

**ATTITUDE OF THE AICC FARMERS TOWARDS USE OF ICT
ENABLERS IN AGRICULTURAL ACTIVITIES**

A Thesis

By

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**MASTER OF SCIENCE
IN
AGRICULTURAL EXTENSION**

**Department of Agricultural Extension
Hajee Mohammad Danesh Science and Technology University
Dinajpur**

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ABSTRACT

The purpose of this study is to determine farmers' attitude towards using ICT enablers in agricultural activities. Multistage random sampling technique was used for selection of a sample of 90 AICC farmers from a population of 301 from Rangpur and Dinajpur districts. Data were collected during 02 February to 16 March 2017 by using pre-tested structured interview schedule. Eight selected characteristics of the farmers' namely: age, educational qualification, family size, farm size, farming experience, annual family income, ICT training received and use of ICT for utilization of farm information were the selected characteristics of the AICC farmers, while the attitude of the farmers' towards using ICT enablers in agricultural activities was the focus issue. Different standard statistical techniques were used to measure the selected characteristics and Likert scale was used to measure the focus issue. Nine statements (4 positive and 5 negative) on various aspects of use of ICT enablers in agricultural activities were used for the attitude scale. The positive and negative statements were arranged alternatively in the schedule in order to achieve the real picture of attitude of the farmers. There were five options to response a statement, namely 'strongly agree', 'agree', 'no option', 'disagree' and 'strongly disagree' with a corresponding score of 5, 4, 3, 2 and 1, respectively for the positive statements and the scoring was reversed for the negative statements. The majority (80.0 percent) of the AICC farmers had highly favorable attitude towards using ICT enablers in agricultural activities compared to 12.2 percent had low favorable attitude and 7.8 percent had neutral attitude towards using ICT enablers in agricultural activities. Correlation analyses indicated that age, educational qualification, family size, farm size, ICT training received and use of ICT for utilization of farm information had positive significant relationships with farmers' attitude towards using ICT enablers in agricultural activities; while the farming experience had significant negative relationships with attitude towards using ICT enablers in agricultural activities; and annual family income had no significant relationship with farmers' attitude towards using ICT enablers in agricultural activities. So, it may be concluded that farmers have positive attitude towards using ICT enablers in agricultural activities. Government and other development non-government agencies should emphasize ICT enablers during extension services at farm level.

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ABBREVIATIONS

AI	:	Application Index
AIS	:	Agriculture Information Service
BAU	:	Bangladesh Agricultural University
BBS	:	Bangladesh Bureau of Statistics
BCKV	:	Bidhan Chandra Krishi Viswavidyalaya
BSMRAU	:	Bangabandhu Sheikh Mujibur Rahman Agricultural University
CIG	:	Common Interest Group
MOF	:	Ministry of Finance
FIAC	:	Farmers information and Advice Centre
FAO	:	Food and Agriculture Organization
FIAC	:	Farmers Information and Advice Center
GDP	:	Gross Domestic Product
GO	:	Government Organization
HSTU	:	Hajee Mohammad Danesh Science and Technology University
ICT	:	Information and Communication Technology
NATP	:	National Agricultural Technology Project
NGO	:	Non-Government Organization
LII	:	Livelihood Improvement Index
SAAO	:	Sub-Assistant Agriculture Officer
UNDP	:	United Nations Development Program
USAID	:	United States Agency for International Development
WB	:	World Bank

CHAPTER 1

INTRODUCTION

1.1 General Background

Agriculture is one of the most important sectors in Bangladesh which could be benefited tremendously with the application of information and communication technologies (ICTs). In that regards, extensive use of modern information technologies need to promote at farm level for the transfer of technologies and information in a cost effective manner. The agriculture information is vast, interdisciplinary, and specific to different area of Bangladesh and needs a proper information dissemination system for its effective use. Hence, agricultural information resources should be significantly organized and processed to disseminate right information to the right user at the right time. Communication is recognized as an important input for development to disseminate and create dialogue among different stakeholders about the technologies and issues of agriculture, environment and sustainable development.

Today it is possible to find a solution to present problems of farmers by using the potential of information and communication technologies (ICTs) to meet the location specific information needs of the farmers. The information and communication networks are expanding very fast. It is time to examine the extent of its utility in farm sector. The Internet connectivity has touched almost all the districts in the country and is moving down to the village and block levels. In the same rhythm the development of ICTs in agricultural sector is also accelerating. This helps in optimizing the use of various inputs such as water, seeds, fertilizers, etc. The problem is that Bangladeshi farmers cannot afford this technology and unless government comes in support for agricultural infrastructure.

1.2 Statement of the Problem

Recent developments in information and communications technology (ICT) offer a great opportunity to facilitate the flow of information and technology services delivery especially to the farmers (Maningas, 2006). It is comprehensible that on the one hand agriculture is becoming highly science driven and knowledge intensive, but on the other hand the existing public extension system, has become less effective, more time consuming and costly and fails to meet the expectations of those involved in agricultural production (McNamara, 2010). The role of public agricultural extension service has traditionally been to provide the important link between agricultural research and farming communities, especially for technology transfer in support of agricultural and rural development (FAO, 2010).

The study was conducted with the farmers who were members of the AICC (Agricultural Information and Communication Center) clubs. The AICC farmers receive ICT enablers and using these in utilization of information related to agricultural activities. It is therefore crucial to know the attitude of the farmers about use of ICT enablers in agricultural activities. Further, it is essential to know, for which issue farmers have favorable attitude towards ICT enablers at what extent. Further, it is imperative to know the factors related to formation of favorable attitude of the farmers towards use of ICT enablers. It will help to know the areas where we need improvements and which issues are more preferred by farmers for communication through ICT enablers and the policy makers need to address for further development. Considering these issues the present study is proposed to measure attitude of the AICC farmers towards use of ICT enablers in agricultural activities.

1.3 Objectives of the Study

Considering the above discussion and keeping in view the importance of ICT in agriculture the study was undertaken with the following general objectives, to determine the attitude of the farmers towards use of ICT enablers in agricultural activities. The specific objectives are:

- i) To determine the extent of attitude towards use of ICT enablers in agricultural activities.
- ii) To determine and describe some selected characteristics of the farmers. The characteristics are: age, educational qualification, family size, farm size, farming experience, annual family income, ICT training received and use of ICT enablers for utilization of farm information.
- iii) To determine the relationship between the farmers' attitude towards use of ICT enablers in agricultural activities with their selected characteristics.

1.4 Scope of the Study

Information is valuable input through which farmers adopt new technologies to make the farming more profitable. The application of ICT offers wider possibilities, there by strengthening transfer of technology between research and extension system and further onward transmission to the end users. Due to the decreasing strength of field level functionaries at gross root level it becomes a challenging task to the concerned agencies to reach the farming community with latest technical know-how. It is quite evident that the advent of ICT revolution which is well utilized by other sectors than agriculture sector. Hence, use of ICT for farm communication plays a vital role in bridging this gap at rural areas hence access to these ICT tools is a crucial requirement for sustainable development of

the farming community. It is quite evident that many of the bottlenecks hinder the free flow of information through these tools. Hence it is time to seriously look these issues to make future communication system more sustainable.

Again, the advancements in ICT can be utilized for providing accurate, timely, relevant information and services to the farmers, there by facilitating better adoption of these technologies to make agriculture profitable. However, all the ICT initiatives are not uniform with disparities between regions, level and quality of telecommunications, information and the effort of individuals, public and private organizations and differentiated nature of demand of the farmers in different areas. As a result, there have many successes and failures lessons learnt and also experience gained, so far. The common problems in adoption of ICT are low literacy, availability of relevant and localized contents in their own language, lack of operational skills, easy and affordable accessibility of ICT tools and other issues such as awareness and willingness for adoption of new technologies. The proposed research will be of immense utility to the extension personnel, researchers, administrators and policy makers to formulate and execute suitable strategies enhancing the use of ICT tools in transfer of technology. Particularly it will be helpful to give a detailed account of attitude of farmers towards use of ICT tools, their socio-economic profile, which will helps to evolve suitable strategies to enhance its utility.

1.5 Assumptions of the Study

An assumption is the supposition that an apparent fact or principle is true in the light of the available evidence (Goode, 1945). The following assumptions were kept in mind by the researcher while undertaking this study:

- The respondents included in the sample were capable of furnishing proper responses to the questions included in the interview schedule.
- The views and opinions furnished by the respondents included in the sample were the representative and opinions of the whole population of the study area.
- The responses furnished by the respondents were valid and reliable. They sincerely expressed all information about ICT enablers in agricultural activities.
- The researcher acting as the interviewer was well adjusted to the society and environment of the study area. Hence, the data collected from the respondents were free from bias.

- The findings of the study will have general applications to other parts of the country with similar personal, socio-economic and cultural conditions of the study area.

1.6 Limitations of the Study

Considering the time, money and other necessary resources available to the researcher and to make the study manageable and meaningful it became necessary to impose certain limitations. The limitations were as follows:

- The study was confined to four upazilas of Rangpur district and four upazilas of Dinajpur district.
- Attitude of the farmers about using ICT enablers in agricultural activities could be measured directly by observation in the field but it would be very much costly and time consuming. In this study, attitude of the farmers was thus measured on the basis of their responses through some selected statements.
- Population for the present study was kept confined within the members of AICCs of the study area.
- There were many characteristics of the farmers in the study area but only eight of them were selected for investigation.
- For information about the study, the researcher dependent on the data furnished by the selected respondents during their interview.

1.7 Definition of Important Terms

For clarity of understanding, certain terms frequently used throughout the study are defined and interpreted as follows:

Information contact: It refers to the frequency of exposure of different individual sources, group sources and mass media of information.

Information Communication Technology (ICT): ICT means development and use of electronic and allied gadgetry for effective generation, collection, processing, storage, retrieval and use of the information for maximum and speedy output.

Knowledge: It is the intimate acquaintance with facts. It is the processed information one has acquired and can be used in various situations.

Attitude: Attitude means one's feelings, beliefs and actions towards an object and concept. This variable was operationalized by developing an attitude scale, following Likert method of

summated ratings. In this study attitude is the degree of positive or negative feeling of farmers towards the information and communication technologies (ICTs).

ICT training: Training is a process of improving skill and knowledge of individuals for doing a special job. ICT training refers to the number of days of training received by the respondent in his life on various aspects of ICT.

Educational qualification: Empirically, it was defined to the development of changes in knowledge skill and abilities in an individual through reading, writing, walking, and other selected activities. It was measured on the basis of formal educational grades completed by the respondents.

Family size: Family size refers to the total number of members including the respondent himself, his wife, children and other dependent members who live and eat together in a single family.

Farm size: Farm size refers to the total area, on which a farmer's family carries on farming operations, the area being estimated in terms of full benefit and utilization to the farmer's family.

Annual family income: It refers to the total earnings by the family members of the respondents from agricultural and non agricultural sources during a year. In fact, it was gross income and expressed in taka.

CHAPTER 2

REVIEW OF LITERATURE

The purpose of this Chapter is to review past researches related to this study. The reviews are conveniently presented based on the major objectives of the study. The researcher found adequate number of related literatures representing this study. This chapter has been divided into eight sections. The first section deals with the concept of attitude, the second section deals with review of literature regarding farmers' attitude, the third section deals with reviews related with ICTs, the fifth section deals with conceptual framework of the study.

2.1 Concept of Attitude

The readiness to respond to a certain object in a favorable or unfavorable fashion; every attitude has both an intrinsic belief and a behavioral disposition. Attitude is a settled way of thinking or feeling about something. A predisposition or a tendency to respond positively or negatively towards a certain idea, object, person, or situation. Attitude influences an individual's choice of action and responses to challenges, incentives, and rewards (together called stimuli). (Business Dictionary, 2015) Individuals develop their attitudes through a continuous process of adaptation to the social environment. Attitudes are organized ways of thinking and acting in relation to facts and people in our environment, and they help influence our overall way of life. Attitudes can also be explicit and implicit. Explicit attitudes are those that we are consciously aware of and that clearly influence our behaviors and beliefs. Implicit attitudes are unconscious, but still have an effect on our beliefs and behaviors (Cherry, 2018).

2.1.1 Formation of attitude

According to Doob (1947), learning can account for most of the attitudes we hold. The study of attitude formation is the study of how people form evaluations of persons, places or things. Theories of classical conditioning, instrumental conditioning and social learning are mainly responsible for formation of attitude. Unlike personality, attitudes are expected to change as a function of experience.

Attitudes can be learned in a variety of ways. Consider how advertisers use classical conditioning to influence your attitude toward a particular product. In a television commercial, one sees young, beautiful people having fun on a tropical beach while enjoying a sport drink. This attractive and appealing imagery causes you to develop a positive association with this particular beverage (Kerlinger, 1973).

Different conditioning can also be used to influence how attitudes develop. Imagine a young man who has just started smoking. Whenever he lights up a cigarette, people complain,

chastise him and ask him to leave their vicinity. This negative feedback from those around him eventually causes him to develop an unfavorable opinion of smoking and he decides to give up the habit. Finally, people also learn attitudes by observing the people around them. When someone you admire greatly espouses a particular attitude, you are more likely to develop the same beliefs. For example, children spend a great deal of time observing the attitudes of their parents and usually begin to demonstrate similar outlooks (Cherry, 2018).

2.1.2 Influences of attitude on behavior

Social psychologists have found that attitudes and actual behavior are not always perfectly aligned. After all, plenty of people support a particular candidate or political party and yet fail to go out and vote.

Researchers have discovered that people are more likely to behave according to their attitudes under certain conditions:

When one's attitudes are the result of personal experience?

When one is an expert in the subject?

When one expects a favorable outcome?

When the attitudes are repeatedly expressed?

When one stands to win or lose something due to the issue?

In some cases, people may actually alter their attitudes in order to better align them with their behavior. Cognitive dissonance is a phenomenon in which a person experiences psychological distress due to conflicting thoughts or beliefs. In order to reduce this tension, people may change their attitudes to reflect their other beliefs or actual behaviors (Cherry, 2018).

2.2 Review of Literature regarding Farmers' Attitude

Arifullah *et al.*, (2014) conducted a study in two unions of Nabinagar Upazilla under Brahmanbaria District to ascertain the attitude of rural elite farmers towards extension activities performed by Upazilla Agricultural Extension personnel of DAE and to explore the relationship between the selected characteristics of the respondents and their extent of attitude towards those extension activities. It was found that the highest proportion (43.14 percent) of the respondents had moderate favourable attitude compared to 33.33 percent having high favourable attitude and 23.53 percent less favourable attitude. Findings revealed that education, farm size, time spent for farm work, organizational participation, extension contact and knowledge on agriculture of elite rural farmers showed positive significant relationship

while age and annual family income did not show any such relationship with their attitude.

Samad (2010) conducted a study to determine study on farmers' attitude towards aerobic rice cultivation. He found that the majority (69.84 percent) of the farmers had favorable attitude while 1 percent had unfavorable attitude and 29.16 percent had neutral attitude towards aerobic rice cultivation. The attitude score of non-project farmers showed that the majority (58.33 percent) possessed neutral attitude, 2.08 percent had favorable attitude and 39.59 percent had favorable attitude towards aerobic rice cultivation.

Ahmed (2006) conducted a study to determine the attitude of the farmers towards shrimp farming in a selected area of Khulna district and to explore the relationships between ten selected characteristics of the farmers and their attitude. Attempt was also made to identify the problems faced by the farmers in shrimp farming. He found that overwhelming majority (87 percent) of the shrimp farmers had favorable attitude towards shrimp farming compared to 7 percent having neutral and only 6 percent had unfavorable attitude.

Uddin *et al.*, (2006) conducted a study to determine farmers' attitude towards sustainable agriculture and to explore the relationships between thirteen selected characteristics of the farmers and their attitude towards sustainable agriculture. Descriptive statistics and Pear-son's Product Moment Correlation are used to analyze data. Equal proportion of farmers having moderately favorable and highly favorable attitude towards sustainable agriculture. On the other hand, 4% and 18% farmers had highly unfavorable and moderately unfavorable attitude towards sustainable agriculture respectively. Farmers level of education, farm size, annual family income, training exposure, knowledge of environment friendly farming experience of environment friendly farming practice and innovativeness had positive and significant relationship with their attitude towards sustainable agriculture. On the other hand, age, family size, farming experience, extension media exposure, cosmopolitaness and organizational participation did not show significant relationship with the same regard.

Khan (2005) attempted to determine the attitude of farmers towards groundnut cultivation and to explore relationships between twelve selected characteristics of the farmers and their attitude. It was also purpose of the study to determine the adoption of improved practices by the farmers in cultivating groundnut and to identify the problems faced by the farmers in groundnut cultivation. Twelve selected characteristics of the farmers namely: age, education, family size, farm size, annual income, agricultural knowledge, organizational participation, cosmopolitaness, extension media contact, agricultural training experience, innovativeness and credit availability constituted the independent variables, while the attitude of farmers towards groundnut cultivation was the dependent variable of the study. The overwhelming

majority (93.14 percent) of the groundnut farmers had favorable attitude towards groundnut cultivation compared to 4.90 percent having neutral and only 1.96 percent had unfavorable attitude. Correlation analysis indicated that education, farm size, agricultural knowledge, agricultural training experience and innovativeness of the farmers had significant positive relationships with their attitude towards groundnut cultivation. Age, family size, annual income, organizational participation, cosmopolitaness, extension media contact and credit availability of farmers, however, had no significant relationship with their attitude towards groundnut cultivation.

Sarker (2004) studied the attitude of the imams towards improved agricultural technologies and to explore the relationships between selected characteristics of the imams and their attitude towards improved agricultural technologies. The findings of this study revealed that 28.75 percent of the imams had favorable attitude towards crop cultivation, while 51.25 percent had moderately favorable attitude and the rest 20 percent had less favorable attitude towards crop cultivation. For livestock development, 22.5 percent of the imams had favorable attitude, while 67.5 percent had moderate and the rest 10 percent had less favorable attitude towards livestock development. For fish culture, 28.75 percent had favorable, 66.25 percent had moderate and rest 5 percent had less favorable attitude towards fish culture. Again, 16.25 percent of the imams had favorable attitude towards overall improved agricultural technologies, while 70.0 percent had moderate and rest 13.75 percent had less favorable attitude towards overall improved agricultural technologies. The correlation test towards improved agricultural technologies for overall attitude showed that general education, religious education, knowledge on improved agricultural technologies, training exposure, cosmopolitaness, organizational participation and communication exposure showed a significant positive relationship.

Farhad and Kashem (2004) conducted a study to determine attitude of rural women in using IPM in vegetable cultivation and to explore the relationship between the selected characteristics of the women and their attitude of IPM in vegetable cultivation. The majority (68 percent) of the respondents had medium attitude while 17 percent low attitude and 15 percent high attitude in using IPM in vegetable cultivation. Out of 10 selected characteristics of the respondents, education, cosmopolitaness and contact with extension media had a positive significant relationship while age had a negative significant relationship with their attitudes in using IPM in vegetable cultivation.

Chowdhury (2003) conducted a research to determine farmers' attitude towards crop diversification in two differently developed villages, one being progressive and other

traditional. Majority of the farmers in progressive village held moderately favorable attitude (52percent) compared to farmers of traditional village of whom 43 percent held moderately favorable and 29 percent held moderately unfavorable attitude towards crop diversification. Farmers of progressive village having favorable attitude towards crop diversification were more than the farmers of traditional village. Overall, 61 percent farmers of the study area had moderately favorable to highly favorable attitude towards crop diversification. Out of twelve selected characteristics of the farmers seven, namely, level of education, family annual income, and cosmopoliteness, knowledge on crop diversification, risk orientation, and awareness on adverse effect of rice monoculture were positively correlated with their attitude towards crop diversification. On the other hand, age, family size, training exposure, extension media contact, and innovativeness had no significant relationships with attitude towards crop diversification.

Afrad (2002) conducted a study in three villages of Dumkiupazila under Patuakhali district. Data revealed that majority (59.1 percent) of the farmers had favorable attitude towards vegetable cultivation while 40.9 percent had moderately favorable attitude towards vegetable cultivation. Extension contact, commercialization, education, farm size. Cosmopoliteness, and agricultural knowledge of the respondents had positive significant relationship with their attitude towards vegetable cultivation. Age, family size, family labor size, annual family income, training experience, organizational participation and fatalism of the farmers had no significant relationship with their attitude towards vegetable cultivation. The top most three problems according to rank order as faced by the farmers in vegetable cultivation are that the soil is not suitable for vegetable cultivation, vegetable are severely attacked by pests and excessive rainfall in the locality during the period of vegetable raising seasons.

Haque (2002) carried out a study to assess the extent of attitude of rural women in selected homestead agriculture activities viz. homestead vegetable cultivation, poultry raising, goat rearing, fish cultivation and tree plantation. The highest percentage of the rural women had moderate favorable attitude in each of the five selected activities. These were 85 percent in poultry raising, 83 percent in goat rearing, 78 percent in fish cultivation, 72 percent in tree plantation, 70 percent in vegetable cultivation. Computed 'r' values indicate that age, family size, aspiration and fatalism of the rural women had no significant relationship with their attitude in any of the five selected homestead agriculture activities. However, education, farm size and family income of the rural women had positive relationship with their attitude to all of the activities and in most cases the relationship was significant.

2.3 Review of Literature regarding ICTs

Das and Chayal (2010) revealed that there is an increasing realization about the potentialities of Information and Communication Technology (ICT) in dissemination of agricultural technologies among the farmers. The extensive use of modern information technology needs to be promoted for communication between researchers, extension workers and farmers to transfer technologies and information in a cost effective manner. The use of ICT is an important pillar of agriculture extension. Here, attempt has been made to analyze the reaction of the farmers towards ICT as a source of reliable and timely information about best production practices, processing, marketing, input and output prices, financial and risk-covering institutions etc. The favorable attitude of farmers towards ICT as an effective and efficient information support tool would lead to stronger conviction and efficient extension program planning. The focus of this study was on the attitude of farmers towards Information and Communication Technology as a source of information. Stratified random sampling technique was used in the selection of seventy five farmers as the sample for the study. A pre-tested structured interview schedule was used to elicit information from the respondents. The data were analyzed using appropriate statistics tool. The findings showed that majority of the farmers had favorable attitude towards the information technology.

In a research with the farmers of Kapasia and Ekhlaspur in Bangladesh could become sure about the important issues for semi-organic cultivation and apply that knowledge into their cultivation watching the video contents in the Income Generation Project for Farmers using ICT (Ozaki *et al.*, 2013).

However, Dhaka and Chayal (2010) conducted research in Bundi district of Rajasthan, India to analyze experience of farmers using ICT services for agricultural information. It was revealed in the study that direct access to information was considered as important benefit and it was given the highest priority by the farmers. It was perceived by the farmers that the ICT services were able to disseminate knowledge intensive information like market intelligence, weather forecast, early warning and management of disease and pests, production practices, post harvest management etc. It was reported by the farmers in the research that their quality of decision making was improved through obtaining alternative solutions to a set of problematic situations with the help of ICT. It was also found in the study that the market information including daily updates on the prices of agricultural commodities in the local markets of the surrounding district was perceived as the most relevant ICT services by the farmers. The farmers were able to sell their commodities at those markets where their agricultural products would command the best prices.

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

It was found in a study conducted by Munyua *et al.* (2009) that the use and application of modern ICTs could contribute in the development of small-scale agriculture in Africa. Some emerging ICTs such as Geographic Information Systems (GIS) and decision support systems, mobile mapping and hand-held personal computers (personal digital assistants/PDAs), precision agriculture and mobile (cellular) phone applications, community radio stations, radio frequency identification tags, World Space satellite radio and access to the Internet and web-based applications facilitated the farmers to concentrate on high-value agricultural (HVA) products, to focus on improvement in productivity, to consider the options for commercial agriculture, to pay increased attention to new markets and marketing strategies, and to increase agricultural production through biotechnology. It was also revealed from the study that the cellular phone facilitated the farmers and entrepreneurs to access the market links. The study further revealed that farmers were provided with extension information through a telephony information service, the National Farmers Information Service (NAFIS) in English and Kiswahili using audio format in Kenya. Besides, farmers and traders had access to information on commodities being sold, their prices and the identity of their buyers and extension messages through other cellular phone applications providing market information and electronic trading platforms such as Tradenet.biz. Mobile phone also facilitated the farmers to pay farm workers and purchase farm inputs as an electronic money transfer channel. It was reported in Kenya that market information was offered to the farmers using voice mail through Interactive Voice Response (IVR) by Kenya Agricultural Commodity Exchange (KACE). It was also observed that farmers could subscribe to real-time information on agricultural and fish prices through their cell phones in Senegal.

Lio and Liu (2006) revealed in a study that there was a significant positive impact of ICT on agricultural productivity. It was also observed that information and communication infrastructure influenced the adoption of modern industrial inputs in agricultural production in that study.

Meera *et al.* (2004) carried out a research to examine the performance of three ICT projects in India. It was observed in the research that under Warana project the farmers of the region were getting the information on the tonnage of sugarcane, payment details, etc. sent from the

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

It was observed by Mwakaje (2010) that the ICT user farmers obtained higher prices than the farmers who did not use ICT for accessing market information in Rungwe District, Mbeya Region, Southwest Tanzania. Again the position of the farmers' was strengthened during bargain with the traders by receiving widely available information on prevailing market prices for seed through the use of ICT (Haider, 2005).

Nielsen and Heffernan (2006) examined the relationship between new and existing knowledge regarding animal health and production among 85 poor farmers in 13 communities in Bolivian Altiplano, who utilized the El Promotor, a multi-media, interactive program. They observed that there was uptake of knowledge due to utilization of the ICT program.

Again, it was revealed in a study that the farmers were able to improve their production, linkages to profitable markets, and reduce poverty by accessing agricultural knowledge and information through ICTs (such as, tele-centers, cell phones and radio) in Tanzania (Lwoga and Ngulube, 2008).

The traditional public-sector extension services use a variety of extension programs to overcome barriers to technological adoption without much success (Anderson and Feder, 2004; Anandajayasekeram *et al.*, 2004; Aker, 2010). Historically, agricultural service delivery in developing countries started with production-oriented limited extension services for export crops. The attention was diverted in the fifties to food production and improved farming techniques (Anandajayasekeram *et al.*, 2008).

In the 1960s US-led 'technology transfer model' employed a large number of extension agents to provide extension services. Since then, with the rise in the demand for agricultural services, many variants of approaches, models and methods have been evolved to connect researchers, extension agents, producers and consumers (Feder *et al.*, 1986; Axinn, 1988; Anderson and Feder, 2004).

It is found that ICT allows efficient and transparent storage, processing and communication of information and that entrepreneurial innovation in agricultural sector may affect economic

and social change (Kaushik and Singh, 2004). Growth in ICT investment is also found to be positively associated with growth in both GDP and productivity (Kraemer and Dedrick, 1994).

It is increasingly recognized that ICT is necessary for accessing required information and knowledge (Chapman *et al.*, 2004; McNamara, 2009; Aker, 2010). According to Raabe (2008) ICT would enable extension workers to gather, store, retrieve and disseminate a broad range of information needed by farmers.

Moreover, Heeks and Molla (2009) find in their ICT evaluation compendium that ICT is not fully utilized in agriculture. Scaling up of delivery still remains at experimental stage. Jensen (2007) demonstrated that the ICT helped farmers about prices at different locations and decide where to sell their products profitably. Thus price volatility and variation dropped. ICT is not always found to deliver its promise as expected.

Although farmers have the real need to access to market information, land records and services, accounting and farm management information, management of pests and diseases, rural development programs and ICT could help accessing these services, ICT enablers are subjected to check the farmer's attitude towards the same (Raabe, 2008). Moreover, the digital divide is not merely a problem of access to ICT, it is part of a larger developmental problem in which vast sections of the farming people are deprived of the capabilities necessary to use ICTs, acquire information and convert it into useful knowledge along with different socio-economic constraints. Balanced growth is needed and deep structural problems must be solved to make ICT-induced development more inclusive in agricultural sector (Parayil, 2005). No research work considering these issues has done yet in Bangladesh to the best of the knowledge of the investigator of this proposal. Thus, the present study proposed to measure farmers' attitude towards use of ICT enablers in agricultural activities in northern Bangladesh.

2.4 Different Reviews Related to Relationship between Attitude and Other Characteristics

2.4.1 Age and attitude

Parvez (2007) found that there was no relationship between age of the farmers and their attitude towards IPM for HYVs production. Nurzaman (2000) and Habib (2000) observed similar findings in their respective studies. In contrary, Alam *et al.* (2004) found that there was a positive significant relationship between age of the rural women and their attitude towards homestead vegetable cultivation.

2.4.2 Educational qualification and attitude

Parvez (2007) found that there was positive significant relationship between education of the farmers and their attitude towards IPM for HYVs production. Sarker (2001), Habib (2000) observed similar findings in their studies. Contrary, Ali (2002) found that educational qualification of Block Supervisors had negative relationship with their attitude. Again, Nurzaman (2000) observed in his study that level of education of the FFS and non FFS farmers had no significant relationship with their attitude towards IPM. Noor (1995) found similar findings in his study.

2.4.3 Family size and attitude

Mahiuddin (2004) found that family size of farmers had significant positive relationship with their attitude towards the adverse effect of using agrochemicals in rice cultivation. But Parvez (2007) concluded in his study that there was no significant relationship between family size of the farmers and their attitude towards IPM for HYVs production. Nurzaman (2000) found similar findings in his study. Again, Alam *et al.*, (2004) observed that family size of the rural women had negative significant relationship with their attitude towards homestead vegetable cultivation.

2.4.4 Farm Size and attitude

Parvez (2007) concluded in his study that there was no significant relationship between farm size of the farmers and their attitude towards IPM for HYVs production. Habib (2000) and Nurzaman (2000) and Noor (1995) obtained similar findings in their respective studies. Contrary, Haque (2003) found that farm size of farmers had positive relationship with their attitude towards extension activities of DAE.

2.4.5 Annual family income and attitude

Parvez (2007) concluded in his study that there was no significant relationship between annual income of the farmers and their attitude towards IPM for HVYs production. Nurzaman (2000) and Siddique (2002) observed similar findings in their respective studies. In contrary, Paul (2000) found that annual income had positive relationship with attitude of farmers towards the Urea Super Granule.

2.4.6 Training and Attitude

Paul (2000) found that there was a positive significant relationship between agricultural training experience of the farmers and their attitude towards the use of urea super granule. Alam *et al.* (2004) and Habib (2000) observed similar findings in their respective studies.

2.5 Conceptual Framework of the Study

Conceptual frameworks (theoretical frameworks) are a type of intermediate theory that attempt to connect to all aspects of inquiry (e.g. problem definition, purpose, literature review, methodology, data collection and analysis). Conceptual frameworks can act like maps that give coherence to empirical inquiry. Because conceptual frameworks are potentially so close to empirical inquiry, they take different forms depending upon the research question or problem (Wikipedia, 2012). In order to develop the conceptual framework for the focus issue and selected characteristics of this study, attitude was conceptualized having three components as: i) cognitive domain come from head, ii) affective domain come from heart and iii) behavior components come from different visible parts of the body such as hand, skin, ear, eye, etc. From the past studies and literature it is observed that various factors influenced and affected farmers in acquiring their attitude towards innovation.

In this study the researcher attempted to highlight three concepts, namely farmers' selected characteristics, farmers' attitude towards use of ICT enablers in agricultural activities. An individual's attitude may be influenced by his/her personal characteristics and through other interacting forces in his/her surroundings. As it is quite impossible to deal with all the forces and characteristics in a single study, it was, therefore, needed to be confined with some selected characteristics which were age, educational qualification, family size, farm size, farming experience, annual family income, ICT training received and use of ICT in utilization of farm information. However, relating other situational factors with farmers' attitude was not considered in this study. On the basis of above discussion and review of literature, the conceptual framework of this study has been diagrammed as shown in Figure 2.1.

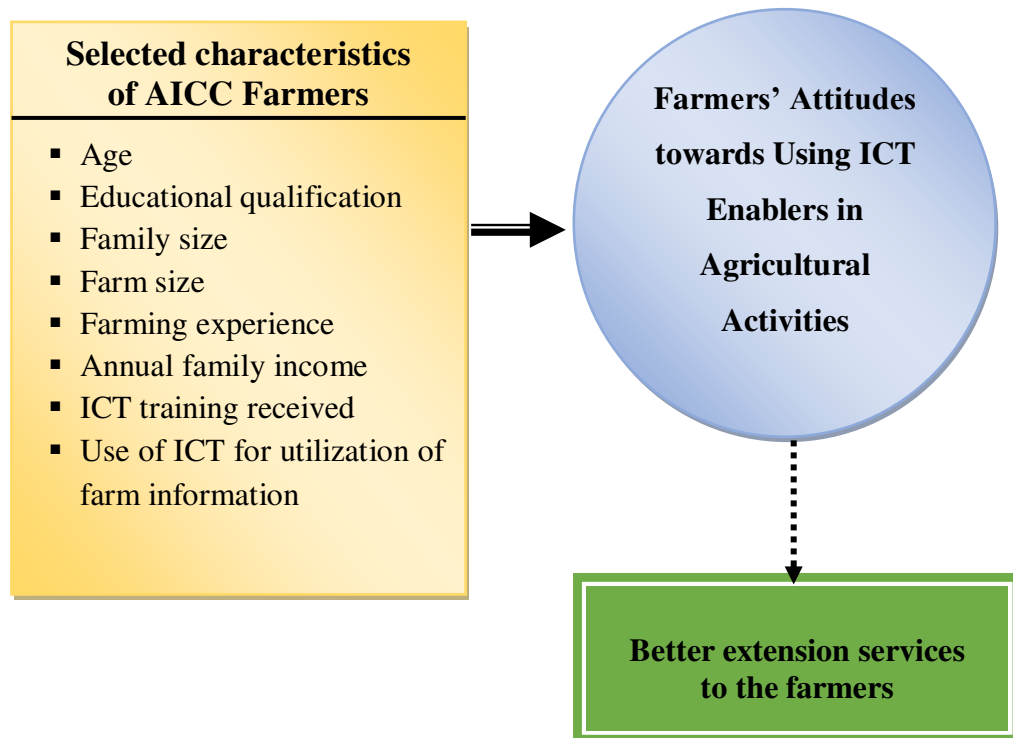


Figure 2.1 The conceptual framework of the study.

CHAPTER 3

METHODOLOGY

Methodological issues are one of the prime considerations for conducting a research for yielding valid findings. In fact, it is the foundation on which the research process rests upon. However, appropriate methodologies were used in research to collect valid and reliable data and analyze the information to arrive at correct and meaningful conclusion. From this point of view, the researcher took great care in using suitable methods. Methods and procedures that were followed in this study are discussed in this Chapter.

3.1 Research Design of the Study

An explanatory and cross sectional research design was used in this research. This flow diagram of the research process has been presented in Figure 3.1

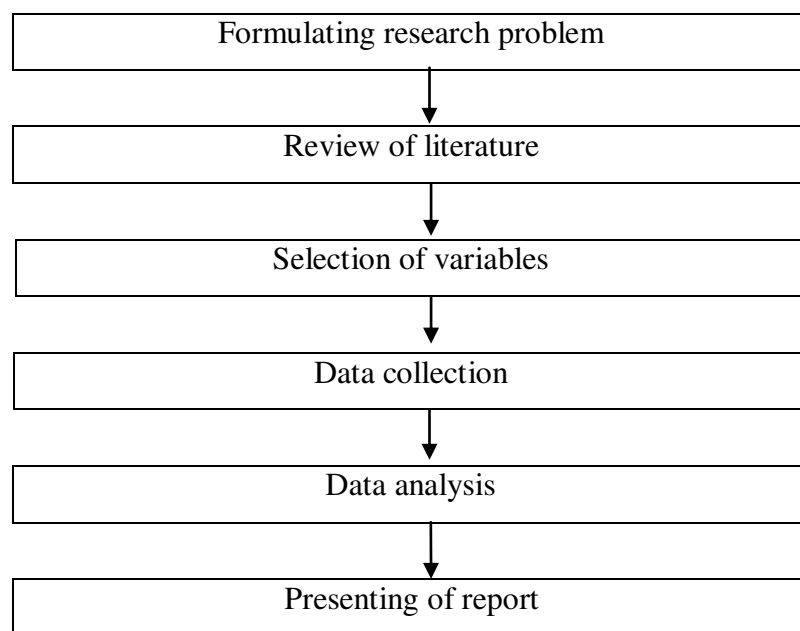


Figure 3.1 Flow diagram of the research process of the study

3.2 Locale, Population and Sample of the Study

Rangpur and Dinajpur districts were selected as purposively for this study. Multistage random sampling technique was followed for sample selection. In the first stage, eight AICCs, four from each district were selected randomly. These eight AICCs are located in four upazilas of Rangpur and four upazilas of Dinajpur district and constituted locale of the study (Figure 3.1 and Figure 3.2). Then the list of the farmers of these AICCs was prepared by the help of Regional AIS (Agriculture Information Service) office of DAE, which

constitute the population of the study and contains 301 farmers. Thirty percent of these farmers were selected randomly as the sample of the study. A reserve list of ten percent of the sample farmers also prepared to collect data during unavailability of the sample farmers during data collection. The distribution of the population and sample farmers are given in Table 3.1.

Table 3.1 Distribution of population and sample of the study

District	Upazila (AICCs)	Poulation	Sample	Reserve list
Rangpur	Sadar (Hajipara AICC)	38	11	1
	Badarganj (Dhontola AICC)	46	14	2
	Taraganj (Baniapara AICC)	31	9	1
	Kaunia (Thakurdash AICC)	37	11	1
Dinajpur	Sadar (Dighon utor para AICC)	44	13	1
	Birganj (Laterhat AICC)	37	11	1
	Birol (Rajuria AICC)	33	10	1
	Chiribondor (Awliapukur AICC)	35	11	1
Total		301	90	9

3.3 Research Instrument

In order to collect valid and reliable data from the respondents a structured interview schedule was designed carefully keeping the objectives of the study in mind. Simple, easy and direct questions and different scales were used to obtain information from the respondents. Both open and closed form questions were included in the interview schedule. The schedule was checked by supervisory committee and extension experts of the Department of Agricultural Extension, HSTU.

In case of age, educational qualification, family size, farm size, farming experience, annual family income and ICT training received direct questions were used but in case of use of ICT enablers and attitude of farmers towards use of ICT enablers scales were used to obtain data. The interview schedule was prepared in Bangla for clarity of understanding and it was pretested with ten farmers of the study areas. On the basis of pre-test, necessary corrections, alterations and modifications were made before finalizing the interview schedule. The interview schedule was then printed in its final form and was multiplied for collecting data from the respondents. An English version of interview schedule has been shown in the Appendix A.

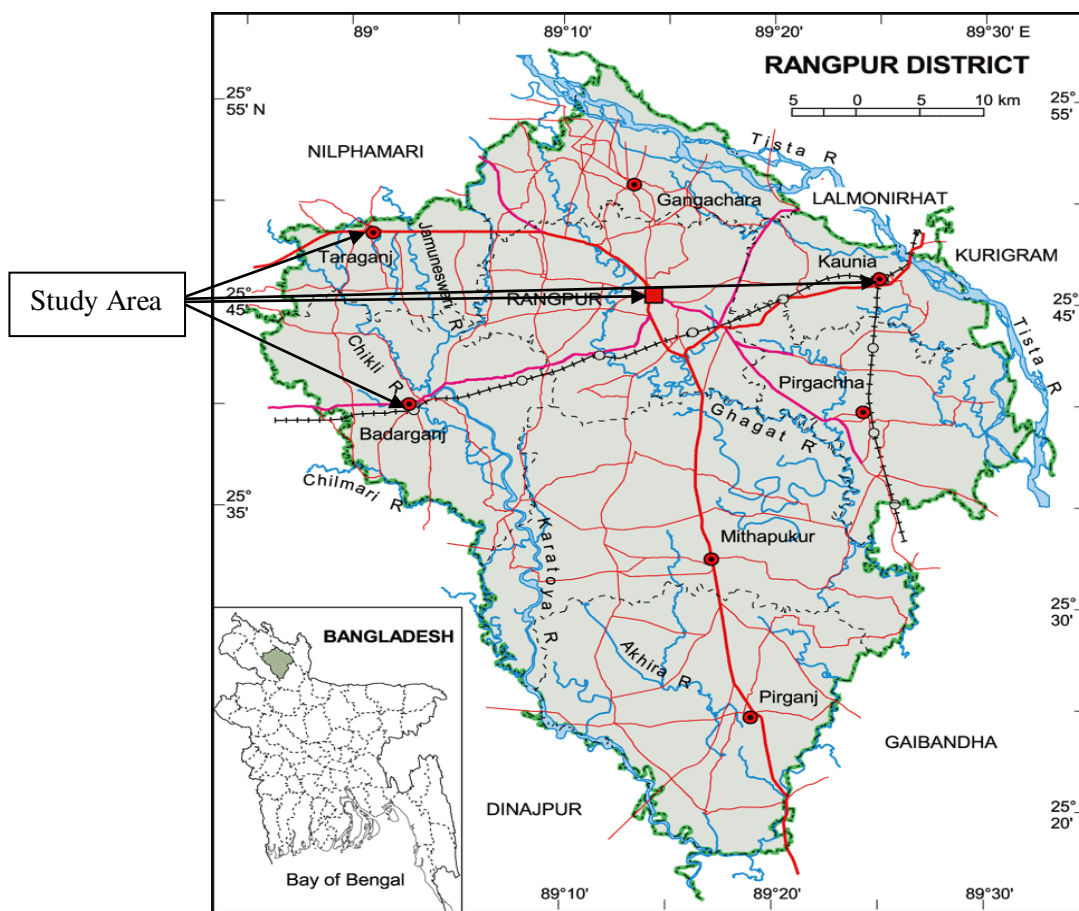


Figure 3.2 Map of Rangpur district showing the study areas



Figure 3.3 Map of Dinajpur district showing the study areas

3.4 Data Collection

The researcher himself collected data from the respondents with the help of interview schedule through personal interviewing. Sub-Assistant Agriculture Officer (SAAO) and AICC representatives of the selected AICC clubs helped to introduce the respondents with the researcher. Appointment with the respondents was made in advance with the help of SAAOs and AICC representatives of DAE. The researcher took all possible care to establish rapport with the respondents so that they don't hesitate to answer to the questions and statements. Whenever any respondent faced any difficulty in understanding any question care was taken to explain the same clearly. The researcher was also aware about side talking during data collection and tried to avoid that problem tactfully. Data were collected during 02 February to 16 March 2017. The researcher didn't face any serious difficulties during data collection.

3.5 Measurement of Variables

Farmers' i.e. age, educational qualification, family size, farm size, farming experience, annual family income, ICT training received, use of ICT enablers were the selected characteristics of the farmers. The focus issue of the study was farmers' attitude towards use of ICT enablers in agricultural activities.

3.5.1 Measurement of the focus issue

Farmers' attitude towards use of ICT enablers in agricultural activities was the focus issue of the study. This variable was measured through a 5 point Likert scale. Nine statements (4 positive and 5 negative) on various aspects of use of ICT enablers in agricultural activities were asked to the farmers. The positive and negative statements were arranged alternatively in the schedule in order to achieve the real picture of attitude of the farmers. There were five options to response a statement, namely 'strongly agree', 'agree', 'no option', 'disagree' and 'strongly disagree' with a corresponding score of 5, 4, 3, 2 and 1, respectively for the positive statements and the scoring was reversed for the negative statements. A respondent was asked to indicate his/her attitude regarding a statement by selecting the appropriate option. The attitude score of a respondent was computed by summing the scores for his responses to all the statements. Hence, scores of a respondent could range from 9 to 45; while 9 indicating highly unfavorable attitude and 45 highly favorable attitudes towards use of ICT enablers in agricultural activities. This variable appears in question no. 9 in the interview schedule as presented in Appendix A.

3.5.2 Measurement of selected characteristics

To keep the study manageable, eight selected characteristics of the farmers were considered. The procedures of measurement of the selected characteristics were as follows:

3.5.2.1 Age

The age of a respondent was measured in terms of actual years from his birth to the time of interview on the basis of his response. A score of one (1) was assigned for each year of age. This variable appears in the question no. 1 in the interview schedule as presented in Appendix A.

3.5.2.2 Educational qualification

Educational qualification was measured as the ability of the respondent to read and write or the formal education received up to a certain standard. A score of zero (0) was given to a respondent who could not read and write, a score of 0.5 was given to the respondent who could sign only and a score of one (1) was given for each year of formal schooling completed by the respondent e.g. one (1) for completing class one, two (2) for class two and so on. This variable appears in the question no. 2 in the interview schedule as presented in Appendix A.

3.5.2.3 Family size

Family size was measured in terms of actual number of members in the family of a respondent. The family members included the respondent himself, his wife, sons, daughters and other dependants. For example, if a respondent had five members in his family, his family size score will be 5. This variable appears in the question no. 3 in the interview schedule as presented in Appendix A.

3.5.2.4 Farm size

Farm size of a respondent was measured as the size of his farm on which he continued his farm practices during the period of study. Each respondent was asked to mention the homestead area, the land under his own cultivation, land given to others on *borga*, land taken from other on *borga*, land taken from others on lease system and others land (pond, poultry yard etc.).

The following formula was used in measuring the farm size:

$$\text{Farm size (FS)} = F_1 + F_2 + \frac{1}{2}(F_3 + F_4) + F_5 + F_6$$

where, F_1 = land under homestead

F_2 = own land under own cultivation

F_3 = land given to others on *borga*

F_4 = land taken from others on *borga*

F_5 = land taken from others on lease/mortgage

F_6 = others land (pond, poultry yard etc.)

The farm size of a respondent was calculated in acre. This variable appears in the question no. 4 in the interview schedule as presented in Appendix A.

3.5.2.5 Farming experience

Farming experience was operationalized by computing the total years of experience of a respondent's farming. The actual experience given by the respondents was measured in completed year(s). This variable appears in the question no. 5 in the interview schedule as presented in Appendix A.

3.5.2.6 Annual income

The annual income of a respondent was measured on the basis of yearly total earnings by all the family members from agriculture, service, business, wage labor and others (if any). A score of one (1) was assigned for each of "000" taka for measuring the annual family income of a respondent. This variable appears in the question no. 6 in the interview schedule as presented in Appendix A.

3.5.2.7 ICT training received

ICT training received of a respondent was measured by the total number of days he/she received training on different subject matters of ICT in his/her life from various organizations. A score of one (1) was assigned for each day of training participated by the respondent. This variable appears in the question no. 7 in the interview schedule as presented in Appendix A.

3.5.2.8 Use of ICT enablers

Use of ICT enablers was measured by nine items related to ICT enablers' utilization of farm information by the farmers. If a respondent use ICT for a particular item, then he was assigned 1 otherwise 0. Thus the scale of use of ICT enablers could range from 0 to 9, where 0 indicating no use and 9 indicating high use of ICT enablers for utilization of farm information. This variable appears in the question no. 8 in the interview schedule as presented in Appendix A.

3.6 Hypothesis of the study

As defined by Goode and Hatt (1952) “a hypothesis is a proportion, which can be put to a test to determine its validity. It may seem contrary to, or in accord with common sense. It may prove to be correct or incorrect. In any event, however, it leads to an empirical test.” In studying relationships between variables, research hypothesis were formulated which state anticipated relationships between the variables. However, for statistical test it becomes necessary to formulate null hypothesis. A null hypothesis states that there is no relation between the variables. If a null hypothesis is rejected on the basis of a statistical test, it is assumed that there is a relation between the concern variables. The following null hypothesis was formulated to examine the relationships between the eight selected characteristics of the AICC farmers and their attitude towards use of ICT enablers in agricultural activities.

The null hypothesis: "There is no relationship between eight of the selected characteristics of the AICC farmers and their attitude towards use of ICT enablers in agricultural activities ".

3.7 Data Analysis

At the end of data collection from the respondents, the collected data were coded, compiled, tabulated and analyzed. The local units were converted into standard units. The qualitative data were converted into quantitative data by appropriate coding techniques. Data were analyzed in accordance with objectives of the study. SPSS (Statistical Package for Social Sciences) computer program was used to perform the data analysis. Various statistical measures such as range, mean, number percentage, standard deviations and rank order were used to describe the selected characteristics of the respondents of the study area. In order to find out the relationship between the individual selected characteristics of AICC farmers and their attitude, Pearson's Product Moment Correlation Co-efficient (r) was computed.

CHAPTER 4

RESULTS AND DISCUSSION

In this Chapter, findings of the study and their logical interpretations have been presented according to the objectives of the study. Findings have been discussed in relation to other similar studies wherever these were applied. The chapter has been divided into three sections. The first section deals with the selected characteristics of the farmers, while second section deals with the attitude of the farmers towards using ICT enablers in agricultural activities and the relationships between the selected characteristics of the farmers with their use of ICT enablers have been discussed in the third section.

4.1 Selected Characteristics of the Farmers

In the study there were eight selected characteristics of farmers were considered, are: age, educational qualification, family size, farm size, farming experience, annual family income, ICT training received and use of ICT enablers for utilization of farm information. The findings of the selected characteristics of farmers are presented in Table 4.1 and have been discussed in the following sections.

4.1.1 Age

The observed age of the farmers ranged from 21 to 58 years. The mean age was 33.73 years with standard deviation of 8.47 years. The respondents were classified into three categories, such as young (<36 years), middle aged (36-50 years) and old (above 50 years) on the basis of their age as shown in Table 4.1.

The findings indicated that the highest proportion (72.2 percent) of the respondents in the study area was young aged category, while 20.00 percent belonged to middle aged and only 7.8 percent belonged to old aged category. It indicated that 92.2 percent of the respondents were young to middle-aged. Young and middle-aged farmers might have valuable opinions in using ICT enablers in agricultural activities. Young people are generally receptive to new ideas and things. They would have a favorable attitude towards in using ICT enablers in agricultural activities if necessary steps are taken to disseminate new technologies/practices to them. Khan (2012), Zakir (2010) also observed similar findings in their respective studies.

Table 4.1 Salient features of the selected characteristics of attitude of using ICT enablers in agricultural activities (n=90).

Characteristics	Scoring System	Possible range (Observed range)	Categories	Respondent (N=90)		Mean	SD
				No	%		
Age	Actual Years	Unknown (21-58)	Young (<36)	65	72.2	33.73	8.47
			Middle Aged (36-50)	18	20.0		
			Old (> 50)	7	7.8		
Educational qualification	Schooling Years	Unknown (0.00-15.00)	Illiterate (0)	8	8.9	8.27	5.00
			Can sign name only (0.5)	5	5.6		
			Primary level (1-5)	14	15.6		
			Secondary level (6-10)	39	43.3		
			Above Scondary(>10)	24	26.7		
Family Size	No. of members	Unknou (3-12)	Small household (1-4)	47	52.2	4.83	1.80
			Medium household (5-6)	32	35.6		
			Large household (above 6)	11	12.2		
Farm Size	Acre	Unknown (.28-3.15)	Landless farmer (0.00-0.49)	30	33.3	1.26	1.03
			Marginal farmer (0.50-1.49)	31	34.4		
			Small farmer (1.5-2.49)	10	11.1		
			Mediam Farmer (2.5-7.49)	19	21.1		
Farming Experience	Years	Unknown (2.00-25.00)	Low (<11)	39	43.3	13.19	6.13
			Medium (11-18)	29	32.2		
			High (>18)	22	24.4		
Annual family income	'000' Tk	Unknown (4.50-265.00)	Low income (<90)	54	60.00	88.32	76.50
			Medium income (90-180)	17	18.9		
			High income (>180)	19	21.1		
ICT training	Days	Unknown (.00-20.00)	No ICT training (<4)	43	47.8	2.45	4.27
			Weeklong ICT training (1-7)	43	58.3		
			More than Weeklon g(>7)	4	41.7		
Use of ICT	Score	0-9 (1-9)	Low (<4)	12	13.3	7.48	2.49
			Medium (4-6)	5	5.6		
			High (>6)	73	81.1		

4.1.2 Educational qualification

Educational qualification helps the farmers to broaden their outlook and expand their horizon of knowledge. Consequently an educated farmer can be considered as rational in his/her

thinking and evaluation. It is expected that educational qualification is one of the most important determining factors in receiving farm information by the farmers. Exposure to formal education is very important for structuring the behavior of an individual.

The educational qualification score of the respondents ranged from 0.00 to 15 years and the mean was 8.27 years with a standard deviation of 5.00 years. On the basis of scores obtained, the respondents were grouped into five categories. Among the respondents 8.9 percent are illiterate, 5.6 percent can sign name only, 15.6 percent are under primary level of education category, 43.3 percent had secondary level education and 26.7 percent are under above secondary level of educational qualification category (Table 4.1). Findings indicated that majority of the respondent had secondary education. However, as educational qualification has a vital role on farmers' attitude on new practice and using ICT enablers in agricultural activities.

4.1.3 Family size

The family size of the farmers ranged from 3 to 12 members. The average was 4.83 with a standard deviation of 1.80. On the basis of their household size, the farmers were classified into the following three categories such as: 'small family' (up to 4), 'medium family' (5-6) and 'large family' (above 6) category. Table 4.1 shows the distribution of the farmers according to their family size.

Results of Table 4.1 indicate that about 87.8 percent of the respondents belong to small and medium family. Existence of small and medium family in the study area may be due to appreciable adoption of modern family planning practices. Habib (2000) and Nurzaman (2000) also observed similar findings in their respective studies.

4.1.4 Farm size

The farm size of the farmers varied from (0.28 to 3.15) acre. The average farm size was 1.26 with a standard deviation of 1.03. The farmers were classified in accordance with the categorization of DAE (1999) as landless farmer (0.00-0.49 acre), marginal farmer (0.50-1.49 acre), small farmer (1.5 to 2.49 acre), medium farmer (2.50 to 7.49 acre). The distribution of the farmers according to their farm size is shown in Table 4.1.

About more than half (67.7 percent) of the respondents are landless and possessed marginal farms compared to 11.1 percent of them having small farms and 21.1 percent having medium farms. Ahmed (2013) and Haque (2002) also observed similar findings in their respective studies.

4.1.5 Farming experience

The farming experience score of the respondents ranged from (2 to 25 years) with a mean of 13.19 and standard deviation of 6.13. Based on the agricultural experience score, the respondents were classified into three categories: 'low' (below 9 years), 'medium' (9 to 18 years), 'high' (above 18 years). The distribution of the respondents according to their farming experience is shown in Table 4.1. Results of Table 4.1 show that 43.3 percent of the respondents had low farming experience, 32.2 percent had low experience and 24.4 percent of the respondents had high farming experience.

4.1.6 Annual family income

The annual family income of the respondents ranged from (4.5 to 265 thousand). The mean is 88.32 and standard deviation is 76.49. Based on their income scores, the farmers were classified into three categories: 'low income' (up to Tk. 90 thousand), 'medium income' (Tk. 90 to 180 thousand) and 'high income' (above Tk. 180 thousand). The distribution of the farmers according to their annual family income is shown in Table 4.1.

Results of Table 4.1 indicate that about half (60.0 percent) of the respondents had low income compared to 18.9 percent of them having medium and only 21.1 percent having high family income. About sixty percent of the farmers had low income it may be due to the fact that low income farmers were get privilege to involve in AICCs.

4.1.7 ICT training received

The ICT training received score of the respondents ranged from (0 to 20) with a mean of 2.45 and standard deviation of 4.25. Based on the ICT training received score, the respondents were classified into three categories: 'no training' (0), 'weeklong training' (1-7), 'more than weeklong training' (above 7). The distribution of the respondents according to their training exposure is shown in Table 4.1. Results of Table 4.1 show that about half (47.8 percent) of the respondents had no training, 47.8 percent had weeklong duration training and 4.4 percent of the respondents had more than weeklong duration ICT training received. Farmers of AICCs took training from both GO and NGOs. Rahman (2006) and Khan (2005) also observed similar findings in their respective studies.

4.1.8 Use of ICT enablers for utilization of farm information

The use of ICT enablers for utilization of farm information score is ranged from 1 to 9 with a possible range of 0 to 9 and the mean is 7.48 and standard is 2.49. The respondents were

classified into three categories low ICT use (less than 4), medium ICT use (4 to 6) and high ICT use (above 6) (Table 4.1). Results of Table 4.1 show that the majority of the respondents (81.1 percent) use high ICT enablers for utilization of farm information where as 13.3 percent fall under low ICT use and 5.6 percent fall under medium ICT use category.

4.2 Farmers' Attitude towards Using ICT Enablers in Agricultural Activities

Farmers' attitude towards using ICT enablers in agricultural activities was the main focus of the study. Attitude scores of the farmers varied from 14 to 44 against the possible range of 9 to 45. The mean is 30.14 and standard deviation is 7.12. Based on the observed attitude scores, the respondents were classified into three categories, low favorable attitude (<19); Favorable attitude (19-27) and highly favorable attitude (>27) as shown in Table 4.2.

Table 4.2 Distribution of the farmers according to their attitude towards using ICT enablers in agricultural activities

Categories	Frequency	Percent	Mean	SD
Low favorable attitude (<19)	11	12.2	30.14	7.12
Neutral attitude (19-27)	7	7.8		
Highly favorable attitude (>27)	72	80.0		
Total	90	100.0		

SD=Standard deviation

The majority (80.00 percent) of the farmers had highly favorable attitude towards using ICT enablers in agricultural activities compared to 12.2 percent had low favorable attitude and 7.8 percent had neutral attitude towards using ICT in agricultural activities.

4.3 Relationship between the Selected Characteristics of the Farmers and Their Attitude towards Using ICT Enablers in Agricultural Activities

The purpose of this section is to explore the relationships between each of the selected characteristics of the farmers and their attitude towards using ICT enablers in agricultural activities. Pearson's Product Moment Correlation Co-efficient (r) was used to test the null hypotheses concerning relationships between any two variables. Out of eight selected characteristics, the relationships of six variables with farmers' attitude towards using ICT enablers in agricultural activities were found significant and positive namely age, educational qualification, family size, farm size, ICT training received, use of ICT in utilization of farm information and one was found negatively significant namely farming experience. One non-significant relationship was found for annual income. The relationships between the selected characteristics of the farmers and their attitude towards using ICT enablers in agricultural

activities is presented in Table 4.3. The correlation matrix considering relationship between different variables is presented in Appendix B.

Table 4.3 Correlation between focus issue and the selected characteristics (N=90)

Focus issue	Selected characteristics	Co-relation coefficient (r) with df = 88
Farmers' attitude towards using ICT enablers in agricultural activities	Age	0.268*
	Educational qualification	0.631**
	Family size	0.455**
	Farm size	0.564**
	Farming experience	-0.266*
	Annual family income	0.057
	ICT training received	0.470**
	Use of ICT	0.762**

*Significant at 0.05 level of probability; **Significant at 0.01 level of probability

4.3.1 Age and attitude towards using ICT enablers in agricultural activities

The relationship between age of farmers and their attitude towards using ICT enablers in agricultural activities was measured by testing the null hypothesis, “there is no relationship between age of farmers and their attitude towards using ICT enablers in agricultural activities”. The computed value of “r” (0.268) was significant with 88 degrees of freedom at 0.05 level of probability (Table 4.3). Based on the above findings, the null hypothesis could be rejected and it was concluded that age of farmers had positive significant relationship with their attitude towards attitude towards using ICT enablers in agricultural activities.

4.3.2 Educational qualification and attitude towards using ICT enablers in agricultural activities

The relationship between educational qualification of the farmers and their attitude towards using ICT enablers in agricultural activities was measured by testing the null hypothesis, “there is no relationship between educational qualification of the farmers and their attitude towards using ICT enablers in agricultural activities”. The computed value “r” (0.631) was significant with 88 degrees of freedom at 0.01 level of probability (Table 4.3). Hence, the null hypothesis is rejected. It was therefore concluded that educational qualification of the farmers had significant relationship with their attitude towards using ICT enablers in agricultural activities.

4.3.3 Family Size and attitude towards using ICT enablers in agricultural activities

The relationship between educational qualification of the farmers and their attitude towards using ICT enablers in agricultural activities was measured by testing the null hypothesis, “there is no relationship between family size of the farmers and their attitude towards using ICT enablers in agricultural activities”. The computed value of “r” (0.455) was significant with 88 degrees of freedom at 0.01 level of probability (Table 4.3). So the concerned null hypothesis is rejected and it can be concluded that the family size of the members had significant relationship with their attitude towards using ICT enablers in agricultural activities.

4.3.4 Farm Size and attitude towards using ICT enablers in agricultural activities

The relationship between farm size of the farmers and their attitude towards using ICT enablers in agricultural activities was studied by testing the concerned null hypothesis, “there is no relationship between farm size of the farmers and their attitude towards using ICT enablers in agricultural activities”. The computed value of “r” (0.564) was significant with 88 degrees of freedom at the 0.01 level of probability (Table 4.3). So the concerned null hypothesis can be rejected and it can be concluded that the farm size of the farmers had significant relationship with their attitude towards using ICT enablers in agricultural activities. These findings clearly indicate that there is a positive relationship between farm size of the farmers and their attitude towards using ICT enablers in agricultural activities. The reasons behind this phenomenon may be that farmers with large farm can easily test ICT tools and take a decision which might not be possible for a farmer a low farm size. In other words, large farmers are more responsive to new technology as they have enough risk taking capability than small farmers.

4.3.5 Farming experience and attitude towards using ICT enablers in agricultural activities

The relationship between farming experience of farmers and their attitude towards using ICT enablers in agricultural activities was measured by testing the null hypothesis, “there is no relationship between farming experience of the farmers and their attitude towards using ICT enablers in agricultural activities”. The computed value of “r” (-0.266) was negatively significant with 88 degrees of freedom at 0.05 level of probability (Table 4.3). Based on the above findings, the null hypothesis was rejected and it was concluded that farming experience have negative significant relationship with their attitude towards using ICT enablers in agricultural activities . The findings indicated that there was a negative relationship between

farming experience of the farmers and their attitude towards using ICT enablers in agricultural activities.

4.3.6 Annual family income and attitude towards using ICT enablers in agricultural activities

The relationship between annual family income of the farmers and their attitude towards was measured by testing the null hypothesis, "there is no relationship between annual family income of the farmers and their attitude towards using ICT enablers in agricultural activities". The computed value of "r" (0.057) was no significant relationship with 88 degrees of freedom (Table 4.3). Based on the above findings, the null hypothesis could not be rejected and it can be concluded that annual income of the farmers had no significant relationship with their attitude towards using ICT enablers in agricultural activities.

4.3.7 ICT training received and attitude towards using ICT enablers in agricultural activities

The relationship between ICT training received by the farmers and their attitude towards using ICT enablers in agricultural activities was studied by testing the null hypothesis, "there is no relationship between ICT training received by the farmers and their attitude towards using ICT enablers in agricultural activities". The computed value of "r" (0.470) is significant with 88 degrees of freedom at 0.01 level of probability (Table 4.3). Thus, the null hypothesis is rejected and it can be concluded that ICT training received by the farmers had a positive significant relationship with their attitude towards using ICT enablers in agricultural activities. This indicates that the ICT training received had relation with the development of favorable attitude towards using ICT enablers in agricultural activities.

4.3.8 Use of ICT and attitude towards using ICT enablers in agricultural activities

The relationship between use of ICT for utilization of farm information by the farmers and their attitude towards using ICT enablers in agricultural activities was studied by testing the null hypothesis, "there is no relationship between use of ICT and their attitude towards using ICT enablers in agricultural activities". The computed value of "r" (0.762) is significant with 88 degrees of freedom at 0.01 level of probability (Table 4.3). Thus, the null hypothesis is rejected and it can be concluded that use of ICT had a positive relationship with their attitude towards using ICT enablers in agricultural activities. This indicates that the use of ICT for utilization of farm information had influence on the development of favorable attitude of the farmers towards using ICT enablers in agricultural activities.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary of the findings, conclusions and recommendation of the study.

5.1 Summary of the Findings

The major findings of the study have been summarized in the following sections.

5.1.1 Selected characteristics of the farmers

Age: The observed age of the farmers ranged from 21 to 58 years. The mean age was 33.73 years with standard deviation of 8.474 years the highest proportion (72.2 percent) of the respondents in the study area was young aged category, while 20.00 percent belonged to middle and only 7.8 percent belonged to old aged category.

Educational qualification: The educational qualification of the respondents ranged from 0 to 15 years of schooling and the mean was 8.27 with a standard deviation of 5.00. Among the respondents, 8.9 percent are illiterate, 5.6 percent can sign name only, under primary level of education is 15.6 percent, 43.3 percent had secondary level education, and above secondary level of education was 26.7 percent.

Family size: The family size of the farmers ranged from 3 to 12 members. The mean was 4.83 with a standard deviation of 1.80. It was found that 87.8 percent of the respondents belong to small and medium family.

Farm size: The farm size of the respondents varied from 0.28 to 3.15 acre. The mean farm size was 1.26 acre with a standard deviation of 1.03. About more than half (67.7 percent) of the respondents were landless and possessed marginal farms compared to 11.1 percent of them having small farms and 21.1 percent having medium farms.

Farming experience: The farming experience score of the respondents ranged from 2 to 25 years with a mean of 13.19 years and standard deviation of 6.13. It was found that 43.3 percent of the respondents had low experience, 32.2 percent had medium experience and 24.4 percent of the respondents had high farming experience.

Annual family income: The annual family income of the farmers ranged from Tk. 4.5 to 265 thousand. The mean was Tk. 88.32 thousand with a standard deviation of Tk. 76.49 thousand. It indicates that more than half (60.0 percent) of the respondents had low income compared to (18.9 percent) of having medium and only 21.1 percent having high annual family income.

ICT training received: The ICT training received score of the respondents ranged from 0 to 20 days with a mean of 2.45 days and standard deviation of 4.27. It was found that 47.8 percent of the respondents had no training, again 47.8 percent had weeklong duration training and 4.4 percent of the respondents had more than weeklong duration training.

Use of ICT for utilization of farm information: The observed score of use of ICT for utilization of farm information ranged from 1.00 to 9.00 and with a mean of 7.48 and standard deviation of 2.49. It was found that 81.1 percent of the respondents fall under high, 13.3 percent under low and 5.6 percent under medium category of use of ICT for utilization of farm information.

5.1.2 Farmers' attitude towards using ICT enablers in agricultural activities

Farmers' attitude towards using ICT enablers in agricultural activities was the focus issue of the study. Attitude scores of the farmers varied from 14 to 44 against a mean of 30.14 and standard deviation of 7.12. The majority (80 percent) of the farmers had highly favorable attitude towards using ICT enablers in agricultural activities compared to 12.2 percent had low favorable attitude and 7.8 percent had neutral attitude towards using ICT enablers in agricultural activities.

5.1.3 Relationship between focus issue and selected characteristics

Out of eight selected characteristics, the relationships of six variables with farmers' attitude towards using ICT enablers in agricultural activities were found significant and positive namely age, educational qualification, family size, farm size, ICT training received, use of ICT in utilization of farm information and one was found negatively significant namely farming experience. One non-significant relationship was found for annul income.

5.2 Conclusions

The following conclusions are drawn on the basis of the findings of the study and logical interpretation of their meaning by the researcher.

1. The findings of the study indicate that the majority (80 percent) of the farmers had highly favorable attitude towards using ICT enablers in agricultural activities. So, a appreciable number of farmers have positive attitude towards use of ICT enablers in agricultural activities.
2. ICT training of the farmers' had significant positive relationship with their attitude towards using ICT enablers in agricultural activities. These findings reveled that ICT training improve farmers' skill to use ICT and motivate farmers to use ICT enablers in agricultural activities.

3. A significant positive relationship was found between use of ICT for utilization of farm information and farmers' attitude towards using ICT enablers in agricultural activities. Thus, it may be concluded that the farmers who were highly ICT user have more favorable attitude of using ICT enablers in agricultural activities.
4. The findings indicate that farming experience had negative relationship with attitude formation of farmers. Farmers with high experience might have high confidence level at farming. Thus, they might not feel ICT enablers as friendly to use in agricultural activities. That might be the reason of having negative relationship between farming experience and attitude towards using ICT enablers in agricultural activities.
5. Annual income of the farmers has no significant relationship with their attitude towards using ICT enablers in agricultural activities. These variables seem to have no major influence in forming attitude of the farmers.
6. Educational qualification was found having positive relationship with attitude towards using ICT enablers in agricultural activities. Education broadens the horizon of outlook of an individual. This might help the individual to form favorable attitude towards using ICT in agricultural activities.

5.3 Recommendations of the Study

Based on the findings and conclusion of the study, the following recommendations are presented:

5.3.1 Recommendations for policy implications

1. As ICT enablers can be used as a user friendly device, government should take different strategies to prepare ICT based agricultural extension services for supporting farmers.
2. Different ICT enablers need to be made easily accessible by the farmers in their local community and farmers' skill development programs to operationalize ICT tools need to be emphasized by different development programs.
3. The farmers mostly belonged to young aged groups. It is recommended that extension programs should include ICT training with equal emphasis to all age groups by giving special emphasis to young farmers.
4. A large portion of the farmers in the study area were under secondary educational level. These educated farmers need to be considered and emphasized as model farmers to trickle down extension services to neighbor farmers.

5. Different government and Non Government Organizations (NGOs) should take programs for strengthening extension services by regular training, group discussion meeting, and field visit to increase the informal education by giving more emphasis on ICT enablers during the programs.

5.3.2 Recommendations for Further Studies

This study was conducted on the attitude of the farmers towards using ICT enablers in agricultural activities. In order to have deeper insight further studies needed to be conducted covering the following aspects:

1. The study was conducted in limited areas of Rangpur and Dinajpur districts. Findings of the study need verification by the similar research in other parts of the country.
2. In this study the relationship of eight characteristics of the farmers towards using ICT enablers in agricultural activities was considered. Therefore, it is recommended that further studies should be conducted with other variables.
3. Further research is necessary to find out the effective ways and means which would contribute in utilization of ICT enablers in agricultural activities.
4. Age, educational qualification, family size, farm size, ICT training received, use of ICT for utilization of farm information of the farmers were found significantly related with their attitude towards using ICT enablers in agricultural activities. Further investigation may be undertaken to verify the results.
5. Further research is necessary to find out the effective ways and means which would contribute in more efficient extension service by using ICT enablers in agricultural activities.
6. Research should also be undertaken to identify the further factors causing the hindrances towards use of ICT enablers in agricultural activities.
7. Further research can be undertaken to study specific farmers' groups, such as landless farmers or young farmers so as to get a clear understanding of the ICT related problems using specific indicators.
8. An attempt to conduct few case studies with regard to get in-depth information about the ICT related issues can be considered in future research.

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APPENDIX A

An English Version of Interview Schedule

Department of Agricultural Extension

Hajee Mohammad Danesh Science and Technology University, Dinajpur

An interview schedule of the research study entitled

Farmer's Attitudes towards Using ICT Enablers in Agricultural Activities

Name of the respondent: Sl. No.....

Village : Union :

Upazila :District :

1. **Age:** Please mention of your present age? Years

2. **Educational qualification:** Mention your educational qualification.

a) Can't read and write

b) Can sign name only

c) Passed class

3. **Family size:** Please mention your total number of family members (including yourself).

Male	-----	Female	-----	Total=	-----
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4. Farm size

Please mention the area of land in the following heads.

Type of ownership	Local unit	Hectare
F ₁ - Homestead		
F ₂ - Own land under own cultivation		
F ₃ - Land given to others on <i>Borga</i>		
F ₄ - Land taken from others on <i>Borga</i>		
F ₅ - Land taken from others on lease/mortgage		
F ₆ - Others land (pond, poultry yard etc.)		
Total		

5. Farming experience

For how many years you are involved in farming? Years.

6. Annual family income

Sl.	Sources	Income
a.	Agriculture	
b.	Service	
c.	Business	
d.	Wage labor	
e.	Others	
	Total	

7. ICT training received

Have you received any ICT training?

Yes days

No

8. Use of ICT enablers in utilization of farm information

Have you use ICT enablers for utilization of the following farm related information?

Items	Yes	No
i) Get information on new varieties		
ii) Get information on market situation		
iii) Exchange of agricultural knowledge and ideas with fellow farmers		
iv) Exchange of agricultural knowledge and ideas with extension workers		
v) Acquire agricultural information from research institution		
vi) Acquisition of agriculture related skill		
vii) Get information on farm inputs availability, cost and where to obtain them		
viii) Searching for recent information or innovation on agriculture		
ix) Searching for places where my farm products are highly needed		

9. Attitude towards use of ICT enablers

	Statements	Strongly agree	Agree	No opinion	Dis-agree	Strongly disagree
1.(+)	Mobile phone is very helpful in getting information regarding farming					
2.(-)	It is hard to get information from internet					
3.(+)	AICC clubs are very useful in getting updated information					
4.(-)	SMS are not much useful for getting farm information					
5.(+)	Using the e-mail make communication easier, quickly and less costly					
6.(-)	The mobile phone is too expensive to use					
7.(+)	By using the internet I will know what is happening in the rest of the World					
8.(-)	Information quality received by ICTs are less authentic compared to traditional extension sources					
9.(-)	I don't want to learn how to use the internet					

Thanks for your kind cooperation.

Signature of interviewer

Appendix B

Correlation matrix between focus issue and selected characteristics

	Age	Educational qualification	Family size	Farm size	Annual family income	Farming Experiences	ICT training received	Use of ICT for utilization of farm information	Attitudes towards using ICT enablers in agricultural activities
Age	1								
Educational qualification	0.281**	1							
Family size	0.432**	0.300**	1						
Farm size	0.257*	0.714**	0.353**	1					
Annual family income	-0.192	-0.078	-0.314**	0.016	1				
Farming Experiences	0.270*	-0.363**	-0.233*	-0.288**	-0.008	1			
ICT training received	-0.080	0.573**	0.409**	0.650**	-0.200	-0.355**	1		
Use of ICT for utilization of farm information	0.083	0.480**	0.144	0.390**	0.279**	-0.124	0.198	1	
Attitudes towards using ICT enablers in agricultural activities	0.268*	0.631**	0.445**	0.564**	-0.266**	0.057	0.470**	0.762**	1

* Correlation is significant at the 0.05 level ; ** Correlation is significant at the 0.01 level