT by the farmers and other independent variables	50
	3.4.6 Interrelationship among the variables	53
	3.5 Awareness about role of ICT and benefit of using ICT in increasing farm productivity	54
	3.6 Problem confrontation	54
	3.7 Suggestions for solution	55
4	Summary, conclusions and recommendations	57
	4.1 Summary of findings	57
	4.1.1 Awareness of the farmers about the role of ICT	57
	4.1.2 Benefit of using ICT in increasing farm productivity	58
	4.1.3 Characteristics of the farmers	58
	4.1.4 Problem confrontation of the farmers in using ICT	60
	4.1.5 Probable suggestions to minimize the problems	60
	4.1.6 Relationship between the variables	61
	4.2 Conclusions	61
	4.3 Recommendations	64
	4.3.1 Recommendations for policy implications	64
	4.3.2 Recommendations for further study	66
5	References	69

List of tables

Titles		Page
Table 1	: Distribution of population and sample size of the study	19
Table 2	: Distribution of the farmers according to their opinion about role of ICT score	27
Table 3	: Opinion of the farmers regarding benefits of using ICT	28
Table 4	: Farmers opinion about existence of ICT centre	29
Table 5	: Opinion of the farmers regarding qualitative changes in farming activities	30
Table 6	: Distribution of the farmers according to their household food security in a year	32
Table 7	: Distribution of the farmers according to increased farm productivity	34
Table 8	: Distribution of the farmers according to their level of education	36
Table 9	: Distribution of the farmers according to their farm size	39
Table 10	: Distribution of the farmers according to their farming experience	40
Table 11	: Distribution of the farmers according to their annual income	41
Table 12	: Distribution of the farmers according to their extension media contact score	42
Table 13	: Distribution of the farmers according to their training exposure	43
Table 14	: Distribution of the farmers according to their organizational participation	44
Table 15	: Selected characteristics of the farmers and their increase of farm productivity due to use of ICT	46
Table 16	: Problems faced by the farmers in using ICT	55
Table 17	: Probable suggestions for minimizing problems of ICT	56

List of figures

	Titles	Page
Figure 1	: Reasons behind lack of bargaining power and lack of productivity of farmers in Bangladesh	2
Figure 2	: Map of Bangladesh showing research area	16
Figure 3	: Map of Mymensingh district showing the location of ICT centers	17
Figure 4	: Research design of the study	18
Figure 5	: Distribution of the farmers according to their age	36
Figure 6	: Distribution of the farmers according to their family Size	38
Figure 7	: Different activities of information and communication technology (ICT) center	45

List of appendices

	Appendix	Page
A	: An English version of the interview schedule	73
B	: English version of the check list	78
C	: Correlation matrix showing inter-correlations among all of the concerned variables	79

Chapter 1

Introduction

1.1 General Background about Bangladesh Agriculture

Bangladesh is a developing country where 76.47% of her population lives in the rural areas (Annonymous, 2007). The fundamental requirement for the improvement of livelihoods of the household is to enhance people's strength and activities essential for means of living. Agriculture is the principal means of livelihoods in Bangladesh. The livelihood approach is founded on a belief that people require a range of assets to achieve a positive livelihood outcome. The major livelihood assets are human, natural, financial, physical and social capitals.

In Bangladesh, adoption and diffusion of improved farming practices are of great importance. Bangladesh is one of the densely populated countries of the world where it constantly facing various problems like poverty, under employment, illiteracy, malnutrition and vulnerability to frequent natural calamities. As a result, the deficit of food production in the country is remaining as a great concern as the pressure of population growth is massive. Due to population growth and development activities the country is loosing a good amount of cultivable land (approximately 1 percent) every year. Continuously sustainable increase in food production is the only option for survival of the huge number of population. Food production can be increased if the farmers are properly informed about improved farming practices and adoption of those practices.

Bangladesh is an agro-based country. Most of the people of Bangladesh are depending on agriculture. But it is a matter of great regret that majority of the peasants of Bangladesh are illiterate and they are collecting agricultural information from the personnel of Department of Agricultural Extension (DAE). The main extension service providers working under the Ministry of Agriculture (MoA). DAE has been practicing conventional methods of transfer of technology (ToT) which is found incapable to provide demand-led information to the farmers. So, they are running their farming activities with deficit of necessary information. This means the farmers are very much vulnerable in coping with changing demand for improved farming practices.

Agricultural production can be increased if appropriate technologies are used by the farmers through adoption of improved farming practices. Diffusion of proper knowledge on modern agriculture among the rural people demands an effective communication system. In addition immediacy and effectiveness is also a valuable dimension of information. The farmers should receive agricultural information as fast as possible so that they understand, interpret, accept and use the information to get desired benefit.

The structure of the agrarian system in Bangladesh is considered as a major impediment for balanced rural development (Rogaly, *et al.*1999). Small farmers are entangled within a vicious cycle. The situation of the vulnerable farmers is exacerbated by the land erosion, drought, flood, deforestation and other natural calamities. This together with lack of financial muscle power reduces farmers' propensity to take risks. Their bargaining power in the input market is not very strong either. Lack of bargaining power reduces farmers' earnings against their produce. Reduced earning also makes a negative impact on farmers' productivity (cf. Figure 1).

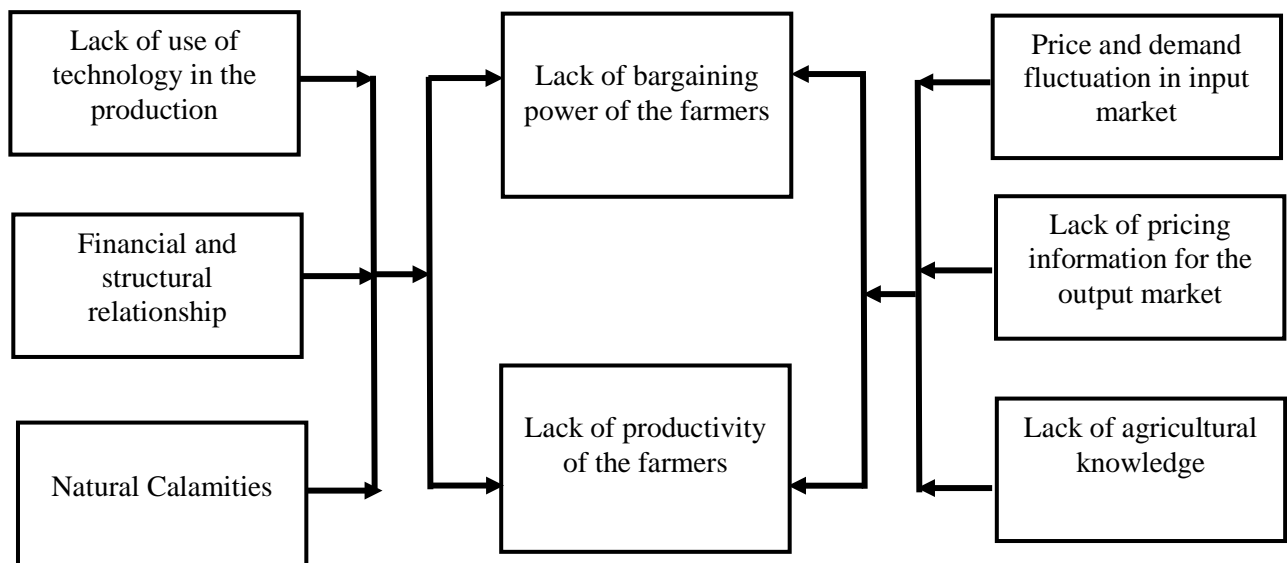


Figure 1: Reasons behind lack of bargaining power and lack of productivity of farmers in Bangladesh (Source: <http://orp.aiub.edu/Working Paper/Working Paper. asp? year =2009>)

Access to 'modern technology for farming' means access to scientific information on hybrid-seed varieties, fertilizer-application, and plant protection, farm machinery, harvesting, marketing and animal-husbandry. The findings of a survey revealed that just 5.7 percent of farmers have access to information from the extension workers. This clearly shows that the

current number of extension workers is inadequate to meet the needs of farmers. Further, they do not reach most of the backward and remote areas that either lack of proper connectivity or lodging facility or both. In addition, the government, due to budgetary constraints cannot increase its expenditure on extension services. The research also provides evidence on the key role that mobile phones are playing in improving the information transfer between farmers and research institutions, government and private input companies, input-dealers and other farmer. The findings suggested that the social media has been becoming an important instrument for dissemination of farm information to the farming community.

“Agricultural extension services provide critical access to the knowledge, information and technology that farmers require to improve the productivity and thus improve the quality of their lives and livelihoods. It is hence crucial to provide farmers with the knowledge and information in a quality and timely way. Although some ground breaking tools like the tele centers can serve as major catalysts for information, knowledge and development opportunities, the access the for farmers in remote villages is restricted due to the lack of infrastructure” (UN, 2005). Kaushik and Singh (2004) found that ICT allows efficient and transparent storage, processing and communication of information and the entrepreneurial innovation in this field may affect economic and social change. In addition Kraemer and Dedrick (1994) found growth in ICT investment is positively associated with growth in both GDP and productivity in Asia-Pacific countries during the period of 1984-1990. This finding prompted the researcher to undertake the study on benefit of using ICT in increasing productivity in agriculture.

1.2 Extension System in Bangladesh

The Department of Agriculture was established during the undivided India in 1906. At that time, the concept of agricultural extension as a discipline was not even conceived of. Based on the recommendation of the Royal Commission for Agriculture, the Department of Agriculture was created in nucleus form followed by establishment of Agricultural Research Laboratory with attached farm at Monipur, Dhaka in 1909. With the partitioning of India creating sovereign state of Pakistan, the provincial Department of agriculture was created in 1950 (Kibria, 1987). At the beginning the main thrust of the organization was to ensure and provide crop production inputs rather than providing extension services. During this period, the Directorate of Livestock, Fisheries, Marketing and Agricultural Information services came up as a separate entity.

During the period of 60's the Department of agriculture has shifted its activity towards delivery of agricultural information to the farmers instead of supplying agricultural inputs. The traditional agricultural extension service - individual contact (farm and home visit, result demonstration of improved farming practices, farmers' meeting, etc.) has been started working during this period. During 70's mono crop extension delivery system gained popularity among the extension agents and farmers. With the passage of time, the mono crop extension system was replaced by a new form of extension delivery system called Training and Visit (T&V) in 1982 (Kibria 1987).

The role of Agricultural Extension is to help the farmers for making efficient, productive and sustainable use of their land and other resources through the provision of information, advice, education and training. To ensure maximum extension services as the farmers needed to improve their living standards, the government of Bangladesh has devised a new concept of integrated extension strategy in 1996 comprising most of the agricultural extension partners under the single umbrella of New Agricultural Extension Policy NAEP (Mutalib, 2002).

In response to provide food to the increased population 'grow more food campaign' was undertaken which influencing farmers to make indiscriminate use of land, under ground water, agro-chemicals and other production inputs resulting new form of complicated farming problems both at macro and micro levels. Efforts have been made from concerned authorities to mitigate the farming problems by strengthening agricultural research and demand driven extension delivery system. Now the extension service providers have undertaken a good number of projects meaning the Department of Agricultural Extension (DAE) are working through project based extension delivery system.

1.3 Introduction of ICT (Information and Communication Technology) Mediated Extension System

Selwyn, 2002 defined information and communication technology (ICT) as an umbrella term that includes computer hardware and software, digital broadcast and telecommunications technologies as well as digital information repositories online or offline, and includes contemporary social networking aspects, read/write interfaces on the web besides file sharing systems online. The author also found that ICT represents a range of elements which includes Television (TV), radio, mobile phones, and policies and laws that govern the widespread use of these media and devices. The ICTs in extension can lead to the emergence of knowledge

workers that will result in the realisation of a bottom – up, demand –driven paradigm for technology generation, assessment, refinement and transfer (Meera, 2003; Meera at al 2004).

Cowder (1998) explains role of ICT in development communication as a means to:

- bridge the communication gaps among development workers, rural organizations and farmers;
- foster new alliances and communication networks;
- enable bottom-up articulation of needs and information sharing of local knowledge;
- enhance relevance of agricultural research and extension; and
- Improve the quality of decisions that affect rural communities and agricultural and rural development organizations.

With the increase of population of the world, in both developed and developing countries a new paradigm of agricultural development is emerging fast. Especially in developing countries the population growth is so fast; it is a challenge for providing food to the increasing population. In this regard Bangladesh is vulnerable in supplying food to its people. In providing food to the increasing population, the government of Bangladesh like other governments of developing countries has undertaken a good number of initiatives towards modernization of agriculture. As a part of modernization in agriculture, the major initiatives were undertaken by the government are mechanization in farming, use of modern variety of seeds, manures and fertilizers, irrigation water, plant protection measures -IPM, intercultural operations, and post harvest technologies.

To increase food production, the government has introduced extension approach during British rule of the country. The objective of the extension approach was to increasing cropping intensity towards growing more food. In spite of doubling rice production in the country since the introduction of modern varieties (MVs) in the early seventies, Bangladesh has experienced a continued annual shortage of nearly 1.5 million tonnes of food grains. This shortage of food production will continue to increase if the present level of population growth is continued. In other words, rice production has to be increased by at least 60 percent to maintain the present level of rice requirements by the year 2020 (Kashem *at el.*, 2011). But ironically it is a fact there is no scope for horizontal expansion of cropped land for increased rice production. The only options are to generate more high potential varieties, or to minimize the yield gaps of the existing modern rice varieties. The generation more high yield potential rice varieties, any way, is a lengthy process and of course, it is costly. The shortest way in increasing rice production in the country is to take massive programmes to reduce the yield gaps.

Farmers often obtain much lower than the achievable yield of a variety, although the research institutes of Bangladesh have developed and released a good number of crop varieties having high yield potentials. This means that there is a gap between the achievable yield and farmers' actual yield. But the factors behind this yield gap are yet to be identified. The factors behind the yield gap vary with crops, their management practices and soil conditions. However, identification of these factors would provide a comprehensive idea in minimizing the present yield gaps of two major food grains like rice and wheat.

The system was found ineffective because local and indigenous varieties of crops and traditional farming practices have limited yield potentials. So, green revolution was introduced and initially which gave impetus to the production system. Because in green revolution, high yielding varieties of seeds, agrochemicals, and other improved farming practices were introduced. The indiscriminate use of chemical fertilizers, pesticides and mono crop based farming approach has created new and complicated farming problems. So, modification and changes in extension system was inevitable to address the complicated farming problems arises due to meet up growing demand for increased food production. The transformation in extension system in Bangladesh has been a continuous process for coping with feeding of increased population. The green revolution requires modern varieties of crops, use of chemical fertilizers, and improved farming practices resulting higher yield but creating complex and complicated farming problems. The traditional extension system was found to fail in addressing the complicated farming problems.

In achieving self sufficiency in food production the extension service providing agencies have made efforts towards modernization of extension system. The extension approach has been changed from individual approach to group approach and simultaneously subsistence farming to semi commercial and finally commercial farming systems. As a result local and indigenous varieties of crops were replaced by modern high yielding varieties, traditional farming practices by improved farming practices. In addition, farm mechanization in moderate extent has been introduced replacing local, indigenous and traditional farm implements. All these efforts were made to increase food production in response to ensure food security of ever increasing population of the country.

The farmers of Bangladesh have been practicing traditional/ subsistence farming systems from time immemorial. The traditional farming was undertaken by using local varieties of crops, locally made farming implements, lower amount of manures and fertilizers, inadequate

of no irrigation meaning rain fed farming, inadequate intercultural practices, almost no pest management measures. This means the farmers have to depend on nature for crop production. It observed that good harvest was made when nature was in favor of crop production while heavy crop damage was made during unfavorable natural condition. So, in order to ensure higher farm output, the government has made initiative to modernize farming activities through introduction of modern varieties of crops, small scale farm mechanization, line sowing, irrigation, use of agrochemicals, pest management practices, and improved farming practices which have yielded higher farm productivity.

The overall development approach of the developing countries has been changing; similarly the development approach in Bangladesh is also changing. The old tradition of delivering services to the people is being challenged while technical equipments are replacing traditional ways of social communication. Similarly, the traditional subsistence farming systems are transforming in to commercial farming societies. Presently agricultural information has been considering as a production input because it can be a vital factor in using all other production inputs properly. The Knowledge itself is an important technology for sustainable development of agricultural. Agricultural extension, in the current scenario of a rapidly changing world, has been recognized as an essential mechanism for delivering knowledge (information) and advice as an input for modern farming activities. ICT can give a new impetus to the social organizations and productive activity of agriculture which, if nurtured effectively, could become a major factor in the transformation stages of Bangladesh agriculture. Considering the above fact and reality of national and global food security perspective, the government of Bangladesh has decided to introduce ICT mediated extension service in 2009-2010. Accordingly 20 ICT centers were established initially and presently more than hundreds of ICT centers are providing information services to the farming community in Bangladesh.

1.4 Justification of the Study

Due to introduction of ICT in extension delivery system, access to information of rural people has been increased resulting higher farm productivity. A sharp change has been found in livelihoods of rural people. Research from a 'Village Pay Phone' project in Bangladesh indicates that the introduction of telephones to the village allowed the villagers to eat well year round compared to only 9.9 months when there were no phones. Benefits of such 'village pay phone' have become diffused manifold in the economy and the society (Global e- governance readiness report, 2005).

These ICT centers are sources of information for farmers. Usually farmers are supplied various information on cultivation of crops, fruits and vegetables, rearing of poultry birds and livestock production. It also delivers information related to social, community and as well as homestead forestry. Information related to various production technologies are also supplied from these centers. These ICT centers also imparted training to the farmers on handling modern technologies. In addition it also provides information on seed processing, preservation and storage in ideal condition by utilizing local resources.

The food security has becoming a challenge to vast majority of population of the world in general and developing countries in particular. For improving food security of the people modern ICT mediated extension service has been introduced in many countries of the world. Bangladesh though late, has undertaken initiatives for providing demand driven farm information to the farmers through ICT mediated extension.

Today farmers seem to be more innovative and sometimes extension agents are struggling to address the issues raised by the farmers. Extension people very often are unable to creatively respond to the change taking place in the environment and remain duplication and tradition bound (Nagasri, 2000).

The 'Knowledge' itself becomes a technology for overall agricultural development. Agricultural Extension, in the current scenario of rapidly changing world, has been recognized as an essential mechanism for delivering knowledge (information) and advice as an input for modern farming (Jones, 1997). However, it has to escape from the narrow mindset of transferring technology packages to transferring knowledge and information packages (Shaik *et al.*, 2004). If this can be achieved, with the help of ICT, extension will become more diversified, more knowledge –intensive, and more demand driven, and thus more effective in meeting farmers' information needs.

1.5 Research Questions

The economy of Bangladesh is still dominated by agriculture sector. Farmers play a vital role in this sector. The food production will increase if they are provided with need based agricultural information at the time of need. As ensuring farmers' access to information is one of the key factors to modernization of existing farming systems. In doing so, the government has made utmost efforts to ensure adequate supply and services of production

inputs including improved farm information. Accordingly during 2009-2010, ICT has been introduced in extension delivery system of the country. The main focus of ICT in agriculture is to address the information needs of the farmers. Similar observation was made by Meera *et al.* 2004. There have been some initiatives undertaken in some of the states of India, using ICT in agricultural development under projects which have been followed in Bangladesh during 2009-2010. Fu and Akter (2010) conducted a study on assessment of impact of ICT mediated extension services enhanced services delivery system not only in greater awareness and knowledge in agriculture technology and information but also terms of farmers' attitude towards trying new technology and new ways of life in the future. Evidence from the assessment suggests that disadvantaged farmers benefit more from ICT mediated extension services than those of who are better off. The present study however is like an assessment of functioning of the newly introduced ICT mediated extension services in providing benefit to the users. Therefore, attempt has been made to find out the outcome of ICT in terms of supplying farm information to the farmers as well as benefit of using ICT in agriculture towards increased farm productivity. Hence, the researcher tried to find out to get answer of the following research questions:

- i) What is the existing level of awareness of the farmers about the use of ICT as a source of information?
- ii) What extent of benefit obtained by the farmers by collecting information from ICT?
- iii) Are there any relationship between selected characteristics of the farmers and their benefit of using ICT for increasing farm productivity?
- iv) What are major constraints faced by the farmers in receiving information from ICT centers?

1.6 Objectives of the Study

The main purpose of the study was to examine the benefit derived by the farmers by using ICT as a source of farm information. However, the following specific objectives were selected to give proper direction to the study:

1. To find out the level of awareness of the farmers about ICT as a potential source of farm information.
2. To determine the benefit of using ICT by the farmers in getting farm information for increasing farm productivity.
3. To determine and describe some of the selected characteristics of the farmers and explore their relationships with use of ICT for increasing farm productivity. The selected characteristics are- age, level of education, family size, farm size, farming experience, annual income, organizational participation, extension media contact and training exposure of the farmers.
4. To identify the problems faced by the farmers in using ICT as well as recommendations for minimizing the problems.

1.7 Assumptions of the Study

The researcher had the following assumptions in mind during conduction of the investigation/study.

1. The sample size was representative of the whole population of the study area.
2. The respondents were capable enough in furnishing proper responses to the questions contained in the questionnaire and checklist.
3. Views and opinions furnished by the respondents were valid and reliable and they expressed the truth while passing their opinions and providing information.
4. Views and opinion furnished by the respondents included in the sample were representative views and opinions of the whole population of the study area.
5. The data collected from the respondents were free from biasness of any kind.
6. The data were normally and independently distributed.
7. The findings of the study are expected to be useful for planning and implementation of various development programmes for sustainable development activities.

1.8 Limitations of the Study

For computing the study in a meaningful and manageable way with the available time, money and resources, the following limitations were formulated in conducting the study:

1. The study deals with the BAUEC beneficiary farmers.
2. The study was confined into 6 villages having coverage of extension delivery system through ICT.
3. There are many attributes or characteristics of the farmers. But only 9 characteristics of the farmers were selected for the present investigation.
4. Due to time, money and other resource constraints small sample size was considered in conducting the study.
5. The data collection was based on memory of the respondents and hence, there might be possibility of forgetting some of the information of past and present was not considered in this study.

1.9 Definition of Terms

Certain terms used through out the study are defined and interpreted below for clarity of understanding:

Age

Age of a rural woman refers to the period of time from her birth to the time of interview.

Level of education

It is defined as the development of desirable knowledge, skill and attitude in an individual through the experience of reading, writing and other related activities.

Family size

Family size was referred as the number of individuals in the family of a farmer including himself, parents, brothers and sisters and other dependent members live together and share and cooking in a same pot.

Farm size

It refers to the number of the total area of land (in acres) owned or rented by the family members of a farmers in obtain full and partial benefit.

Farming experience

It refers to the number of years a respondent is involved directly in operating farming activities.

Annual income

The annual income refers to the total income earned and shared by family members from various sources such as, crops, fruits and vegetables, poultry, livestock, fisheries, business, service etc. in a year.

Organizational participation

An organization was defined as an association of a farmer with an organization, which had a name, a regular set of officers and at least one face to face meeting in a year. Participation of a farmer in an organization referred to his taking part in the organization as an ordinary member, an executive committee member or an officer of the executive committee.

Extension media contact

This term refers to the extent of contact of an individual with various information media in getting farm information.

Training exposure

It refers to the number of days a respondent is imparted training on various aspects of farming activities by development agencies.

Role of ICT

It refers to the awareness of a farmer regarding the role of ICT in supplying farm information for operating various farming activities.

Food security

“The World Food Summit of 1996 defined food security as existing “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life”. Commonly, the concept of food security is defined as including both physical and economic access to food that meets people's dietary needs as well as their food preferences. In many countries, health problems related to dietary excess are an ever increasing threat, In fact, malnutrition and food borne diarrhea are become double burden”.

Food security is built on three pillars:

- Food availability: sufficient quantities of food available on a consistent basis.
- Food access: having sufficient resources to obtain appropriate foods for a nutritious diet.
- Food use: appropriate use based on knowledge of basic nutrition and care, as well as adequate water and sanitation.

A diverse role can be played by ICT in promoting human capacity building for food security. The ICT is a powerful tool for informing people and providing them useful knowledge and skills they need to put agricultural science and production inputs to best use. The planned use of ICT also help people exchange experiences, find common ground for decisions and actively participate in and guide development activities (Crowder, 1998).

Farm productivity

“Agricultural productivity may also be measured by what is termed total factor productivity (TFP). This method of calculating agricultural productivity compares an index of agricultural inputs to an index of outputs. This measure of agricultural productivity was established to remedy the shortcomings of the partial measures of productivity; notably that it is often hard to identify the factors cause them to change. Changes in TFP are usually attributed to technological improvements”. In this study farm productivity of a farmer referred to output/yield obtained by him from farm through utilization/adoption of improved farming practices.

Awareness

Awareness is a mental process of knowing about an object. At this stage an individual gather knowledge about an object, form attitude and finally make decision about its acceptance or rejection. Therefore, awareness about role of ICT referred to knowing about activities of ICT by the farmers. In this study awareness about role of ICT referred to the activities of ICT in respect to dissemination of agricultural information to the farmers.

Benefits of using ICT for increasing farm productivity

It refers to the gain of profit by an individual from farming by using improved farming practices through utilization of ICT mediated extension service. So, the benefit derived by a farmer from farming in terms of increased yield of crops due to use of information received from ICT. In this study the increase of rice production of a farmer from per unit area of land due to intervention of ICT in agriculture was considered as the benefit of using ICT as a source of information.

Chapter 2

Methodology

The purpose of this Chapter is to describe the methods and procedures followed in collecting and analyzing data for achieving objectives of the study. This Chapter is divided into four sections. The first section deals with the selection of the study area and samples. The measurement procedure of various terms and concepts used throughout the study are presented in the second section. The instruments and techniques of collecting data are described in the third section. The last section describes the statistical techniques used for analysis of data.

2.1 Locale of the Study

The Bangladesh Agricultural University (BAU) was established in 1961 with the function of teaching, research and extension. The Bangladesh Agricultural University Extension Center (BAUEC) of BAU is an extension wing responsible for dissemination of farm technology among the farmers of adjacent villages around BAU. The BAUEC is established in 1976 and working with the farmers of 24 villages around BAU under Mymensingh district. The role of BAUEC is to perform extension function of BAU in its working areas. Like government sponsored extension system BAUEC has also been changing its extension strategy in coping with the changing scenario of farming problems. The BAUEC has introduced ICT mediated extension activities in 2011 which gave impetus to delivery of extension services in its working areas. Accordingly 6 ICT centers were established in 6 villages in such a way that all the 24 villagers have almost equal access to ICT centers.

The study was conducted in six ICT centers of BAUEC. Among the centers, one village from each center was randomly selected. So, in total 6 villages from 6 centers was the locale of the study. The selected villages under 6 ICT Centers are as follows:

- 1) Baera, Mymensingh Sadar upazilla
- 2) Vabokhali, Mymensingh Sadar upazilla
- 3) Mirzapur, Mymensingh Sadar upazilla
- 4) Suhila, Mymensingh Sadar upazilla
- 5) Muktizoddha Bazar, Gouripur Upazilla
- 6). Shailmari, Mymensingh Sadar upazilla

The locale of the study and location of ICT canters are shown in Figure 1 and Figure 2.

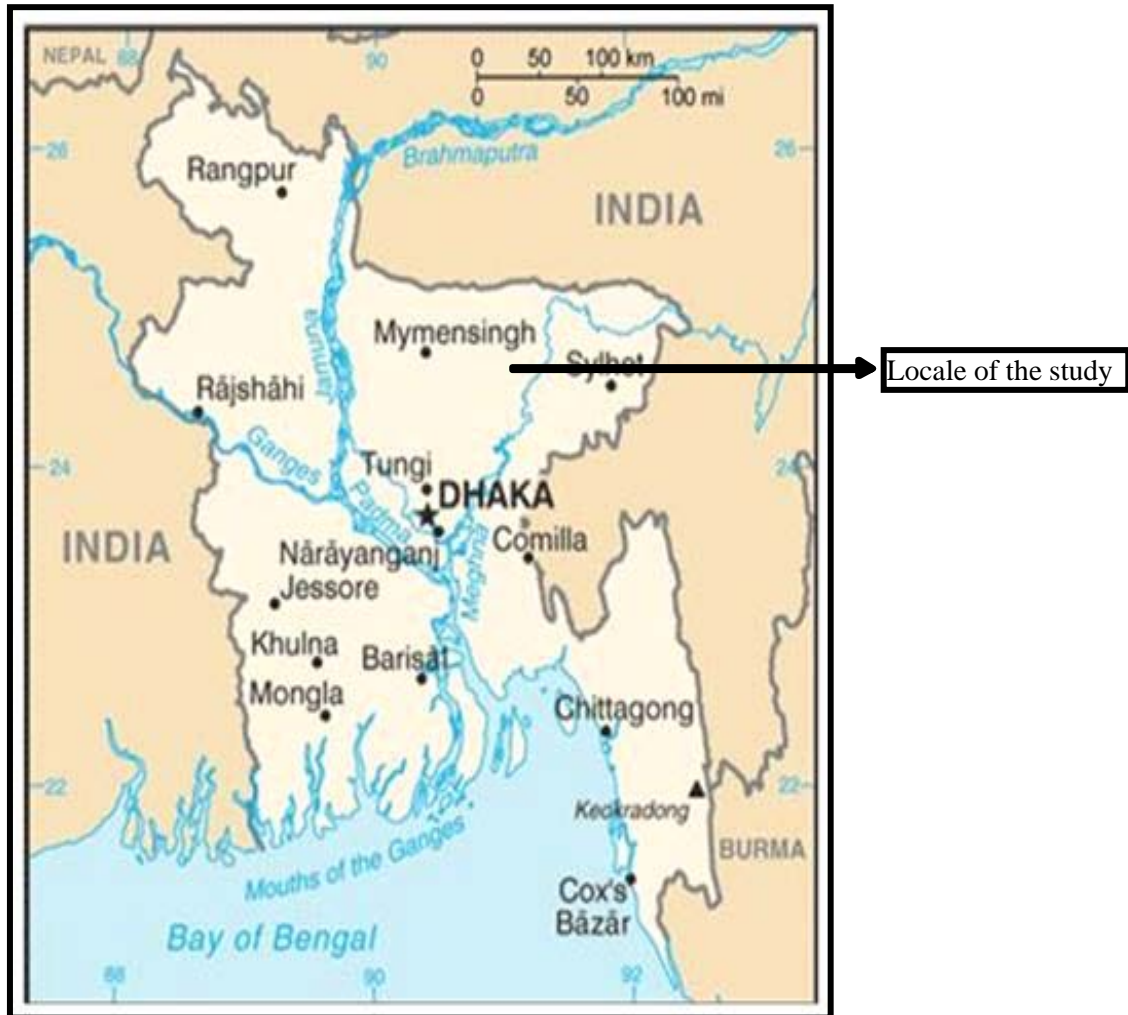


Figure 2: Map of Bangladesh showing research area

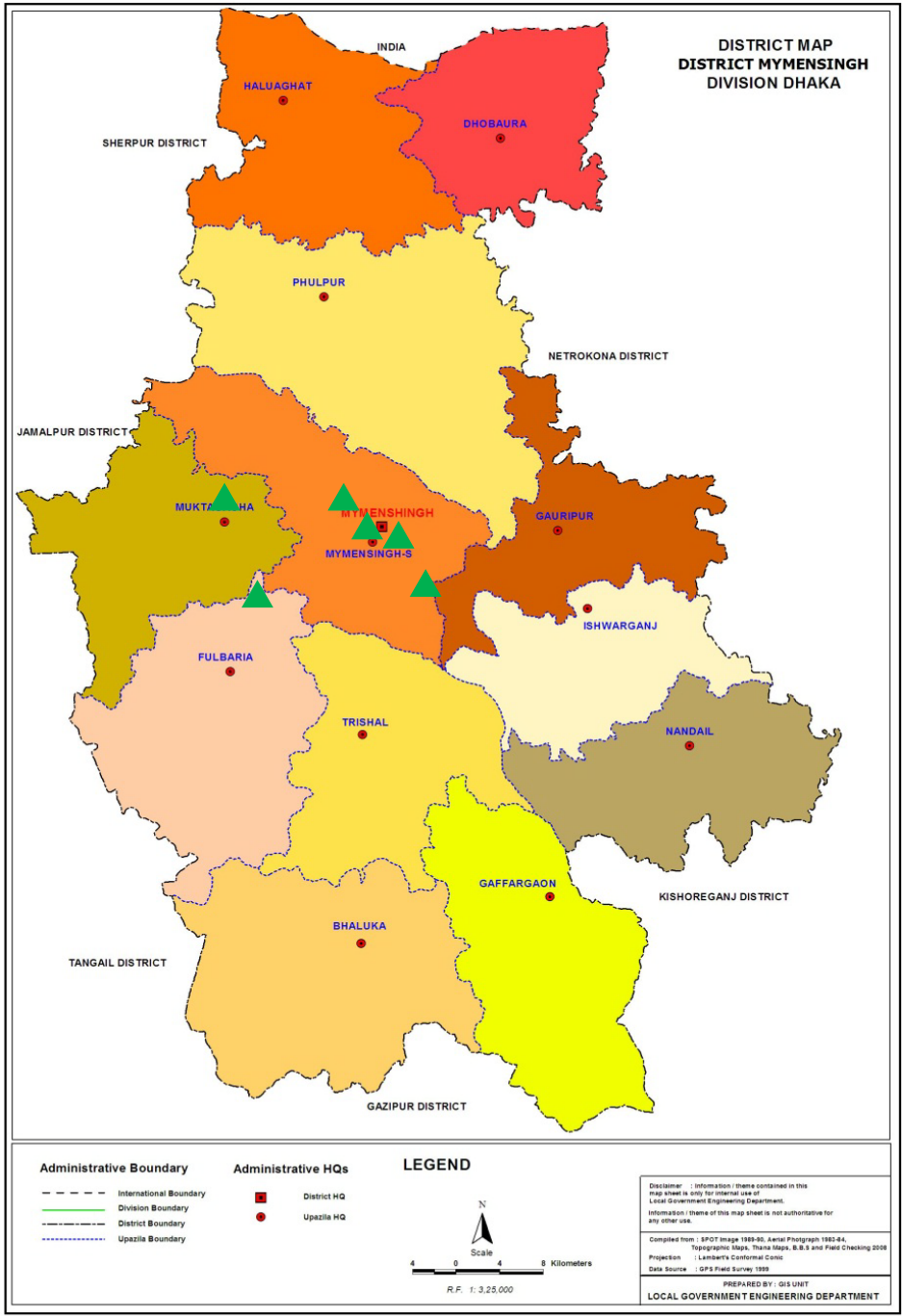


Figure 3: Map of Mymensingh district showing the location of ICT centres

2.2 Research Design

A research design enables the investigator to answer research questions as objectively, accurately and economically as possible. It sets up a frame work for the test of relationship among variables, and help to keep the research in proper direction (Ray and Mondal, 2004). The research design applied in this study has been presented in the following figure:

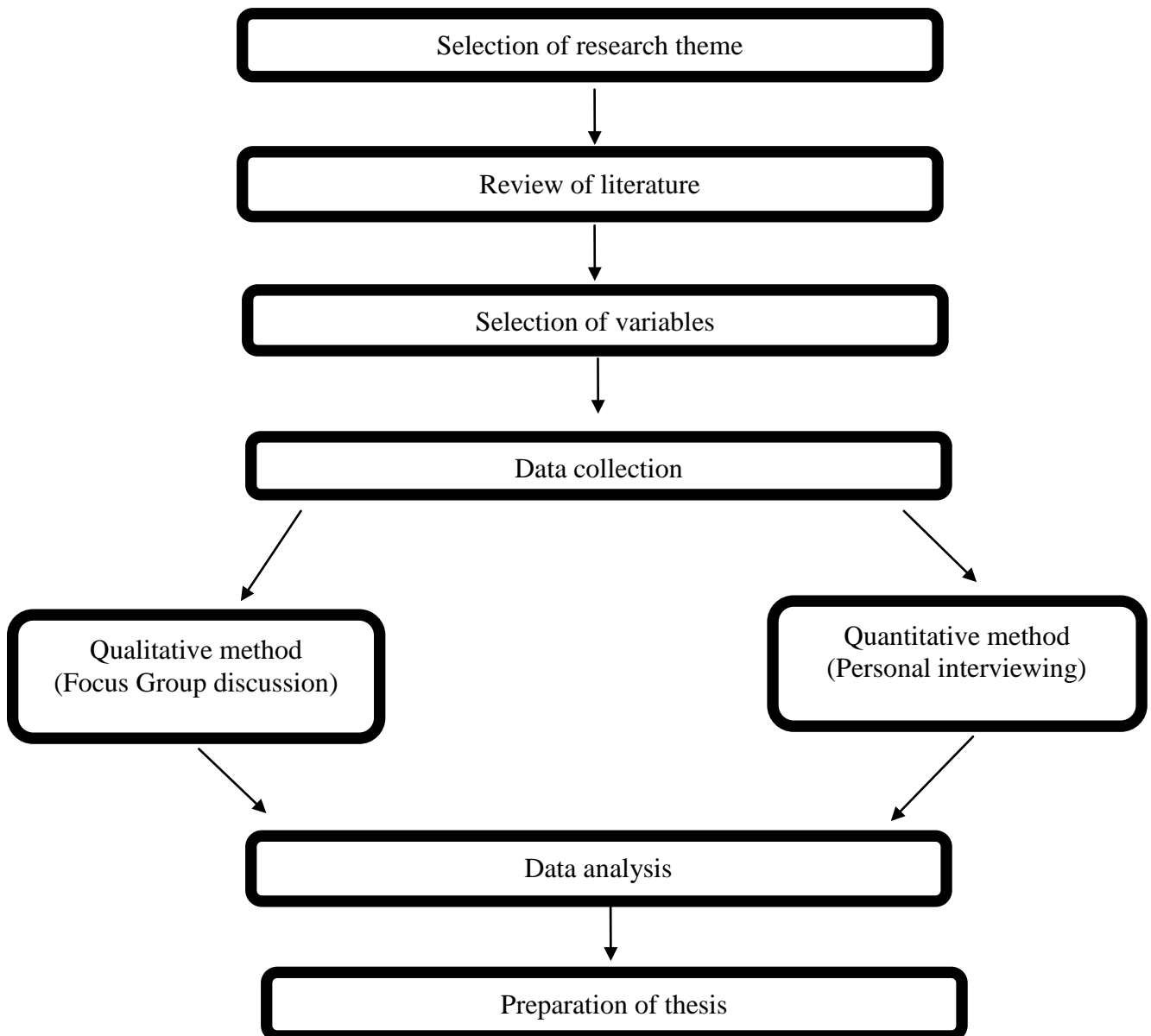


Fig: 4. Research design of the study

2.3 Population and Sample of the Study

The total number of household heads of the selected villages was the target population for the study. However, data were collected from a sample rather than the whole population. An updated list of BAUEC society members was collected from the office. Thus, total number of household heads (980) was the population of the study. Since the BAUEC has been working with the resource poor farmers, so 12.24% household heads (BAUEC society member) of the population were randomly selected by using simple random method and a Table of Random Numbers. Thus, the total sample size stood at 120 and presented in Table 1.

Table 1: Distribution of population and sample size of the study

Study area	Name of village	Population	Sample size	Reserve list
BAUEC working area	Boyra	200	25	2
	Suhila	205	25	2
	Mirzapur	135	20	2
	Muktizoddah bazaar	110	15	2
	Bhabakhali	115	20	2
	Shailmari	115	15	2
	Total		980	120

Besides, a reserve list of 12 farmers was prepared and was only used when a respondent included in the original list was not available during collection of data.

2.4 Data Collection Instruments

In order to collect relevant data for the study, a structured interview schedule (questionnaire) was carefully prepared keeping the objectives of the study in mind. The questions and statements contained in the schedule were simple, direct and easily understandable by the respondents. The schedule contained both close and open form of questions. Some scales were included in the schedule, wherever necessary. In addition, a check list was developed for conducting focus group discussion (FGD) with some of the selected farmers. The instruments were pre-tested before final collection of data. Necessary modifications and

corrections were made in the instruments based on the results of pre-test. The interview schedule (questionnaire) and check list were then finalized for collection of data. The FGD was used to measure the increase farm productivity (rice production) and identification of the problems faced by the farmers in using ICT for farm information.

2.5 Variables of the Study

In this study, benefit of using ICT in increasing farm productivity was the dependent variable. The selected characteristics of the farmers were considered as the independent variables of the study. These were, age, level of education, family size, farm size, farming experience, annual income, training exposure, organizational participation, and extension media contact of the farmers.

2.6 Measurement of Independent Variables

The procedure followed for measuring the independent variables of the study are presented below:

2.6.1 Age

Age of the respondents was measured in terms of his/her actual years at the time of data collection. It was measured in complete years as reported by the respondent. A score of one (1) was assigned to each year of age.

2.6.2 Level of education

The level of education was measured in terms of grade (class) passed by a respondent (item 2 in Appendix 1). If a respondent received education in a school, his level of education was measured in terms of educational standard of the school. For example, if a respondent passed the final examination of class V, his education score was taken as 5. If a respondent had education outside school and the level of his education was equivalent to that of class II then his education score was taken as 2. If a respondent did not know how to read or write, his education score was taken as zero (0) but if he could sign his name only he was given score of 0.5.

2.6.3 Family size

It was measured on the basis of total number of individuals including the respondent, his wife, children and other dependents living and eating together and sharing their earnings. The family size was expressed in number (item 3 in Appendix 1). If a respondent had 5 members in his family the family size score was taken as 5.

2.6.4 Farm size

Farm size of a farmer referred to the total area of land on which his family carried out farming operations, the area being estimated in terms of full benefit of his family at the time of interview (item 4 in Appendix 1). It was expressed in hectares. So, farm size was measured by using the following formula:

$$\text{Farm size} = A+B+C+D+G+ \frac{1}{2} (E) - F$$

Where,

A = Homestead area

B = Cultivated area owned by a respondent's family

C = Cultivated area taken on lease by a respondent's family from others

D = Cultivated area taken as share in by a respondent's family from others

E = Own land share out to others

F = Own land lease out to others

G = Garden/pond

The total area of land, thus, obtained was considered as the farm size of a respondent.

2.6.5 Farming experience

Farming experience of respondent was defined as practical experience in working in farming activities directly. It was measured by number of years a respondent is directly involved in farming activities. The farming experience of a respondent was expressed in terms of years (item 5 in Appendix 1). For example, if a respondent directly working in farming activities for 8 years, his farming experience score was taken as 8.

2.6.6 Annual income

The income of a farmer is an important indicator of how much he can invest in his farming business. Annual income of a respondent was measured in Taka on the basis of his responses. The total yearly earnings from agriculture and non-agricultural sources by the family head and other members of the family were determined. The yearly earnings from agriculture and non-agricultural sources were added together to obtain annual income of a farmer (item 6 in Appendix 1). Annual income of a respondent was expressed in terms of thousand Taka. Al Amin (2009) used the same procedure in measuring annual income of the farmers in his study.

2.6.7 Training exposure

Training exposure of a farmer was determined by computing a ‘training exposure score’ on the basis of total number of days for which he received training on various subject matter related to farming and non-farming activities by different GO and NGOs. The information for the variable was obtained in response to item 7 in Appendix 1.

2.6.8 Organizational participation

Organizational participation of a farmer was determined by computing an ‘organizational participation score’ on the basis of his participation in different organizations related to agriculture and rural development in the past and also at the present time. Miah (2002) used to determine the organizational participation score of a respondent by using the following formula:

$$OP = \sum N \times D$$

Where, OP= Organizational participation

N= Weight on the basis of respondent’s nature of participation

D= Weight on the basis of duration of participation

The nature of organizational participation of a farmer was quantified in the following manner:

Nature of participation	Weights
No participation	0
Participation as general member	1
Participation as executive committee member	2
Participation as chairman/secretary/treasurer	3

The duration of participation was also recorded and weight was assigned in the following manner:

Duration of participation	Weights
Nil period	0
1 to 3 years	1
4 to 6 years	2
7 years and above	3

The organizational participation score of a respondent was obtained by summing weights of all the responses according to the above mentioned formula.

2.6.9 Extension media contact

The extension media contact referred to the extent of contact of a respondent with various information sources in getting farm information. Extension media contact of a respondent was measured by computing and “extension media contact score” on the basis of his frequency of contact with 16 selected information sources. The farmers were asked to mention his frequency of contact with each of the selected information sources. It was measured by using a 5 point rating scale. Appropriate weights were assigned to each of the responses such as 4 for ‘regular’, 3 for ‘sometimes’, 2 for ‘seldom’ 1 for ‘occasionally’ and 0 for ‘not at all’ contact with information sources in getting farm information. Thus, the extension media contact score of a respondent was calculated by summing together his weights for all the 16 information sources. The extension media contact score of a respondent could range from 0 to 64, where, zero indicating no contact while 64 indicating highest level of extension media contact in getting farm information.

2.6.10 Awareness about role of ICT

The awareness of the role of ICT as a potential source of farm information was measured by using a 4 point rating scale consisting of selected statements (item 9 in Appendix 1). The respondents were asked to give their opinion regarding the role of ICT in dissemination of farm information. Appropriate weights were assigned to each of the responses such as 3 for 'highly aware', 2 for 'moderately aware', 1 for 'somewhat aware' and 0 for 'not at all aware'. After summing all the responses of the respondents, the awareness about role of ICT in dissemination of farm information score was determined. Weights against each of the responses of the farmers were assigned in the following manner:

Nature of response	Weight assigned
Highly aware	3
Moderately aware	2
Somewhat aware	1
No role at all aware	0

Thus, the awareness about role of ICT in dissemination of farm information score of a respondent was calculated by summing together his weights for all the responses. The awareness of role of ICT score of a respondent could range from 0 to 21, where, 21 indicating highly aware about role of ICT in dissemination of farm information while zero indicating not at all aware about the role of ICT by the farmers.

2.7 Measurement of Dependent Variable

The dependent variable in this study was the benefit of using of ICT in increasing farm productivity of the farmers. The variable was measured from two dimensions, firstly by using rating scale (score) and secondly by comparing production of rice between two consecutive years (percentage of increase) from same unit of land. The respondents were asked to give their opinion regarding the benefit of using ICT in increasing farm productivity. It was measured by using a 4 point rating scale consisting of selected information on crop production (item 11 in Appendix 1). The major crops grown and allied agricultural enterprises commonly practiced by the farmers in the study area were considered in exploring the increase in farm productivity due to use of ICT. The crops were production of Boro rice,

Aman rice, fruits and vegetables, rearing of poultry birds and dairy cow, and fish culture. The production of rice (farm produce) of last season compared with immediate past season from same unit of land. Keeping all other production factors constant, the use of information collected from ICT center was the main basis for determining the increase in farm productivity. The difference between the two was the basis for measurement of increased farm productivity. An appropriate weights were assigned to each of the responses of the respondents such as, 3 for 'high benefit', 2 for 'moderate benefit', 1 for 'somewhat benefit' and 0 for 'not at all benefit'. After summing all the responses of the respondents, the use of ICT in increasing farm productivity score was determined. Weights against each of the responses of the farmers were assigned in the following manner:

Nature of response	Weight assigned
High benefit	3
Moderate benefit	2
Somewhat benefit	1
Not aware at all	0

Thus, the benefit of using ICT in increasing farm productivity score of a respondent was calculated by summing together his weights for all the responses. The benefit of using ICT score of a respondent could range from 0 to 21, where, 21 indicating high benefit about in using ICT in increasing farm productivity while zero indicating no benefit due to use of ICT as an information source in increasing farm productivity of the farmers.

The farmers were asked to mention the actual increase in farm productivity due to adoption of farm information collected from the ICT center and was expressed in percentage. Since the farmers of Bangladesh do not maintain farm record, so recall data was the only way of data collection. In addition, 4 Focus Group Discussions were conducted with the farmers which also validate the data collected through personal interviewing.

2.8 Statement of Hypothesis

Walpole (1982) defined research hypothesis or statistical hypothesis as an assertion or conjecture concerning one or more population. The truth or falsity of a research hypothesis is never known with certainty unless one examines the entire population. This of course, would be impractical in most situations. Therefore, we usually take a random sample as taken from the population of interest and use the information contained in the sample to decide whether the hypothesis is likely to be true or false. Hypothesis may be classified into two types, namely, research hypothesis (H_1) and null hypothesis (H_0).

A total of nine independent variables were tested with one dependent variable. Hence, the research or statistical hypothesis formulated was as follows:

H₁: There were significant relationships between the selected nine characteristics of the farmers and their benefit of using ICT in increasing farm productivity.

In this study, the following null hypothesis as were formulated to examine the relationships between the selected nine characteristics of the farmers and their benefit of using ICT in increasing farm productivity.

H₀: There were no significant relationships between the benefit of using ICT in increasing farm productivity and the selected nine characteristics of the farmers.

2.9 Data Analysis

At the end of data collection from the respondents, all the responses of the interview schedule were given numerical coded values. Qualitative data were converted to quantitative one whenever necessary. Data obtained from the respondents were compiled to a master sheet, then tabulated and analyzed in accordance with the objectives of the study. SPSS (Statistical Package for Social Sciences) computer program was used to process all the collected information in computer. Descriptive statistical methods like range, mean, percentage distribution and standard deviation were used. Pearson's Product Moment Correlation Coefficient (r) model was computed to analyze the test hypothesis of this study by using the following formula:

$$r_{xy} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

Where,

r_{xy} = Person's product moment correlation coefficient

\bar{x} and \bar{y} = Means of the variables x and y

Chapter 3

Results and Discussion

This Chapter deals with the results of the study. The findings and discussion have been presented in this Chapter according to the objectives of the study. Necessary explanation and interpretations have also been made showing possible and logical basis of the findings whenever necessary.

3.1 Awareness about Role of ICT

The awareness is the first hearing about an innovation. Extension research has shown that different sources of information are important for first hearing about an innovation and for making final decision to adopt or reject it. Since the ICT was a new initiative in extension approach in Bangladesh, it was necessary to find out the level of awareness of the farmers regarding role of ICT in increasing farm productivity.

The awareness about role of ICT score of the farmers ranged from 0-26 against the possible range of 0 to 30 (Item 9 in Appendix 1). The average score was 12.33 and standard deviation 7.86. Considering the role of ICT score, the farmers were classified into three categories: Low (up to 10), Medium (11-20) and High (21 and above) and presented in Table 2.

Table 2: Distribution of the farmers according to their opinion about role of ICT score

Categories	No.	Percent	Mean	SD
Low (2- 10)	41	34.2	12.33	7.86
Medium (11 - 20)	55	45.8		
High (21 and above)	24	20.0		
Total	120	100		

Data presented in Table 2 indicates that highest portion (45.8 percent) of the farmers had medium awareness about the role of ICT in disseminating farm information while 34.2 percent of the farmers had low awareness. One –fifth (20 percent) of the farmers had high awareness about the role of ICT in providing farm information to the farmers. This means majority (65.8 percent) of the farmers had medium to high awareness about the role of ICT while the rest had low awareness about ICT as a potential source of information. The

introduction of ICT in extension work is a new initiative in Bangladesh. The information of above Table revealed that initial response of the farmers to the use of ICT seems positive and encouraging. If the extension agents could provide better services to the farmers the ICT mediated extension service will give a better output from farming. This is how the farmers would be immensely benefited out of ICT mediated extension approach in Bangladesh. The awareness to an object helps an individual to make up his/her mind towards liking or disliking to the object. The information of the above Table revealed that the farmers possess positive mind set about use of ICT in getting farm information. Agricultural development is becoming increasingly dependent on the availability of information. The newly introduced ICT mediated extension service is an opportunity for supplying adequate amount of information which would provide immense benefit to the farmers.

3.2 Benefits of ICT in Increasing Farm Productivity

The farmers of the study area were asked to mention the benefits of using ICT. The benefit was measured by considering the increased yield of rice by using information from ICT. The increased yield of rice was considered as increased farm productivity. The opinion provided by the farmers in this regard is presented in Table 3 along with number of citations.

Table 3: Opinion of the farmers regarding benefits of using ICT

SL. No.	Advantages	No. of citations
1.	Availability of demand led information	22
2.	Diversity of information on various aspects of agriculture	14
3.	Information is available whenever necessary	25
4.	Get accurate information	10
5.	Learning through information sharing	10
6.	Credibility of information as well as information source is high	26
7.	New technology is available	19
8.	Both high and low input information is available	18
9.	Information supported by pictorial presentation increases faith of the users	23
10.	Location specific information is possible	17
11.	Increases confidence of extension agents	21
12.	The coverage of information is high	22
13.	Information having wide range of reference increase level of confidence	22
14.	Continuous generation of information with the changes in farming problems	29
15.	Availability of information for all categories of farmers	23
16.	The information of ICT enhances transformation process of farming	27

Availability of demand-led information at the time of need, diversity and location specific information, and credibility of information source were the major considerations opined by the farmers in choosing ICT facilities. It was found that the information available through ICT was more attracted to the users because of its mode of presentation (photograph). The ICT can satisfy all categories of farmers in providing information with more number of alternatives and diverse utility. The in-built mechanism of continuous generation and up dating of information of ICT is also a good consideration in selecting the source. In addition the ICT information is more reliable to the users because of its suitable explanation. Above all the farmers and extension agents have trust on ICT as a potential source of information.

3.2.1 Information about existence of ICT center

The respondents of the study area were asked to mention how the farmers came to know about the existence ICT center in the locality. It was found that out of 120 farmers, the large majority (96.66 percent) mentioned various sources while a few did not know anything about existence of ICT center. The farmers mentioned the information source in this regard is presented in Table 4.

Table 4: Farmers’ opinion about existence of ICT center

SL. No.	Advantages	No. of citations
1.	President of farmers’ society	16
2.	Executive committee members of farmers’ society	22
3.	Extension agents and Field officers of BAUEC	46
4.	Local leaders	4
5.	Neighbors	12
6.	Seeing the signboard of the center	5
7.	Local extension agent of DAE	9

The information of Table 4 indicates that BAUEC field workers and farmers’ society members of the study area were the major sources of information about ICT center to the respondents. Generally the farmers maintained contact with farmers’ society members regarding society activities. At this time they share and exchange views and experiences about various farming problems. The neighbors are also a potential source of information as mentioned by the respondents. This may be due to the reason that the farmers live in a close society and usually maintained interaction about various issues of livelihoods with the neighbors.

3.2.2 Qualitative changes in farming activities

Although the duration of ICT activities in the study area was almost two years but the farmers were found enthusiastic about its utility. They experienced qualitative changes in their farming activities due to use of ICT for information. Almost 86 percent of the farmers opined positively in this regard while the rest 14 percent opined negatively. This means the large number of farmers considered ICT center as a potential source of farm information by using which they can make qualitative changes in farming activities. The farmers who answered negatively were due to their ignorance about ICT center and its functions in disseminating farm information. The farmers' opinion regarding the qualitative changes they made in their farming activities due to use of ICT facilities is presented in Table 5.

Table 5: Opinion of the farmers regarding qualitative changes in farming activities

SL. No.	Changes in farming activities	No. of citations
1.	Allocated more land for high value crop production	31
2.	Use balanced dose of manure and fertilizers	49
3.	Use of modern variety of crops	60
3.	Brought improved breed of dairy cow	19
4.	Established small scale poultry farm	13
5.	Rented more land under farming activities	21
6.	Concerned about environmental degradation	10
7.	Awareness about soil health and soil management	24
8.	Income increased due to commercialization of farming system	32

Over the period of time transformation is taking place in farming systems in Bangladesh. For improving household food security, the subsistence farming system has been transformed to semi-commercial and semi-commercial to commercial farming systems. This transformation is occurred due to changes in socio-economic condition of the farmers. With the availability of modern farming facilities, such as, information, training, inputs, other support and services the farmers are becoming interested in modernizing their farming enterprises. Presently the farmers considered farming as an enterprise which might give economic benefit; this is why they are interested to make investment in farming.

The information of Table 5 shows that with the introduction of ICT mediated extension services to the BAUEC farmers; qualitative changes have taken place in farming activities. Farmers are now interested in producing high value cash crop, establishment of small scale poultry and dairy farm, even rented land for commercial farming. This finding indicates that the farmers now- a-days are considering farming as a profitable enterprise rather than subsistence enterprise.

3.2.3 Food security

As far as fulfilling of household food demand is concerned, it was found that 48 percent of the farmers met up their household demand for food from own production source while slight majority (52 percent) of the farmers purchased food from market in addition to their own production. On that respect we can assume almost half of the respondents are self secured while the rest have partial security over food consumption from their own harvest. It was also found that none of the respondents made exchange of food staffs with other farmers in fulfilling their demand for food. This is because traditionally the farmers used to exchange crop seeds among them but not food items.

The above information revealed that majority of farmers is not self sufficient in food production, they are to depend on both in farm and off farm earnings to purchase food from market for meeting up household demand. Usually in Bangladesh, the resource poor farmers usually involved in share cropping, selling of labor, rickshaw pulling, fishing, small trade, and other off farm activities during lean season in maintaining their livelihoods. Out of 12 months, the farmers remain involved in farming for almost 8 months, and the rest (4 months) they become unemployed and involved in off farm activities for maintaining livelihoods.

3.2.4 Household food security

Food security is becoming a great concern to the world community in general and highly true for Bangladesh in particular. The concern arises due to unplanned increase of population, reduction of cultivable lands, decrease of soil fertility and productivity in addition to environmental degradation. The country has been trying hard to maintain a sustainable level of food production for feeding its increasing population. In doing so, attempts have been made to modernize farming activities. To ensure peoples' access to food, the government has to spend a good amount of foreign currency in purchasing food from outside. However, for improving household food security the government has been undertaken a good number of initiatives. Among the major initiatives, use of modern variety of seeds, balance dose of manures and fertilizers, availability of agro-chemicals, irrigation facilities, demand driven extension support, training, motivational campaign etc. have been provided to the farming community. In addition, awareness about environmental degradation, maintenance of sustainable level of crop production at farmers' level is also taking care of by concerned development agencies. In support of various initiatives the government has also modifying

and modernizing its extension services for providing need based extension services to the farmers. The introduction of ICT mediated extension service at farmers' door steps is one of the major effort that has been initiated by the government. Due to modernization of extension services along with national agricultural research system (NARS), it is claimed that the country is almost close to self sufficiency in (cereal) rice production, although production of fruits, vegetables, pulses and oil seeds are not at par of cereal production. It is a fact that there are three crop growing seasons in a year in Bangladesh. These are Rabi, Kharif- I and Kharif-II. The rice dominated cropping pattern covers majority of the cultivable land which boost up rice production of the country. The farmers were requested to mention their condition of household food security during 12months of the year; the responses of the farmers in this regard are presented in Table 6.

Table 6: Distribution of the farmers according to their household food security in a year

SL. No.	Number of months	Number of farmers	Percent
1.	12	58	48.3
2.	10	9	7.5
3.	9	5	4.1
4.	8	12	10.0
5.	7	3	2.5
6.	6	17	14.1
7.	2	2	1.6
8.	1	14	11.6
Total	12	120	100

Examining the opinion of the farmers of Table 6 regarding fulfilling their demand for food, it is found that almost 48 percent of the farmers are self sufficient in cereal consumption through out the year from their own production while majority (51.67 percent) of the farmers in addition to own production dependent on purchasing of food from market in a varying extent. The information also revealed that 13.32 percent of the farmers are in a vulnerable condition as far as food security is concerned, they can provide food to household members only for 1-2 months of the year. A good number (38.35 percent) of the farmers could provide food for 6-10 months to their household members. The present condition of food security could be improved through modernization of agriculture.

3.2.5 Selling of farm produce

Generally the farmers for meeting various kinds of household expenditure depend on different sources of earning. When other sources are not available, then selling of own farm produce is become an option to them. In order to know the selling of farm produce, the farmers of the study area were asked to mention the extent of selling of farm produce to meet up demand for cash. It was found that 48 percent of the farmers had small quantity of surplus food which they sell in the market while the rest (52 percent) had no surplus food for sale. Since majority of the farmers were resource poor thus could not produce enough food by using indigenous and local farming practices. Although a good number of them using improved farming practices could produce food required for fulfilling household demand. It has been a usual practice followed by the farmers that for meeting up immediate cash crisis they sell a small amount of foods although they are scarce of food. The resource poor farmers sell their farm produce during harvesting season with lower market price while rich farmers do it during lean season when market price is high. This is how the poor farmers are deprived of getting better price of their farm produce.

3.2.6 Increase of farm productivity (rice production) due to use of ICT

Introduction of ICT in extension service is a new initiative added in extension work in Bangladesh. At the initial response the farmers were found curious and enthusiastic in using ICT facilities for getting farm information. This is due to achieving benefit from ICT in improving agriculture. The benefit of using ICT for increased farm productivity score of the farmers ranged from 1 to 20 against the possible range of 1 to 21. The average farm productivity increased score was 10.79 with standard deviation 5.34. The farmers were classified on the basis their farm productivity (yield of rice: CH: 2.7) score into three categories such as low increase (1 -6), medium increase (7 -14), and high increase (15 -20) and shown in Table 7. The information of Table 7 indicates that three-fourths (75 percent) of the farmers opined the benefit (increased farm productivity) of using ICT as medium to high while the rest (25 percent) of the farmers found to harvest lower farm productivity although using ICT in getting farm information. This may be due to the reason that majority of the farmers were young to middle aged and having high risk taking ability. On the other hand the ICT centre was new in the area and all the farmers were not well aware about benefit of using ICT in agriculture. Efforts are needed to be made by the concerned agencies for creating positive awareness among the farming community about benefit of using ICT in getting farm information.

Table 7: Distribution of the farmers according to increased farm productivity

Categories	No.	Percent	Mean	SD
Low productivity (1-6)	30	25.0	10.79	5.34
Medium productivity (7 -14)	54	45.0		
High productivity (15- 20)	36	30.0		
Total	120	100		

Sustainable crop production is a must for providing food to the continuously increasing population of the country. To keep the crop production system moving, extension service providers have been implementing various extension strategies for motivating the farmers towards adoption of modern farming practices. In doing so, ICT mediated extension service has been established in the study areas for providing services to the farmers during the last two years. The field extension agents have been working in the area for motivating the farmers towards the use of ICT for getting farm information. In addition, human resource development through training on various aspects of handling ICT has also been offered to the farmers. In order to assess the effect of ICT on farming activities, the farmers were requested to mention the increase of farm productivity due to use of ICT mediated extension service. A great majority (93 percent) of the farmers opined affirmatively while the rest (7 percent) replied negatively meaning unaware about benefit of using ICT in increasing farm productivity.

3.2.7 Overall increase of farm productivity

The extension service providers along with other development partners have been working to increase food production of the country. In doing so, need based farming technologies are being generated from research organizations and disseminated to the farmers by extension service providers. The BAUEC has introduced ICT mediated extension service in its working areas with the aim of providing need based services to the farmers. The farmers getting ICT mediated extension services were asked to mention whether they have increased their farm productivity due to use of ICT facilities. The increase of amount of rice production was compared with the production of same during immediate past year. The farmers' response in this regard was expressed in percentage. The farmers' opinion has been ranged from 1 to 9 percent with an average of 5.91 percent. This means average farm productivity of ICT users has been increased by 5.91 percent in compared to the yield of previous years when ICT was not available at the locality. The farmers who did not use ICT facilities were found to increase their average farm productivity by 3.9 percent. So, through simple calculation it can

be said that farmers having access to ICT mediated extension services have increased average farm productivity by (5.91-3.90) 2.01 percent higher than the non-user of ICT. This finding revealed that the ICT mediated extension service has contributed higher farm productivity. The increase of farm productivity was measured by comparing the yield of two consecutive years with and without use of ICT in farming activities.

3.3 Characteristic Profile of the Farmers

The personal, social, economic and psychological characteristics of the farmers may influence the use of ICT in getting farm information. The use of ICT in agriculture is inevitably important for performing various farming activities. Procedures followed for measuring the characteristics of the farmers have been described in Chapter 2. The characteristics were classified into suitable categories for description and interpretation in relation to the use of ICT in agriculture and presented in this section.

3.3.1 Age

The age of the farmers ranged from 17 to 70 years. The mean age of the farmers was 37.1 years when standard deviation was 12.50. Based on their age, the farmers were classified into three categories: 'Young aged (up to 35)' 'Middle aged (36 to 50)' and 'Old aged (above 50)' and shown in Figure 5. The data presented in figure 5 indicates that the highest proportion of the respondents (35.8 percent) fell in middle aged category compared to 51.7 percent were young which is above national average (BBS, 2010) and only 12.5 percent of the respondents were old. This means that the large portion (87.5 percent) of the farmers was young to middle aged. Amin (2011), Khatun *at el.* (2009) found almost similar age distribution of rural women in their respective studies. It is a general assumption that the younger people are always curious to adoption of new knowledge and possess high risk taking ability. The ICT mediated extension activity is a new form of extension approach may be more acceptable to the younger farmers than the older ones. Motivation campaign could be arranged by the concerned authority to attract young and middle aged farmers to ICT centers for collection of farm information.

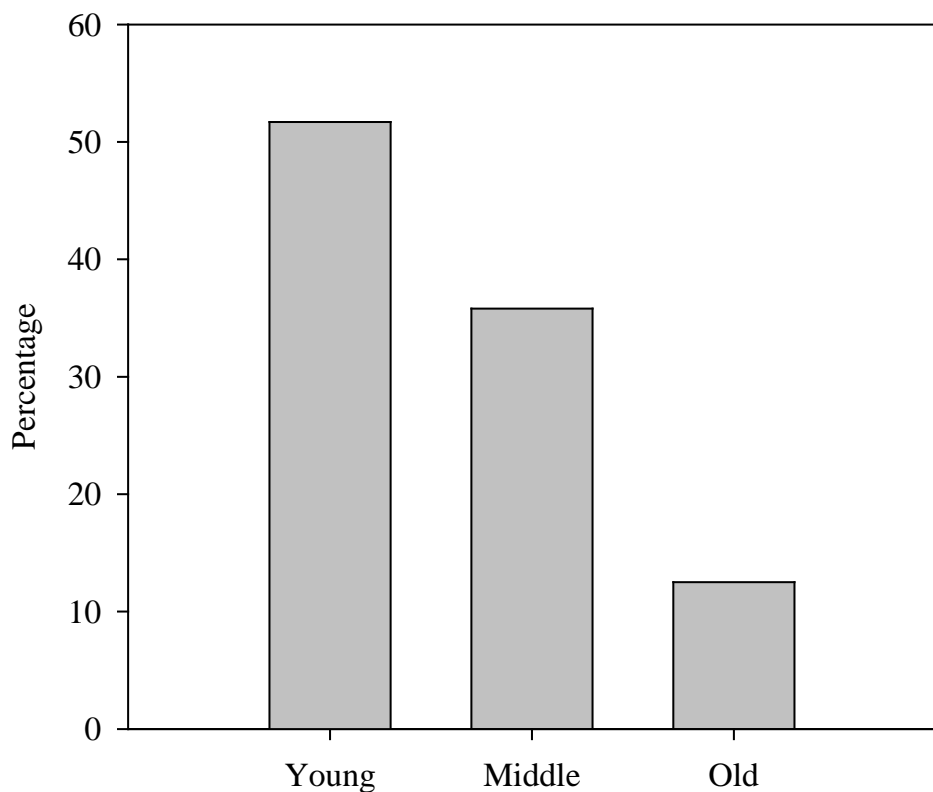


Figure 5: Distribution of the farmers according to their age. The farmers were classified into three categories: Young aged (up to 35), Middle aged (36 to 50) and Old aged (above 50).

3.3.2 Level of education

The level of education of the farmers varied from 0 to 16 years of schooling, the average being 8.08 with a standard deviation 4.34. Based on their schooling, the respondents were classified into six categories: Illiterate (0), Can sign only (0.5), Primary Education (1-5), Secondary Education (6-10), and Higher Education (above 10) are shown in Table 8.

Table 8: Distribution of the farmers according to their level of education

Categories	No.	Percent	Mean	SD
Illiterate (0)	1	0.8	8.18	4.29
Can sign only (0.5)	16	13.3		
Primary education (1-5 years)	14	11.7		
Secondary education (6-10 years)	67	55.8		
Higher secondary education 11 years and above	22	18.3		
Total	120	100		

Data furnished in Table 8 indicates that the highest proportion (55.8 percent) of the respondents had secondary education followed by 18.3 percent having higher secondary education while 11.7 percent had primary education. It is noted that only 13.3 percent of the farmers' have the ability to sign their names only and surprisingly none of the farmers have been found with zero schooling. This finding has conformity with the findings of Rahman *et al.* (2009) and Amin (2011). The results indicated that a large majority (86 percent) of the farmers have varying degree of education and only 14 percent though could not read and write but can sign their names only. Examining the information of Table 8, it can be assumed that large number of farmers could collect improved farming information from ICT centres. The information of above Table also revealed that the large number of farmers have the ability to use ICT in operating farming operations.

Education is the way of broadening the horizon of outlook of an individual. It is the prerequisite for making one conscious of the surroundings. So, educated people generally lead prestigious livelihoods. In the present study, livelihood status of the farmers would be improved because of their use of ICT in farming activities resulting increase of farm productivity.

3.3.3 Family size

The average family size of the farmers was 5.53 with a standard deviation of 1.82. The observed family size of the farmers was 2-13. Based on their family size, the farmers were classified into three categories: Small (up to 4), Medium (5-6) and Large (above 6) and presented in Figure 6.

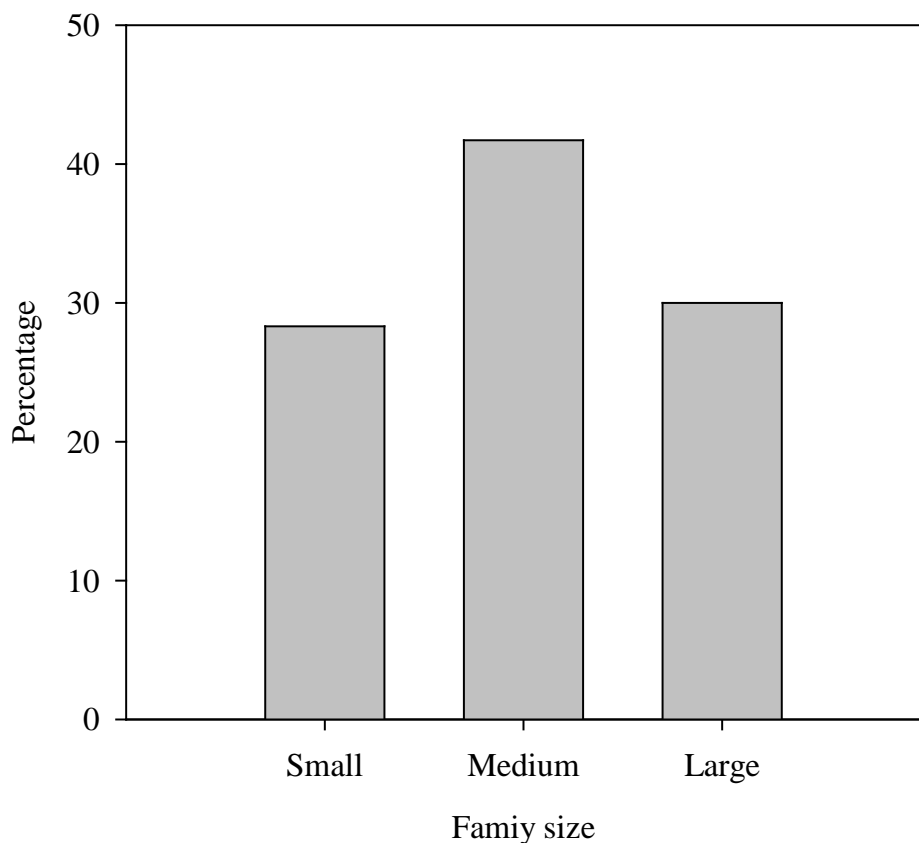


Figure 6: Distribution of the farmers according to their family Size (N=120). Based on their family size, the farmers were classified into three categories: small (up to 4), medium (5-6) and large (above 6).

Data presented in figure 6 shows that almost two-fifths (41.7 percent) of the farmers had medium family size, 28.3 percent having small family size and only 30.0 percent of the farmers had large family size. The distribution of family members of the study area is almost similar to those of national average. Slightly less than 70 percent of the farmers belonged to medium to large size family which means the trend of population growth is higher in respect to national prediction. Kamruzzaman *at el.* (2010) in his study found that large number (87.5 percent) of the farmers had large family size while the rest had small and medium family size. The information of figure 6 revealed that despite government initiatives the trend of population growth is still growing fast which is a threat to the development process in general and agriculture in particular. All out efforts should immediately be made by the government and development partners to keep the population growth in a manageable size so that sustainable growth in agriculture could be possible.

3.3.4 Farm size

The average farm size of the farmers was 2.09 acres with a standard deviation of 1.72. The observed farm size of the farmers was 0-7.56 acres. Based on their farm size the respondents were classified into five categories: Landless (<0.50 acre), Marginal (0.50 - 0.99 acre), Small (1.00-2.49 acres), Medium (2.50 – 7.49 acres) and Large (7.50 acres and above) and shown in Table 9.

Table: 9. Distribution of the farmers according to their farm size

Categories	No.	Percent	Mean	SD
Landless (< 0.50 acre)	20	16.7	2.09	1.72
Marginal (0.50 – 0.99 acre)	19	15.8		
Small farm (1.00 – 2.49 acres)	46	38.3		
Medium farm (2.50 – 7.49 acres)	34	28.3		
Large farm (7.50 acres and above)	01	0.8		
Total	120	100		

Data presented in Table 9 shows that a good number 16.7 percent) of the respondents was landless and 15.8 percent of the farmers were marginal. It is found that the highest proportion (38.3 percent) of the farmers possessed small farm, while slightly above one-fourth (28.3 percent) of the farmers had medium size farm. Very few (0.8 percent) of the farmers had large size farm. This means the distribution of farm holdings among the farmers of the study area are slightly deviated compared to other farmers of the country. Barman *at el.* (2009) in their study on “use of mobile phone by the farmers in receiving agricultural information from the input dealers” observed a similar possession of land holdings by the farmers. On the other hand Mondal *at el.* (2009) found slightly different possession of land holding status of the farmers in their study. It is assumed that the land holdings are associated with the demand for information in operating farming activities. About two-thirds (66.6 percent) of the farmers possessed small to medium size farm holdings. Traditionally these categories of farmers are mostly dependent on farming for their livelihoods. So for survival they are the higher user of improved farming information. This is why the ICT centers might be better utilized by small and medium farmers as a potential source of agricultural information provided the extension service providers put utmost effort in this regard.

3.3.5 Farming experience

The information is a key element in making appropriate decision by the farmers about farming activities. Miah (2002) reported that farmer has been considering agricultural information as an input for crop production. It has been said that information help farmers in making proper utilization of other production inputs. Since farming has been transforming from subsistence to commercial farming, new and complicated problems are arising out of newly introduced farming practices. The farmers having no farming experience could not address those problems effectively. Farming experience of the farmers ranged from 2-50 years. The average farming experience was 15.98 with a standard deviation 10.39. On the basis of farming experience, the farmers were classified into three categories: Low (2-10 years), Medium (11- 20 years), and High (21 years and above) and presented in Table 10.

Table 10: Distribution of the farmers according to their farming experience

Categories	No.	Percent	Mean	SD
Low experience (2 -10 years)	54	45.0	15.98	10.39
Medium experience (11 -20 years)	37	30.8		
High experience (21 year and above)	29	24.2		
Total	120	100		

Data presented in Table 10 indicates that majority (45 percent) of the farmers had low farming experience while 30.8 percent of the farmers had medium farming experience. It is noted that only 24.2 percent of the farmers had high farming experience. This means slightly above half (55 percent of the farmers have medium to high farming experience in farming activities. This finding suggested that majority of the farmers could operate their farming activities in a better way. So, farming activities of these farmers could yield higher farm output than the farmers having low experience. On the other hand it is assumed that farmers having low experience are young may not lagging behind in harvesting better farm output. Amin and Islam (2009) in their study observed almost similar working experiences of the farmers on adoption of improved potato cultivation practices. The farmers of these categories are energetic and cosmopolite possessed high risk taking ability and may have positive awareness towards the use of ICT in getting improved farming information.

3.3.6 Annual income

The annual income of an individual is considered to be a principal source of investment in any enterprise. Similarly, the income of a farmer is the main source of investment in farming enterprise. The annual income of the farmers ranged from TK. 3 thousand to TK. 120 thousand with an average of TK. 72.24 thousand. The standard deviation was 93.44. This means the distribution of annual income of the farmers have wide variation. Based on the annual income, the respondents were classified into three categories, Low (up to TK. 25.0 thousand), Medium (TK. 26 thousand to TK. 75 thousand) and High (TK. 75 thousand and above) and presented in Table 11.

Table 11: Distribution of the farmers according to their annual income

Categories	No.	Percent	Mean	SD
Low income (Up to TK. 25 thousand)	28	31.7	72.24	93.44
Medium income (TK. 26 thousand to TK. 75 thousand)	48	40.0		
High income (TK. 76 thousand and above)	34	28.3		
Total	120	100		

Data presented in Table 11 indicates that the majority (40 percent) of the respondents had medium annual income, while 28.3 percent having high annual income and 31.7 percent of the respondents had low annual income. This means great majority (71.70 percent) of the farmers of the study area were resource poor. Ferdousi *at el.* (2010) and Kamruzzaman *at el.* (2010) found almost similar family income of the farmers in their respective studies. It is assumed that the resource poor farmers are skeptical in adopting new technology in farming activities. They usually suffer with cash crisis and not capable in investing money in farming. In addition, they have low risk taking ability resulting poor adoption of improved farming practices. But in the study area it was found that the farmers are enthusiastic in collecting farm information from local ICT centers. This may be due to the reason that the ICT cent res are available at their door steps and cooperation of extension agents for collection of farm information from the centers.

3.3.7 Extension media contact

We learn from our own experiences in this way, but we also learn from communicating with others about their experiences. This is why other farmers are very influential as information sources in the diffusion process (Ban and Hawkins, 1985). The extension media contact score of the farmers ranged from 1 to 53 against the possible range of 0 to 64. The average score was 23.76 with the standard deviation 11.41. The farmers are classified into 3 categories based on their extension media contact score and presented in Table 12.

Table 12: Distribution of the farmers according to their extension media contact score

Categories	No.	Percent	Mean	SD
Low contact (1-15)	33	27.5	23.76	11.41
Medium contact (16- 30)	54	45.0		
High contact (31 and above)	33	27.5		
Total	120	100		

The information of Table 12 indicates that majority (45 percent) of the farmers maintained moderate level of contact with various information sources for getting farm information while 27.5 percent maintained very low profile of contact and equal number (27.5 percent) had high contact. This means that majority (72.5 percent) of the farmers have maintained medium to high contact with various information sources in getting necessary farm information. It was found that among the information sources, farmers usually preferred to obtain information from local sources such as input dealer, school teacher, model farmer, neighbor, friends and relatives. This may be due to the reason that local sources are available at the time of need. They are credible, and trust worthy in respect to reliability of information. This finding has conformity with the research finding of Hossain *at el.* (2010). In addition the local sources have knowledge about local situation, intensity of problem and existing natural resource base of the farmers. So the fellow farmers have confidence on the local sources about solution of problems. On the other hand a good number of farmers preferred professional sources such as Sub Assistant Agriculture Officer (SAAO), Agriculture Extension Officer (AEO), Upazila Agriculture Officer (UAO) and local NGO workers for getting information. The professional sources are more knowledgeable and reliable than the locally available sources. A few number of farmers having access to mass media preferred those for getting farm information in operating farming activities. The farming problems in Bangladesh are getting complex day

by day may be due to practicing mono crop farming, imbalanced use of manures, chemical fertilizer and pesticides, excess lifting of underground water for irrigation, excessive farming operations in a same unit of land, etc. These unusual practices have been reducing soil fertility and productivity which in turn reduces crop yield. For improving soil fertility and productivity farmers are searching for appropriate information from various sources of information which could minimize soil management problems. Considering the above finding it can be said that the farmers may become more interested in searching ICT for information to address the issues which are vulnerable for future farming.

3.3.8 Training exposure

The training exposure score of the farmers ranged from 0 to 70 days. The average score was 7.28 days and standard deviation 8.63. This means the training exposure of the farmers are widely varied. According to the training exposure score, the farmers were classified into 4 categories such as, No training (0), Low training exposure (1-6), medium training exposure (7-13), and high training exposure (14 and above) and presented in Table 13.

Table 13: Distribution of the farmers according to their training exposure

Categories	No.	Percent	Mean	SD
No training exposure (0)	20	16.7	7.28	8.63
Low training exposure (1 -6)	54	45.0		
Medium training exposure (7 -13)	29	24.2		
High training exposure (14 and above)	17	14.2		
Total	120	100		

The information of Table 13 shows that one-sixth of the farmers had no training exposure on any aspect of farming activities while the rest (83 percent) had varying extent of training exposure on various aspects of agricultural activities. Hossain et al. (2010) in their study found almost similar training exposure of the farmers practicing rice cum fish culture. Training is an important factor, which enhance the level of knowledge and improve skills on various aspects of agricultural technologies (Islam, 2004). The above finding indicated that the existing training exposure of the farmers is encouraging towards the use of ICT in getting farm information for obtaining increased farm productivity. This finding suggested that the authority concern could provide training to the farmers for sustainable use of ICT and production of crops as well.

3.3.9 Organizational participation

The organizational participation score of the respondents ranged from 2 to 30. The average participation score was 7.15 and standard deviation 5.14. The respondents were classified in to 3 categories on the basis of their organizational participation score. These are low participation (2-10), medium participation (11-20), and high participation (21 and above) and shown in Table 14.

Table14: Distribution of the farmers according to their organizational participation

Categories	No.	Percent	Mean	SD
Low participation (2- 10)	103	85.80	7.15	5.14
Medium participation (11 - 20)	14	11.67		
High participation (21 and above)	3	2.53		
Total	120	100		

The information of Table 14 depicts that majority (85.80) percent of the farmer's maintained low profile of organizational participation while 11.67 percent moderate involvement and very negligible number (2.53 percent) had high participation in various organizations. This finding has conformity with the research findings of Hossain *at el.* (2010) and Rahman *at el.* (2010). It is assumed that organizational participation inspired farmers towards the adoption of improved farming practices because of their interaction and sharing of farming experiences with other farmers in the social system. The above finding also suggest that the farmers having poor organizational participation meaning poor interaction with other farmers of the society might hamper the use of ICT to a reasonable extent. The BAUEC authority should strengthen its group activities so that farmers could maintain higher organizational participation which in turn increases use of ICT and farm productivity as well. Different activities of ICT center are shown in figure 7.



Figure 7: Different activities of Information and Communication Technology (ICT) center. A: Sign board of Information center to recognize the office, B: People are gathering to the information center for getting information, C: Old aged farmer is trying to handling computer and D: A view of group discussion.

3.4 Relationships between the Variables

This section deals with the relationship between selected characteristics of the farmers (independent variables) and increase of farm productivity due to use of ICT (dependent variable). The relationships were computed by using Pearson's Product moment correlation co-efficient (r). The co-efficient of correlation (r) was used to test the null hypothesis as the basis for rejection of the null hypothesis. The results of correlation co-efficient (r) analysis between the dependent and independent variables are presented in Table 15. However, the inter relationships among the different variables have also been presented in Appendix-3

Table 15: Selected Characteristics of the farmers and their increase of farm productivity due to use of ICT

Dependent variable	Independent variables (selected characteristics of farmers)	Observed correlation co-efficient (r) values with d.f. = 118
Benefits of using ICT for increased farm productivity	Age	-.095
	Level of education	.212*
	Family size	-.011
	Farm size	-.081
	Farming experience	-.113
	Annual income	.110
	Training exposure	.220*
	Organizational participation	.102
	Awareness about role of ICT	.661**
	Extension media contact	.670**

*Significant at 0.05 level of probability

** Significant at 0.01 level of probability

3.4.1 Level of education of the farmers and their benefit of using ICT in increasing farm productivity

Relationship between level of education of the farmers and their use of ICT in increasing farm productivity was determined by testing the null hypothesis "there is no relationship between level of education of the farmers and their use of ICT in increasing farm productivity".

The calculated value of the co-efficient of correlation between the concerned variables was 0.212 as shown in Table 15. The following observations were made regarding the relationship between the two variables under consideration.

- The computed value of 'r' (r = 0.212) was found to be larger than the tabulated value (r =) with 118 degrees of freedom at 0.05 level of probability.

- The null hypothesis was rejected
- The relationship between the concerned variables was significant.
- The relationship showed a positive trend between the concerned variables.

Based on the above findings, the researcher concluded that level of education of the farmers about the use of ICT was an important factor in increasing farm productivity. This means the more education of the farmers the higher would be their use of ICT for obtaining higher farm productivity. Similar relationship was reported by Waheduzzaman (2004), Kabir (2003), Rahman (2002), Rahman *at el.* (2009) and Kamruzzaman *at el.* (2010) in their respective studies related to influence education in improving livelihood status of the farmers. Barman *at el.*(2009) found a positive and significant relationship between literacy and use of mobile phone by the farmers in getting farm information. It can be assumed that the farmers having higher education about ICT were likely to make more use of ICT in farming activities for obtaining higher farm output. Because a farmer having education about ICT can understand the potentiality of ICT in providing demand led information and adoption of which eventually increase farm productivity. The level of education of the farmers also related to training exposure of the farmers in using ICT for increasing farm productivity.

Education develops mental and physical ability of a person to understand, decide and adopt improved farming practices. It also helps farmers to improve their power of observation, analysis, and integration, develop perception and decision making capability as a whole. Education also helps to make adjustment to new situations of an individual. Educated farmers likely to maintain more contact with various information sources and have social participation. Furthermore, education is the process of producing desired change in the behaviour of the people. It produces changes in their knowledge, skills, attitudes and actions. It helps the farmers to broaden their outlook and expand their mental horizon by helping them to develop favourable attitudes, correct perception and objective assessment. Hence, education gives favourable disposition to the respondents to adopt new ideas, and skills related to improved farming practices for getting maximum benefit out of new adoptions. As far as interrelationships between the variables are concerned, the level of education has significant negative relationship with farming experience and positive with training exposure of the farmers which is logical and reasonable.

3.4.2 Training exposure of the farmers and their benefit of using ICT in increasing farm productivity

Relationship between training exposure of the farmers and their use of ICT in increasing farm productivity was determined by testing the null hypothesis “there is no relationship between training exposure of the farmers and their use of ICT in increasing farm productivity”.

The calculated value of the co-efficient of correlation between the concerned variables was 0.220 as shown in Table 15. The following observations were made regarding the relationship between the two variables under consideration.

- The computed value of ‘r’ ($r = 0.220$) was found to be larger than the tabulated value ($r =$) with 118 degrees of freedom at 0.05 level of probability.
- The null hypothesis was rejected
- The relationship between the concerned variables was significant.
- The relationship showed a positive trend between the concerned variables.

Based on the above findings, the researcher concluded that the training exposure of the farmers on various aspects of agriculture motivated them in using ICT which finally increases farm productivity. It can be assumed that the farmers having training exposure on various aspects of improved farming practices were likely to have more use of ICT in farming activities for obtaining higher farm output. Because a trained up farmer can understand the potentiality of ICT which eventually increase the adoption of improved farming practices and ultimately increase farm productivity. Training provides both ‘do- hows’ and ‘know- hows’ of an individual which is essential performing a job in a better way. The training exposure of the farmers was also found correlated with level of education and annual income of the farmers in using ICT for increased farm productivity. The relationship supports the findings of Islam (2005), Kabir (2005), Waheduzzaman (2004), Rokanuzzaman (2004), Kabir (2003), Rahman (2002), Alam (2001), Rahman *at el.* (2009) and Kamruzzaman *at el.* (2010) in their respective studies.

Training at the present time is considered as a useful learning attribute to improve the level of skill of an individual to perform a specific job. Hence, the training exposure of the farmers is very helpful to improve their farming behaviour. Training enhances individuals’ skill, attitude, and knowledge concerning the issues under training. It makes easier the adoption of improved farming practices leading to increased farm productivity and eventually the

improvement of livelihood status of the adopter. So, use of ICT in farming activities was changed positively with the change of training exposure of the farmers. Hence, the training exposure of the farmers seems to be an influencing attribute to the use of ICT by the farmers for yielding higher farm productivity. So, the concerned authority should provide training to the farmers as well as local extension agents for popularizing ICT mediated extension in the study area.

3.4.3 Extension media contact of the farmers and their benefit of using ICT in increasing farm productivity

Relationship between extension media contact of the farmers and their use of ICT in increasing farm productivity was determined by testing the null hypothesis “there is no relationship between extension media contact of the farmers and their use of ICT in increasing farm productivity”.

The calculated value of the co-efficient of correlation between the concerned variables was 0.670 as shown in Table 15. The following observations were made regarding the relationship between the two variables under consideration.

- The computed value of ‘r’ ($r = 0.670$) was found to be larger than the tabulated value ($r =$) with 118 degrees of freedom at 0.01 level of probability.
- The null hypothesis was rejected
- The relationship between the concerned variables was significant.
- The relationship showed a positive trend between the concerned variables.

Based on the above findings, the researcher concluded that extension media contact of the farmers was an important factor in influencing them towards the use of ICT in getting farm information leads to increased farm productivity. Miah (2002) in his study found that the farmers of Bangladesh had to perform farming activities with deficit of information meaning “information crisis”. The introduction of ICT mediated extension activities was found to increase the flow of agricultural information to and from the farmers resulting higher farm output. The overall media exposure of the farmers showed that the farmers maintained more contact with extension media and using ICT in farming activities obtained higher farm output. Because a farmer having higher extension media contact might have interest in using ICT for getting information on various aspects of farming which eventually might increase farm productivity. The extension media contact of the farmers was found highly correlated with their awareness in using ICT for increased farm productivity. Media is a very effective source of receiving

information about improved farming practices. The positive and significant relationship between extension media contact and use of ICT by the farmers depicted that the more contact of farmers with information sources might have higher use of ICT in farming activities resulting higher farm productivity. Kamruzzaman *at el.* (2010) also reported extension media contact of the farmers had significant positive relationship with their flood coping abilities while Rahman *at el.* (2009) and Hoque *at el.* (2010) observed similar relationship with fish farming by the farmers and adoption of farming technology by the char land people respectively.

3.4.5 Relationships between benefit of using ICT by the farmers and other independent variables

Relationships between selected characteristics such as age, family size, farm size, farming experience, annual income, and organizational participation of the farmers and their use of ICT in increasing farm productivity were also tested by using the null hypotheses. These were “there are no relationships between age, family size, farm size, farming experience, annual income, and organizational participation of the farmers and their use of ICT in increasing farm productivity”.

The calculated values of the co-efficient of correlation between the concerned variables were age (-0.095), family size (-0.011), farm size (-0.081), farming experience (-0.113), annual income (0.110), and organizational participation (0.102) as shown in Table 17. The following observations were made regarding the relationships between the above mentioned variables under consideration.

- The computed values of ‘r’ for age ($r = -0.095$), family size $r = (-0.011)$, farm size ($r = -0.081$), farming experience ($r = -0.113$), annual income ($r = 0.110$), and organizational participation ($r = 0.102$) were found to be smaller than the tabulated value of ‘r’ with 118 degrees of freedom at 0.05 level of probability.
- The null hypotheses were not rejected.
- The relationships between the concerned variables were not significant.

The relationships between age, family size, farm size and farming experience of the farmers and their use of ICT for increasing farm productivity were not significant and showed a negative trend. The relationships between annual income and organizational participation of the farmers and their use of ICT for increasing farm productivity were also not significant but showed a positive trend.

The age of the farmers is an important attribute influence them in adoption of an innovation. In the rural farming community, it was observed in various research studies that comparatively younger farmers are more innovative than the older farmers. On the other hand the older farmers having long time farming experience felt proud and satisfaction by providing information (advice, suggestions) to the young and less experienced farmers (Miah, 2002). The correlation analysis between age of the farmers and their benefit of using ICT in farming activities for increased farm productivity showed an insignificant relationship. This means age of the farmers has very little influence in using ICT services in farming. The relationship between the variables in true sense is not logical and reasonable. But this may be due to the reason that ICT mediated extension system is a new approach in transfer of farming technology, and the farmers have inadequate knowledge about potentiality of ICT in increasing farm productivity.

It was found that a narrow range of variation (standard deviation 1.82) in family size of the farmers was existed, which indicate that farmers from all categories of family concerned about family food security through farming. As the introduction of ICT is new initiative in extension activities, the family members were not well informed about role of ICT in increasing farm productivity. This is why statistically insignificant relationship between the concerned variables was observed.

An insignificant relationship between farm size of the farmers and their use of ICT in increasing farm productivity was found in the study. It was observed that slightly above 70 percent of the farmers were resource-poor, it is generally realistic to assume that farmers due to their resource limitations are reluctant to use modern technology like ICT in farming activities for obtaining higher farm productivity. The farmers due to their lack of knowledge and awareness about potentials of ICT remained indecisive about the use ICT for getting higher farm productivity. In Bangladesh, the resource-poor farmers generally live on a subsistence level and this may be a vital reason having insignificant relationship between the variables. The inadequate use of ICT in farming activities by the farmers compelled them to get poor harvest of their farm produce.

The farming experience is helpful to increase knowledge, improve skills, and changing attitude of an individual towards farming practices. It also builds confidence of the farmers for making appropriate decisions at the time of need. The farming experience of a farmer might develop his leadership capabilities and eventually improve communication skills and exposure as well. The

communication skills of the farmers might be useful in receiving information from different sources as well as dissemination of information to others. Therefore, it is expected that the more farming experience of the farmers the more they are likely to be increased use of ICT in farming activities. It was found that majority (55 percent) of the farmers had moderate to high (>10 years) farming experience. But the relationship between farming experience of the farmers and their use of ICT for higher farm productivity was insignificant, which seems unusual. This may be due to the reason that farmers were not well aware about potential role of ICT in changing farming behaviour of the farmers as well as increase farm productivity.

The annual income of a farmer is an important factor for his development. The data revealed that 72 percent of farmers fell in low to medium income group while only 28 percent of the farmers were better off. The annual income of majority of the farmers from farming was found minimal; they earned a reasonable amount of annual income from other sources like business, service, labour selling etc. It is true that they spent a bulk amount of their earnings in purchasing food stuffs left almost nothing to be spent for conducting improved farming activities. It is likely to be expected that the resource-poor farmers generally hesitate to adopt improved farming practices because of their inability to arrange necessary capital for purchasing of inputs. In addition, the resource-poor farmers are sceptical to make change by using modern farming practices. They possessed poor risk taking capability, which in turn discouraged them to go for improved farming activities. The existing correlation between annual income of the farmers and their use of ICT in farming for getting higher farm productivity was insignificant, meaning the variables are not significantly dependent to each other. Considering the above finding the existing relationship is usual. In Bangladesh farming is a risky business because it is largely dependent on nature, which is a barrier for adoption of improved farming practices, this hidden factor might be a potential reason for inadequate use of ICT by the farmers for getting increased farm productivity.

The participation of farmers in different social, cultural, and professional organizations brought them in contact with other members of the social system. It enable them to take part in discussion and get opportunity to exchange information, ideas, views, share feelings and experience with other participated members of the organization. It develop their insight and level of understanding enabling them to identify, analyze and prioritize the farming problems as well as offer solutions. In this consideration, it is expected that the use of ICT in getting farm information would be increased to a considerable extent, might increase farm productivity to a reasonable extent. The existing relationship between organizational participation of the farmers and their use of ICT in obtaining increased farm productivity was

found insignificant, which seems unusual. This may be due to the reason that the existing farmers' society of BAUEC are not working well. The present finding is the reflection of poor functioning of farmers' society of BAUEC. In order to have better functioning of ICT centres concern authority should reorganize and strengthen farmers' society so as to enable these organizations to act as per need of the farmers.

Based on the above findings, the researcher concluded that age, family size, farm size, farming experience, annual income and organizational participation of the farmers did not influence the use of ICT by the farmers in getting farm information for increased farm productivity. Examining the above findings it can be said that ICT mediated extension being a new approach of transfer of technology has not yet been popularized among the farming community, may be due to this reason many of the attributes of the farmers are not well acquainted with the use of ICT in extension work.

3.4.6 Interrelationship among the variables

The information presented in Appendix III (correlation matrix) depicted that some of the variables were found interrelated with each other. This means some of the characteristics of the farmers are influencing each other (interrelated variables) as well as might be influenced by some other factors/variables in using ICT for increased farm productivity. The age of the farmers was found to have negative significant relationships with their level of education and family size while significant positive relationship with farming experience of the farmers. The family size was found to have significant positive relationship with farming experience of the farmers. It was found that farm size of the farmers was highly correlated with their annual income. The correlation test showed that more the participation of farmers in organizations the higher would be their annual income. Barman *et al.* (2009) found significant negative relationship with age, but positive with annual income, and insignificant relationship with organizational participation of the farmers with their use of mobile phone in receiving farm information. Alam *et al.* (2010) in their study observed that family size, farm size, and annual income of the farmers had insignificant relationships while age of the farmers was positively correlated with the constraints faced by the fish farmers. Rahman *et al.* (2009) in their studies on fish farming by the farmers on the other hand found insignificant relationship with age but positive relationships with farm size and family size of the farmers. Amin and Islam (2009) found a significant positive relationship between organizational participation of the farmers and their adoption behaviour.

3.5 Awareness about Role and Benefit of using ICT in Increasing Farm Productivity

Relationship between awareness in using ICT by the farmers and increase in farm productivity was also determined by testing the null hypothesis “there is no relationship between awareness of the farmers about the use of ICT in increasing farm productivity”.

The calculated value of the co-efficient of correlation between the concerned variables was 0.661 as shown in Table 15. The following observations were made regarding the relationship between the two variables under consideration.

- The computed value of ‘r’ ($r = 0.661$) was found to be larger than the tabulated value ($r =$) with 118 degrees of freedom at 0.01 level of probability.
- The null hypothesis was rejected.
- The relationship between the concerned variables was significant.
- The relationship showed a positive trend between the concerned variables.

Based on the above findings, the researcher concluded that the awareness of the farmers was an important factor in using ICT for increasing farm productivity. It can be assumed that the farmers having awareness about ICT were likely to make more use of ICT in getting farm information and possible to obtain higher farm output. Awareness is a mental process of an individual from first hearing about an innovation. So, the awareness of a farmer can help him in understanding the potentiality of ICT in getting demand led information which eventually increases the adoption of improved farming practices. The improved adoption behaviour of the farmers ultimately increases their farm productivity. The awareness of the farmers about the use of ICT was also found to have significant positive relationship with their extension media contact. This means more awareness of the farmers higher would be their contact with extension media.

3.6 Problem Confrontation

In part of the modernization of extension activities, ICT has been introduced in extension services of Bangladesh. This is a new initiative in extension work in Bangladesh. One of the main limitations of usage of ICT in extension work is the inadequacy of computer literacy of both the extension agents and farmers. This is why it is difficult to conceptualize and use of ICT by the concerned users. It is generally assumed that adoption of new technology at the beginning may face some problems by the users. With the passage of time, and having

acquaintance with the technology most of the problems are reduced to a reasonable extent. It was found that most of the psychological problems are automatically minimized with the adaptation of the technology by the users. In order to find out the problems arises during use of ICT, the farmers through personal interviewing and FGD were asked to mention the problems they faced in using ICT for getting farm information. The identified problems are arranged in rank order based on their number of citations. However, the problems mentioned by the farmers are presented in Table 16.

Table 16: Problems faced by the farmers in using ICT

SL. No.	Problems	No. of citations
1.	Disrupted supply of electricity	26
2.	Irregular visit of BAUEC personnel	67
3.	Lack of skills of BAUEC personnel in handling ICT facilities	19
4.	Office time (10.00-17.00) of BAUEC staff do not suitable to the farmers (because they remain at field during this time).	11
5.	Very often network failure of ICT centre	31
6.	Sometimes modem does not work well	15
7.	Inadequate sitting arrangement of farmers in the office	35
8.	Delay in trouble shooting of computer	27
9.	Lack of regular monitoring and supervision of field work by BAUEC supervisory officials	21
10.	Inadequate training facilities for the farmers	10

The information of Table 16 indicates that irregular visit of BAUEC personnel, inadequate sitting arrangement in the center, network failure of ICT center, delay in trouble shooting, disrupted supply of electricity, poor supervision of ICT center etc. identified as the major problems encountered by the farmers in using ICT center for getting farm information. The other problems have been identified as obstacles in using ICT in getting farm information were - lack of skill of BAUEC personnel in operating ICT, disturbance in functions of modem, and inadequate training facilities of farmers.

3.7 Suggestions for Solution

The farmers were asked to provide suggestions for possible solution of the identified problems by utilizing the existing/available resources at their disposal. The farmers provided

some suggestions for minimizing the problems they encountered in utilizing ICT facilities for getting farm information. The suggestions are presented in Table 17.

Table 17: Probable suggestions for minimizing problems of ICT

SL. No.	Suggestion for problem solution	No. of citations
1.	Ensure continuous supply of electricity	26
2.	Regular visit of ICT centres by BAUEC personnel	67
3.	Capacity building of BAUEC workers through training	19
4.	Adjustment of office timing considering the farmers' time	16
5.	Improve ICT network by using broad band connection	31
6.	Regular updating of high speed modem service	19
7.	Provide adequate number of furniture in local office	32
8.	Provide prompt service in trouble shooting of computer	27
9.	Ensure regular monitoring and supervision of field work	21
10.	Increase training facilities for the farmers	10

The information of Table 17 depicted that regular monitoring and supervision of field activities of ICT centre by BAUEC to be strengthened for ensuring farmers' access to extension system. There is accommodation problem because the center is lacking of adequate number of furniture, this is why a good number of farmers cannot seat in the center at a time, the concerned authority should pay due attention in this regard. The center is delivering farm information to the farmers by using modem, sometimes the network is found weak and slow and very often facing networking problem along with trouble shooting, the BAUEC authority should address these issues (including introduction of high speed modem service) as much as possible. The field extension agents of BAUEC should reallocate their office time considering the time available and suitable for the farmers. It should be kept in mind that the ICT service is meant for the farmers, so there availability should be ensured in rendering services to the farmers.

Chapter 4

Summary, Conclusions and Recommendations

The main focus of the study was to examine the benefit of using ICT by the farmers as a source of information for increasing farm productivity. The specific objectives of the study were as follows:

- To find out the level of awareness of the farmers about ICT as a potential source of farm information.
- To determine the benefit of using ICT by the farmers in getting farm information for increasing farm productivity.
- To describe some of the selected characteristics of the farmers and explore their relationships with use of ICT for increasing farm productivity. The selected characteristics of the farmers are age, level of education, family size, farm size, farming experience, annual income, organizational participation, extension media contact and awareness about role of ICT
- To identify the problems faced by the farmers in using ICT as well as suggestions for minimizing the problems.

The study was conducted in six ICT centers of BAUEC. Among the centers, one village from each center was randomly selected. So, in total 6 villages from 6 centers were as the locale of the study. The selected villages under 6 ICT Centers were Baera, Vabokhali, Mirzapur, Suhila, Muktizoddha Bazar, and Sailmari. The BAUEC has been working with the resource poor farmers, out of which 12.24% of the population were randomly selected as sample the study. Thus, a total of 120 farmers (usually the head of household) constituted the sample size.

4.1 Summary of Findings

The major findings of the study are summarized below:

4.1.1 Awareness of the Farmers about the Role of ICT

To boost up food production of the country the government has been trying hard to adapt an information delivery system which can properly address the needs of the farming community. From time immemorial government has been experimenting with various extension

approaches and as such many models and approaches were introduced. This is how trial and error method of searching out suitable extension delivery system was done. Very recently the ICT mediated extension work was introduced to strengthen information delivery system. In order to find out the acceptability, it was necessary to examine the level of awareness of the farmers about ICT and its role in dissemination of farm information. It was found that one-fifth (20 percent) of the farmers were highly aware about the role of ICT, 45.8 percent having medium awareness while 34.2 percent of the farmers had low awareness about the role of ICT in dissemination of farm information to the farmers. The initial response of the farmers seems positive and encouraging since ICT is a new initiative in extension work

4.1.2 Benefit of using ICT in increasing farm productivity

The farmers were found curious and enthusiastic in using ICT facilities for obtaining benefit out of it. Majority (75 percent) of the farmers considered the benefit/outcome of using ICT in agriculture as medium to high, while 25 percent of the farmers opined the benefit as low. The farmers of the study area reported that rice production has been increased by 5.91 percent due to use of ICT while farmers having no exposure of ICT have increased 3.90 percent of their farm productivity. This can apparently be assumed that the ICT alone can contribute 2.01 percent increase of farm productivity. This may be due to the reason that the information collected from ICT centers by the farmers was need based/oriented, accurate, timely, even location specific and diversified.

4.1.3 Characteristics of the farmers

The highest proportion of the respondents (35.8 percent) were middle aged compared to 51.7 percent were young and only 12.5 percent of the respondents were old. This means that the large proportion (87.5 percent) of the farmers is young to middle aged.

The majority (55.8 percent) of the respondents had secondary education followed by 18.3 percent having higher secondary education while 11.7 percent had primary education. It is noted that only 13.3 percent of the farmers' have the ability to sign their names only and surprisingly none of the farmers were found with zero schooling.

It was found that almost two-fifths (41.7 percent) of the farmers had medium family size, 28.3 percent having small family and only 30.0 percent of the farmers had large size family. The distribution of family members of the study area was found almost similar to those of national average. A good number (16.7 percent) of the respondents was found landless and 15.8 percent of the farmers were marginal while 38.3 percent of the farmers possessed small farm holding. Slightly above one-fourth (28.3 percent) of the farmers of the study area had medium size farm and very few (0.8 percent) of the farmers had large size farm. Land is the basic unit of production, considering the possession of land holdings it can be said that the farmers of the study area were resource-poor.

Farming experience is a foundation of performance of farming activities. It was found that 45 percent of the farmers had low farming experience while 30.8 percent of the farmers had medium farming experience. It is noted that only 24.2 percent of the farmers had high farming experience. This means about three-fifths of the farmers have low to medium farming experience meaning majority of the farmers were young to middle aged. The farmers of these categories are supposed to be energetic, hard working, having high risk taking ability and might have positive awareness towards the use of ICT in getting improved farm information.

Annual income of an individual is an indicator of economic position and social status in the society and also indicates his livelihood standard. The annual income of the farmers ranged from TK. 3 thousand to TK. 120 thousand with an average of TK. 72.24 thousand. The majority (40 percent) of the respondents had medium annual income, while 28.3 percent having high and 31.7 percent of the respondents had low (up to TK. 25 thousand) annual income. This means great majority of the farmers of the study area were resource poor and might have dependence on other professions for maintaining livelihood means.

The extent of extension media contact of the farmers indicated that majority (45 percent) of the farmers maintained moderate level of contact with various information sources for getting farm information while 27.5 percent maintained very low profile of contact and equal number (27.5 percent) of the farmers had high contact. This means that the majority (72.5 percent) of the farmers have maintained medium to high contact with various information sources in getting necessary farm information. The finding revealed that the communication behaviour of majority of the farmers seems moderate to high which is encouraging for adequate flow of agricultural information to and from the farmers.

It was found that one-sixth of the farmers had no training exposure on any aspect of farming activities while the rest (83 percent) has varying extent of training exposure on various aspects of agricultural activities. Training is an important factor, which enhance the level of knowledge and improve skills on various aspects of agricultural technologies. The above finding indicated that the existing training exposures of the farmers are encouraging towards the use of ICT in getting farm information for obtaining increased farm productivity.

The organizational participation score of the respondents ranged from 2 to 30. The majority (85.80 percent) of the farmers was found to maintain low profile of organizational participation while 11.67 percent having moderate involvement and very negligible number (2.53 percent) had high participation in various organizations. Organizational participation of an individual is an opportunity for increasing contact and interaction with other members of the social system which might helpful in increasing knowledge, improving skills and changing attitudes.

4.1.4 Problem confrontation of the farmers in using ICT

The farmers were asked to mention the problems encountered by the farmers in using ICT in getting farm information. The major problems mentioned by the farmers were irregular visit of ICT centres by BAUEC personnel, inadequate sitting arrangement for the visitors in the centre, failure of ICT network, delay in addressing of trouble shooting of ICT centre, irregular supply of electricity disrupted functions of ICT, poor supervision and monitoring of ICT centre by the supervisory personnel of BAUEC etc. have been identified as the major problems encountered by the farmers in using ICT centre for getting farm information. The other problems have been identified as obstacles in using ICT for getting farm information were- lack of necessary skills of BAUEC personnel in operating ICT, disturbances in functioning of modem, and inadequate training facilities of farmers on ICT.

4.1.5 Probable suggestions to minimize the problems

To minimize the problems, the farmers have mentioned some of the suggestions those are- monitoring and supervision of field activities of ICT centre by BAUEC to be strengthened for ensuring farmers' access to information. There is accommodation problem because the centre is lacking of adequate number of furniture, this is why a good number of farmers cannot seat in the centre at a time, the concerned authority should pay due attention in this regard. The

centre is delivering farm information to the farmers by using modem, sometimes the network is become weak and slow and very often facing networking problems along with trouble shooting, the BAUEC authority should address these issues (introducing high speed modem service) as soon as possible. The field extension agents of BAUEC should reallocate their office time considering the time available and suitable for the farmers.

4.1.6 Relationships between the variables

The correlation test showed that the characteristics of the farmers such as level of education, training exposure, and extension media contact of the farmers was found to have significant positive relationships with benefit of using ICT for increased farm productivity. The other selected characteristics- age, family size, farm size, farming experience, annual income, and organizational participation of the farmers did not show any significant relationship with their benefit of using ICT in farming activities. The awareness of the farmers was also found highly correlated with the benefit of using ICT in achieving increased farm productivity.

4.2 Conclusions

On the basis of discussion and interpretation of findings of the study the following conclusions were drawn:

1. The farmers of the study area had varying degree of literacy. The correlation test showed a positive and significant relationship between the level of education of the farmers and their use of ICT in farming activities for increased farm productivity. There is a general belief that education increases or widens the mental horizon of an individual and thereby he becomes receptive to new ideas. Individuals having education might have higher intelligence, perception, understanding and knowledge, skills and attitudes and are more likely to maintain contact with information sources including use of ICT facilities. So, education is a crucial factor for ensuring higher use of ICT by the farmers in getting farm information. The above facts lead to the conclusion that the adult literacy programmes of various development agencies are helpful to increase the use of ICT in farming activities.

2. The information of Table 15 indicates that one-sixth of the farmers had no training exposure on any aspect of farming activities while the rest (83 percent) had varying extent of training exposure on various aspects of agricultural activities. Training is a technical job, and many of the 'how to do' skills needs to perform in conducting farming activities. So, training is essential for successful operation of various farming activities. The correlation test indicated its significant influence in increasing the use of ICT in getting farm information in performing various farming operations. This finding indicates more the training exposure of the farmers; the higher would be use of ICT in farming activities. Such consideration leads to the conclusion that training is imperative for maintaining increased use of ICT by the farmers in farming activities. Thus, more and more need based training courses should be organized for the farmers to increase the use of ICT in agriculture.
3. The majority (73 percent) of the farmers had medium to high extension media contact while the rest had low contact with various information sources in getting farm information. The correlation test identified extension media contact as one of the potential influencing factors for motivating farmers towards the use of ICT in getting farm information. This means more the extension media contact of the farmers the higher would be the use of ICT in farming activities. Based on the above findings, one can draw conclusion that extension media contact is vital for increasing the use of ICT in getting farm information by the farmers. Therefore, arrangement should be made by the concerned agencies to increase the access of farmers to ICT mediated extension services, so that the use of ICT in agriculture would be increased.
4. About three-fifths (67 percent) of the farmers had medium to high awareness about the role of ICT in dissemination of farm information to the farmers while the rest had low awareness. The awareness about role of ICT of the farmers is essential for maximizing profit by using ICT in agriculture. It is well agreed that the farming is becoming complex and complicated day by day due to multifarious reasons. The extent awareness of majority of the farmers revealed that they are capable enough to handle existing farming problems. The correlation test showed a positive significant relationship between awareness of the farmers about the role of ICT in dissemination of farm information and its use in farming activities. This means that more the awareness of the farmers the higher would be the use of ICT

in farming activities. Because awareness creates knowledge and develop perception which enhances the use of sources of information like ICT. On the basis of above finding, it may be concluded that the awareness of the farmers is a vital factor for maintaining sustainable use of ICT in getting farm information which eventually increase farm productivity. Therefore, farmers having low to medium awareness about the role of ICT in dissemination of farm information needs special attention to improve their level of awareness so as to increase their use of ICT in farming activities.

5. Majority of the respondents faced management problems those are- irregular visit of ICT centres by BAUEC personnel, inadequate sitting arrangement of farmers in the centre, lack of regular monitoring and supervision of field work by BAUEC supervisory officials, lack of skills of BAUEC personnel in handling ICT facilities etc. The technical problems encountered by the respondents in utilizing ICT centres were- very often network failure of ICT centre, delay arrangement/initiatives in addressing of trouble shooting of computer accessories, irregular/disrupted supply of electricity etc. Considering the above findings it can be concluded that the centres are not performing as expected due to facing many problems. The majority of the above mentioned problems are created due to lack of proper attention of concerned authority of the centres. However, many of the problems could be solved to a reasonable extent through sincere efforts/initiatives of BAUEC authority.
6. The BAUEC since inception (1976-1977) has been conducting its extension activities by following group approach of extension. The BAUEC at present has at least 60 farmers' (farmer and women society) societies helping grass root level extension workers in implementation of various extension programmes. These societies are the backbone of extension work of the organization. It was found that organizational participation of the farmers and their use of ICT in farming activities had insignificant relationship. This means the farmers' societies are not adequately equipped to handle ICT mediated extension work with the farmers. This finding suggested that most of the societies are either 'dead' or 'ineffective' in mobilizing farmers towards the use of ICT in farming activities. The BAUEC authority should pay due attention to make farmers' societies active and lively so as to enable them to use of ICT centres for dissemination of farm information.
7. Three out of four respondents opined to have medium to high increase of farm productivity due to use of information from ICT while one-fourth (25 percent) of

the farmers opined in favour of low productivity. This means all of the farmers under study considered the information of ICT to have varying extent of credibility. It was found that due to use of information from ICT, 5.9 percent of the farm productivity has been increased in compared to the yield of immediate past year while ICT was not available to the farmers. The non-users of the study area also obtained 3.9 percent increased yield. If we consider all the production factors remains constant, the above finding revealed that ICT alone has contributed 2.01 percent of increased farm productivity. The duration of using ICT (two years) in agriculture and its contribution in agriculture seems encouraging. This fact lead to the conclusion that sustainable supply of need based information to the farmers from ICT would increase farm productivity to a reasonable extent. So, BAUEC should put appropriate efforts in strengthening its information delivery system to the farmers through ICT.

8. The perception of majority of the farmers regarding receiving farm information from ICT was encouraging. They considered the information as demand-led, diversified, location specific, accurate, justified and reasonable, and on the whole the credibility of ICT as an information source was high. The information can also satisfy the needs of all categories of farmers. The finding revealed that the in-built mechanism of continuous updating of information in ICT creates confidence of the farmers for choosing ICT as a potential source of information. This fact leads to the conclusion that ICT has been emerging as a potential and credible source of information to the farming community. Hence, the concerned authority should pay attention to make good use of ICT in providing farm information to the farmers.

4.3 Recommendations

4.3.1 Recommendations for policy implications

The following recommendations were formulated on the basis of the findings, related conclusions and their logical interpretations:

The following recommendations were formulated on the basis of the findings, related conclusions and their logical interpretations:

1. The farmers obtained 2.01 percent of net increase in farm productivity due to use of ICT in farming activities. The finding of the study is found encouraging in respect of contribution of ICT in increasing farm productivity. So, the concerned authority

should continue the existing momentum of getting benefit of using of ICT by the farmers through strengthening motivational campaign of BAUEC.

2. The perception of the farmers about ICT should be kept in mind during planning and designing information delivery strategy by BAUEC authority. During delivery of information by the extension agents, BAUEC should remember that the information should be accurate, need based, timely and location specific as desire of the farmers.
3. The training activities of grass root level extension agents should be strengthened with a view to improve their knowledge and skills on handling of ICT by BAUEC authority, so that they will be able to address the needs of the farmers. Lack of motivation of extension agents of BAUEC towards job may be a vital reason of their inefficiency in handling of ICT mediated extension work. The training on ICT should also be conducted for the younger unemployed rural youths (usually the members of farmers' society) to enable them as skill manpower in rural areas. This attempt may create job opportunity for the unemployed rural youths.
4. The existing mass media coverage on agricultural information should be increased. The mass media, such as radio, TV, and newspaper should be given more coverage on agricultural information and it should be administered on regular basis instead of occasional basis. The demand driven information needs to be given priority so that the mass media could benefit the farmers. A mass campaign on use of ICT as a potential source of farm information has been given for popularizing ICT mediated extension work, so farmers' exposure on mass media would motivate them towards the use of ICT. In addition, BAUEC can take initiatives in favour of using ICT by the society members for increased farm productivity.
5. A positive significant relationship between education of the farmers and their benefit of using ICT was found in the study. This means more education (functional literacy) of the farmers higher would be their benefit from farming by using ICT mediated extension service. The concerned authority - BAUEC should strengthen its motivational campaign especially to the less educated (education having 0 to primary level) section of the farmers. So, that the number of ICT users in farming activities would be increased to a larger extent. The finding of the study revealed that the higher use of ICT by the farmers would increase the farm productivity which ultimately improves food security of the country.
6. The correlation test between awareness of the farmers and their benefit of using ICT in farming showed a positive significant relationship, which means more awareness

about role of ICT higher would be their use in agriculture. The BAUEC for ensuring better use of ICT by the farmers should strengthen and maintain awareness building activities so as to increase the use of ICT in farming activities.

7. It was found that majority of the existing farmers' society are not performing well in disseminating farm information to the farmers through ICT. So, BAUEC should pay due attention if necessary to reorganize the groups for their proper functioning in increasing the use of ICT by the farmers so as to enable them to derive maximum benefit from farming.

4.3. 2 Recommendations for further study

Considering the scope and limitations of the study and unbiased observations, the following recommendations are made for further study on ICT mediated extension activities.

1. The present study was conducted in working areas of BAUEC where ICT mediated extension service has newly been introduced. The government of Bangladesh has also introduced ICT mediated extension facilities at Union Parishad (UP) Offices of all over the country. Further studies need to be conducted with the ICT activities of UP to examine the variation in locations and use of ICT by the farmers of other areas of the country.
2. The use of ICT by the farmers has been investigated in this study. The farm women are also a potential force in farming as the involvement of women in homestead farming and other areas of farming has been increasing. In the past, the women were mostly involved in post harvest activities, but now they are becoming involved in many of the farming activities and decision making process. Considering the role of women in farming, it is recommended that the similar study should be conducted with both men and women and to find out the variation of use of ICT in farming activities due to gender differences.
3. The characteristics of farmers are many, but in the present study some of the selected characteristics, such as, age, level of education, family size, farm size, farming experience, annual income, training exposure, organizational participation, and extension media contact of the farmers were studied. It is necessary to conduct research with other characteristics of the farmers.
4. In the present study, the age, family size, farm size, farming experience, annual income, and organizational participation of the farmers did not show significant

relationship with benefit of ICT use. Thus, further research needs to be undertaken to assess the relationship of other characteristics of the farmers with the same. Similar study will also validate the present findings.

5. The perception of the farmers on ICT in agriculture needs to be undertaken to examine farmers' attitude towards the newly introduced ICT mediated extension service in Bangladesh.
6. The introduction of ICT in extension services of Bangladesh is a new initiative which enhancing digitalization agenda of the government. A study needs to be undertaken to examine how farming community has accepted it either as a media/source of information or political propaganda of the government.

5 References

- Alam, A.B.M.T. (2001). Study on Socio-economic Aspect of the Participating Group Members of Caritas Social Forestry Project. MS (Ag.Ext.Ed.) *Thesis*. Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Alam,N., M.J.Hoque and M.A.m. Miah. (2010). Constraints Faced by the Fishermen in Flood Prone Areas of Jamalpur District. *Bangladesh Journal Extension Education*, Bangladesh Agricultural Extension Society (BAES), Bangladesh Agricultural University (BAU), Mymensingh, Vol. 22, No.1&2 pp. 81-86.
- Al-Amin, Sultana. (2009). Role Performance of Char land Women in Maintaining Sustainable Livelihoods, An Unpublished Ph D Thesis, Department of Agricultural extension education, BAU, Mymensingh.
- Amin, M.R. (2011). Accessibility of Rural Women to Family Decision-Making Process. *Bangladesh Journal of Extension Education*. Bangladesh Agricultural Extension Society (BAES), Department of Agricultural extension education, BAU, Mymensingh, Vol.23, No. 1&2, P. 94.
- Amin,M.R. and M.R. Islam. (2009). Adoption of Improved Potato Cultivation Practices by the Farmers in Some Selected Areas of Naogaon District. *Bangladesh Journal of Extension Education*. Bangladesh Agricultural Extension Society (BAES), Department of Agricultural extension education, BAU, Mymensingh, Vol.21, No. 1&2, P. 129.
- Anonymous. (2007). Agriculture Diary, Published by Agriculture Information Service (AIS), Ministry of Agriculture, Government of the peoples' Republic of Bangladesh, Dhaka. Available at: www.odi.org.uk/agren/papers/agrenpaper_135.pdf
- Ban.A.W.Van Den., and H.S.Hawkins. (1985). *Agricultural Extension* Longman Scientific & Technical Copublished in the United States with John Wiley & Sons, Inc., New York. P. 123.
- Barman,K.S, M.A. Kashem, M.Z. Rahman and M.A.S. Mondal. (2009). Use of Mobile Phone by Farmers in Receiving Agricultural Information from the Input Dealers. *Bangladesh Journal of Extension Education*. Bangladesh Agricultural Extension Society (BAES), Department of Agricultural extension education, BAU, Mymensingh, Vol.21, No. 1&2, PP. 89-95.
- BBS. (2010). *Bangladesh Statistical Year Book*, Bangladesh Bureau of Statistics. Ministry of Planning, Govt. Of the Peoples' Republic of Bangladesh, Dhaka.
- Crowder, Loy Van. (1998). Knowledge and Information for Food Security-The Role of Telecentres. Seminar on Multipurpose Community Telecentres, Budapest, 7-9 December 1998. PP.2-9.
- Ferdousi,Z., M.A.M.Miah and M.J.Hoque. (2010). Need for Capacity Strengthening of Women Members of BAUEC for Homestead Gardening. *Bangladesh Journal Extension Education*, Bangladesh Agricultural Extension Society (BAES),

Bangladesh Agricultural University (BAU), Mymensingh, Vol. 22, No.1&2 pp. 15-22.

- Fu, Xiaolan and Shaheen Akter. (2010). The Impact of ICT on Agricultural Extension Services Delivery: Evidence from the Rural e-services Project in India. TMD Working Paper Series, No. 146, department of International Development, University of Oxford.
- Global e-governance readiness report. (2005). Retrieved 11th July 2009, <http://unpan1.un.org/intradoc/groups/public/documents/un/unpan021888.pdf>.
- Hoque, M.Z., M.E.Haque, M.S.I.Afrad and M.A.Hossain. (2010). Adoption of Farming Technology by the Charland Farmers. Bangladesh Journal Extension Education, Bangladesh Agricultural Extension Society (BAES), Bangladesh Agricultural University (BAU), Mymensingh, Vol. 22, No.1&2 pp. 49-55.
- Hossain, M.K., M.J.Hoque and M.H.Rahman. (2010). Use of Communication Media by the Farmers in Practising Rice cum Fish Culture. Bangladesh Journal Extension Education, Bangladesh Agricultural Extension Society (BAES), Bangladesh Agricultural University (BAU), Mymensingh, Vol. 22, No.1&2 pp. 95-102.
- Islam, M.S. (2004). Extent of Knowledge and Information System in Rural Community for Improving Rural Livelihood of Farmers. *M.S. (Ag. Ext. Ed.) Thesis*, Dept. of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Jones, G. E. (1997). The history, development, and the future of agricultural extension. *Improving agricultural extension – a reference manual*. Rome: FAO.
- Kabir L.I. (2005). Comparative Analysis of Livelihood Status Between the Adibashi and the Native Women. *MS (Ag.Ext.Ed.) Thesis*. Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Kabir, M.F. (2003). Effect of Palli Daridro Bimochon Foundation (PDBF) on Reducing the Level of Poverty of landless people. *MS (Ag.Ext.Ed.) Thesis*. Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Kamruzzaman, M., M.G.Farouque and M.H. Rahman. (2010). Farmers' Knowledge on Flood Coping Strategies: A Study in a Flood Prone Areas of Munshigonj District. Bangladesh Journal Extension Education, Bangladesh Agricultural Extension Society (BAES), Bangladesh Agricultural University (BAU), Mymensingh, Vol. 22, No.1&2 pp. 23-30.
- Kashem M.A., M.A.M. Miah and M. A. Islam 2011. Factors Responsible for Yield Gaps in Rice and Wheat at Farmers' Field in Four Districts in Bangladesh, An unpublished research article, Funded by Krishi Goveshona Foundation (KGF), BARC Complex, Ministry of Agriculture, GoB, Dhaka, PP.1-3.
- Kaushik, P.D. and Singh, N. (2004). Information Technology and Broad-Based Development: Preliminary Lessons from North India. *World Development*, 32, 591-607.

- Khatun, F., M.H.Rahman and M.G.Farouque. (2009). Flood Coping ability of Ultra Poor Household Women in a Flood Prone areas of Jamalpur District. *Bangladesh Journal Extension Education*, Bangladesh Agricultural Extension Society (BAES), Bangladesh Agricultural University (BAU), Mymensingh, Vol. 21, No.1&2 pp. 63-71.
- Kibria, A.K.M. Anwarul. (1987). Growth and Development of Agricultural Extension in Bangladesh. *Bangladesh Journal Extension Education*, Bangladesh Agricultural Extension Society (BAES), Bangladesh Agricultural University (BAU), Mymensingh. Vol. 2, special seminar issue, pp. 7-28.
- Kraemer, K.L.and Dwdrick, J.(1994). Payoffs from Investment in Information Technology: Lessons from the Asia-Pacific Region. *World Development*, 22, 1921-1931.
- Meera, Shaik N. 2003. A critical analysis of information technology in agricultural development: impact and implications. Unpublished PhD thesis, IARI, New Delhi.
- Meera, Shaik N., A. Jhamtani, and D.U.M. Rao. 2004. Information and communication technology in agricultural development: a comparative analysis of three projects from India. AgREN Network Paper No. 135, ODI, January 2004.20p.
- Miah, M.A.M. (2002). Flow of Agricultural Information to the Farmers in Two selected Areas of Bangladesh, An Unpublished Ph.D Thesis, Department of Agricultural Extension Education, BAU, Mymensingh.
- Mondal, S., M.H.Rahman and M.J.Hoque. (2009). Adoption of Hybrid Rice by the Farmers of Fulpur Upazila of Mymensingh District. *Bangladesh Journal Extension Education*, Bangladesh Agricultural Extension Society (BAES), Bangladesh Agricultural University (BAU), Mymensingh, Vol. 22, No.1&2 pp. 55-61.
- Mutalib. M.A, (2002). Implementing of New Agricultural extension Policy in the context of Livestock: Achievement and Constraints, Proceedings of the national Workshop on NAEP, Organized by BAES and DAE, BAU, Mymensingh.
- Nagasri, K. (2000). Assess of creative potential practice of extension personnel. PhD Thesis (Unpublished) IARI Pusa, New Delhi.
- Rahman, M.A.(1999). Performance of Proshika in some Selected Areas of of Khulna District. *M.S. (Ag. Ext. Ed.) Thesis*, Dept. of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Rahman,M., M.M.Islam and M.G.Farouque. (2009). Management Knowledge of Pond Owners on Pond Fish Farming. *Bangladesh Journal Extension Education*, Bangladesh Agricultural Extension Society (BAES), Bangladesh Agricultural University (BAU), Mymensingh, Vol. 21, No.1&2 pp. 17-25.
- Rahman,M.M., M.J.Hoque and M.G.Farouque. (2010). Participation of Rural Youth in Fish Farming Activities. *Bangladesh Journal Extension Education*, Bangladesh Agricultural Extension Society (BAES), Bangladesh Agricultural University (BAU), Mymensingh, Vol. 22, No.1&2 pp. 87-93.

- Rogaly, B., B. Harris-White and S. Bose. 1999. Introduction: Agricultural Growth and Agrarian Change in West Bengal and Bangladesh, in Rogaly, B, Harriss-White and Bose, S (Eds), *Sonar Bangla? The Agricultural Growth and Agrarian Change in West Bengal and Bangladesh*, Sage Publications India Pvt. Ltd.
- Rokanuzzaman, M. (2004). Impact of Community Based Fisheries Management Project on Livelihoods of a Fishing Community in Haor Area of Sunamgonj District. *M.S. (Ag. Ext. Ed.) Thesis*, Dept. of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Selwyn, N. 2002, Defining the "Digital Divide": developing a theoretical understanding of inequalities in the information age. Available at: <http://www.cf.ac.uk/socsi/ict/definigdigitaldivide.pdf>
- Shaik. N. Meera, A. Jhamtani, & D.U.M. Rao. (2004). Information and communication Technology in Agriculture Development: A comparative Analysis of Three Major projects from India *Agricultural Research and Extension Network, Network Paper No.135*.
- United Nations. (2005). "Global E-government Readiness Report: From E-Government to E-Inclusion", UNPAN/2005/14, United Nations, New York.
- Waheduzzaman, M. (2004). Impact of NGO on Livelihoods of Women in a Fishing Community. *M.S. (Ag. Ext. Ed.) Thesis*, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Walpoe, R.E.(1982). Introduction to Statistics. 3rd Edn., New York: MacMillan Publishing Co.

APPENDIX I
(English version of the Interview Schedule)

Interview schedule for collection of data on “Awareness of Farmers about the Role of ICT towards increased Farm Productivity”

(Information collected through this interview schedule will be kept confidential and only be used for research purpose)

Serial No.....
 Name of respondent.....
 Father’s name.....
 Village..... Block.....
 Upazila..... District.....

(Please provide information on the following aspects)

1.0 Age: years.

2.0 Level of education.

What is your level of education?

- a) Don’t know reading and writing.....
- b) Can sign only.....
- c) I have passed class.....

3.0 Family size:

What is the member of your family members (including yourself)? Nos.

Male:....., Female:....., Children:..... Total:.....

4.0 Farm size:

Please state your farm size.

Types of land	Local unit	Hectare
Homestead		
Own land under own cultivation		
Own land given to others on barga		
Land taken from other on barga		
Land given to others on lease		
Land taken to others on lease		
Fellow land		
Garden		
Total		

5.0 Farming experience.

How long are you actively engaged in farming activities?

..... Years

6.0 Annual income:

Please mention the annual income of your family for last year.

Sources of income	Taka
Field crops	
Vegetables	
Livestock and poultry	
Fish/pond	
Service	
Business	
Others	
Total	

7.0 Training Exposure.

Please mention training you received on farming activities during your farming career.

Sl No.	Subject of the training	Duration (Days)	Sponsoring organization
1.			
2.			
3.			
4.			
5.			
Total days			

8.0 Organizational participation.

Indicate the nature of your participation in the following organizations.

Name of Organization	Not Involved	Involved				Duration (Years)
		Ordinary member	Executive member	Secretary	President	
Krishak Somabay Samittee						
Cooperative society						
School/Madrasha Committee						
Mosque Committee						
Market Committee						
Local union parishad						
Youth club/society						
ICT centre MGT committee						

9.0 Awareness about role of ICT.

Please provide your opinion regarding role of ICT in dissemination of agricultural information to the farmers.

Role	Extent of Awareness			
	Highly Aware	Moderately Aware	Somewhat Aware	Not Aware
1. Potential source of information				
2. Having higher diversity of information				
3. Availability of higher choice of information				
4. Timely availability of information				
5. Availability of demand driven information				
6. Provide solution of complicated farm problem				
7. Reference of problem solution of other places is possible				
8. Alternative solution of problem is possible				
9. Provide environment friendly technology				
10. Offer resource-based technology				

10. Sources of information

Please indicate your extent of contact with the following sources for getting agricultural information. .

Sources	Extent of Contact				Never
	Regular	Frequent	Occasional	Rare	
Experienced farmer					
Local leader					
Neighbors					
Friends					
Relatives					
Input dealer					
SAAO					
NGO personnel					
School teacher					
AEO					
UAO					
Radio					
Television					
News paper					
Printed materials					
ICT centre					

11.0 Use of ICT

Please mention the benefit of using ICT as a source of farm information for increased farm yield.

Sl No.	Crop production	Extent of increase			
		High	Moderate	Low	No
1.	Boro rice production				
2.	Aman rice production				
3.	Vegetables production				
4.	Fruit production				
5.	Poultry production				
6.	Dairy production				
7.	Fish production				

12.0 Do you know there is ICT center at your locality? Yes= 1, No = 0

12.1. If No, Mention the reasons

.....

12.2. If yes, please mention how did you know?

.....

13.0 Did you make any changes in your cropping pattern and input use due to having ICT facilities at your door steps? Yes..... No.....

13.1. If no, why not?

13.2. If yes, what changes did you make?

- a) Allocated more land for high value crop production.
- b) Used balanced fertilizer and improved seeds.
- c) Bought improved breed of dairy cow.
- d). Established small scale poultry farm.
- e) Rented more land..... decimal under farming activities.
- f) Concerned about environmental degradation.
- g) Awareness about soil health and land management.
- h) Increased income due to commercialization of farming system

14.0 How do you fulfill the household food requirements?

(Please mark \checkmark where appropriate, if not please specify)

14.1 Own production: Purchase: Exchange:

14.2 Do you produce enough food you required? Yes= 1, No=0

15.0 What is your food self-sufficiency situation? Months

(Note: if the house hold is food surplus please ask that how long the food grain they can continue next year assuming there is no sale and no new harvest.)

15.1 Do you sale the surplus food? Yes= 1, No = 0

15.2 Do you think the ICT facility has improve the availability farm information? Yes= 1, No = 0

15.3 The availability of farm information has increased the farm productivity? Yes= 1, No = 0

15.4 If yes, please mention the over all increase of farm productivity: %

16. Problem confrontation

Please indicate the problems you are facing in collecting information from local ICT centre for operating your farming activities.

- 1.
- 2.
- 3.
- 4.
- 5.

17. Suggestions

Please mention your opinion in minimizing problems you are facing in using ICT as a source of information.

- 1.
- 2.
- 3.
- 4.
- 5.

Thank you very much for your kind cooperation.

Signature of the Interviewer

Date:

APPENDIX II
(English version of the Check List)

Check List for conducting focus group discussion (FDG)

1. How many of you made contact with ICT center for getting farm information?
2. Please mention what type of information you have collected from the center.
3. Do you found the information useful in operating farming operations?
4. Do you think that due to use of ICT your farm productivity has been increased?
5. Mention the problems you are facing in getting ICT service.
6. Please mention the probable suggestions to mitigate the problems of using ICT facilities.

Signature of the Interviewer

Date:.....

APPENDIX-III

Correlation matrix showing interrelationships among the variables (N=120)

variables	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	Y
X ₁	1										
X ₂	-.347**	1									
X ₃	-.186*	-.088	1								
X ₄	-.007	.024	.124	1							
X ₅	.646**	-.269**	.257**	.080	1						
X ₆	-.027	-.053	.001	.420**	-.054	1					
X ₇	-.047	.361**	-.033	-.020	.025	.007	1				
X ₈	-.041	.004	-.160	.139	.051	.264**	.173	1			
X ₉	.049	.073	.046	-.080	-.056	.009	.150	.105	1		
X ₁₀	.044	.178	.020	-.029	-.019	.159	.159	.145	.774**	1	
Y	-.095	.212*	-.011	-.081	-.113	.110	.220*	.102	.661**	.670**	1

Notes: ** Correlation is significant at the 0.01 level (Table value of 'r' is 0.265 at 92 df)

* Correlation is significant at the 0.05 level (Table value of 'r' is 0.202 at 92 df)

X₁ = Age

X₂ = Education

X₃ = Family size

X₄ = Farm Size

X₅ = Farming Experience

X₆ = Annual income

X₇ = Training Exposure

X₈ = Organizational Participation

X₉ = Awareness about role of ICT

X₁₀ = Extension Media Contact

Y = Benefits of ICT