

Farmers' Access to Agricultural Market Information Using ICTs

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CERTIFICATE

This is to certify that the thesis enlighten, “**Farmers’ Access to Agricultural Market Information Using ICTs**” submitted to the faculty of agriculture, Sher-e-Bangla Agricultural University, Dhaka in partial fulfilment of the requirements for the degree of **MASTER OF SCIENCE IN AGRICULTURAL EXTENSION**, embodies the result of a piece of bona fide research work conducted by **SAIMA SHIDDIQUA, Registration no. 10- 04148** under my supervision and guidance. No part of this thesis has been submitted for any other degree or diploma.

I further certify that any help or source of information, received during the course of this study has been dully acknowledgement.

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***Dedicated to
My
Beloved Parents***

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ABBREVIATION AND ACRONYMS

AICC	=	Agriculture Information and Communication Centers
AIS	=	Agricultural Information Service
AMIS	=	Agricultural Market Information System
BAU	=	Bangladesh Agricultural University
BBS	=	Bangladesh Bureau of Statistics
DAE	=	Department of Agricultural Extension
FAO	=	Food and Agriculture Organization
GOB	=	Government of Bangladesh
HYV	=	High Yielding Variety
ITU	=	International Telecommunication Union
MMS	=	Multimedia Message Service
MOA	=	Ministry of Agriculture
NGO	=	Non-Government Organization
SMS	=	Short Message Service
SPSS	=	Statistical Package for Social Science
SAAO	=	Sub-Assistant Agriculture Officer
SAU	=	Sher-e-Bangla Agricultural University
UNDP	=	United Nations Development Program

Farmers' Access to Agricultural Market Information Using ICTs

ABSTRACT

The primary objectives of this study were i) to determine the extent of Information and Communication Technologies (ICTs) use by the farmers for receiving agricultural market information, and ii) to identify the factors that influence farmers' choice on use of ICTs for receiving agricultural market information. Attempt was also made to explore the influence of the selected factors on the use of ICTs for receiving agricultural market information. Two villages from Rajbari sadar upazila under Rajbari district were selected as the study area. Proportionate random sampling technique was used to determine the sample size (here, 127) drawn from 620 farm families. Data were collected by the researcher herself using a well-structured interview schedule. Multiple regression analysis revealed that ICT ownership, ICT literacy, distance home to market and innovativeness had significant contribution to farmers' use of ICTs for receiving agricultural market information which explained 81.8% of the variance of ICTs use while perceived usefulness was found to be non-significant to ICTs use.

CHAPTER I

1 INTRODUCTION

1.1 General Background

The thesis is framed within the research area of Information and Communication Technologies (ICTs), which is concerned about understanding specifically how ICTs can leverage farmers' access to agricultural market information, therefore, fostering farmers' better economic gain. It aims to investigate to what extent farmers use ICTs in rural Bangladesh particularly receiving time-sensitive agricultural marketing information. Also, it highlights some salient factors that seems to have an influence on farmers' choices of using ICTs in receiving agricultural information. There have been enormous attempts to develop Agricultural Market Information Systems (AIMS), however many of them either suffered for sustainability issue due to withdraw of financial support or failed to draw much attention to the intended end-users (Islam and Gronlund, 2010). Nonetheless, if AMIS is properly designed and implemented, it might induce more transparency in agriculture market price, reduce information asymmetry, increase farmers' bargaining power in negotiated deal and improve market access. Despite Department of Agricultural Marketing (DAM)¹ under the Ministry of Agriculture, Government of the People's Republic of Bangladesh launched a website listing Market- and district-wise daily retail prices, this has been proven ineffective for rural poor farmers who might have no access to the Internet. While the resource poor farmers of Bangladesh are yet not to be ready for using Web-based AMIS (Alam and Wagner, 2013), their use of ICTs, particularly mobile phone seems to be impressive. Therefore, rather than investigating farmers' access to DAM's Website for agricultural market price, this study investigated farmers' overall use of ICTs for accessing agricultural market price from various information sources ranging from mobile phone, Internet to TV and radio.

Agriculture is the most prominent employment sector of a country like Bangladesh where 63 percent of the population directly and indirectly involved in agriculture (BBS, 2012). Despite a quick urbanization effect, majority of the people still live in rural areas and their major earning source is agriculture. Hence, agricultural development has been recognized as vital for rural growth by increasing rural income and improving rural

¹ <http://www.dam.gov.bd/damweb/jsp/index.jsp>

livelihoods that in turns positively impact national GDP. While there are many prevailing factors, farmers' poor access to marketing facilities is found to be one of the important factors that limit rural farmers to reap the best harvest from agriculture. Information asymmetry and unfavorable policy matters of market prevent the farmers to get their real product price. Furthermore, farmers' lack of education and proper their produce. Therefore, this study sheds light on a topic of growing interest to assess ICTs' roles in enabling resource poor farmers to market their produce in fair price.

An efficient pricing system helps in giving information to the farmers about price of different crops. It also inform them to what to sell or store and what to plan for future agriculture. Traditionally, small-scale farmers are dependent on the intermediaries such as wholesalers, retailers, and often deprived of fair pricing for their produce. ICTs can help to remove these market inequalities by reducing information search costs and build better market linkage (Alam and Wagner, 2013).

1.2 Statement of the Problem

Ubiquitous technologies like mobile phones are not only useful for communication but also creates opportunities in receiving time-sensitive pricing information. A farmer having a mobile phone can be well connected to his farming communities such as progressive farmers, input dealers, and agricultural support staffs. Better connectivity also helps a farmer to be updated with product demand and price. However, for most instances, small-scale farmers do not get the proper price of their produce due to less access to the market information. Despite of having few evidences of ICTs impact in rural livelihoods, it has till now been quite unclear the present status of farmers' use of ICT for accessing agricultural market information, and have lack the evidence of the most complaining factors that drive farmers to use ICTs over the traditional media for accessing agricultural market information. Above all, this study sheds new light of the phenomenon of interest that will provide valuable insight to design appropriate ICT-based solutions for farmers of rural Bangladesh. Hence, this study tends to address the following research questions:

1. To what extent farmers use ICTs to receive agricultural market information?
2. What factors determine farmers' choice of use of ICTs to receive agricultural market information?

3. To what extent these factors explain farmers' choice of using ICTs to receive agricultural market information?

On the basis of the above discussion, the researcher undertook this study, entitled "Farmers' Access to Agricultural Market Information Using ICTs".

1.3 Specific Objectives of the Study

On the basis of the above mentioned problems, the following objectives have been formulated to guide the research:

- i. To describe the selected characteristics of the farmers,
- ii. To identify the factors those influence farmers' choice of using ICTs for accessing agricultural market information,
- iii. To determine the extent of ICTs use by the farmers to access agricultural market information, and
- iv. To explore the influence of the identified factors to the extent of ICTs use by the farmers for accessing agricultural market information.

1.4 Scope and Limitations of the Study

There are great scope for working research with ICTs because of the farmers are increasingly using their handheld mobile devices for obtaining information regarding agriculture such as crops health and diseases, availability of seeds and fertilizers, new agricultural practices and pricing information of their produce as well. The findings of the study will be particularly applicable to the Parshadipur and Roshora village under Mulghor Union of Rajbari district however this may applicable in other areas where the physical, socio-economic and cultural conditions are the same as the study area. These findings may be beneficial for the extension workers, policy makers, planners and field workers for successful planning and extension of programs aimed to effective communication of agricultural market information to the farmers using ICTs in general.

The main aim of the study was to determine farmers' access to agricultural market information using ICTs. However, in order to fulfill the research in purposeful and controllable way it becomes important to oblige certain limitations regarding certain aspects of the study. Seeing the time, money and necessary resources available to the researcher the following limitations have been identified throughout the study.

- i. The study was conducted in only Parshadipur and Roshora village of Mulghor union under the Rajbari district.
- ii. Population for the study was kept confined within the heads of the families of the farmers.
- iii. The farmers possessed many characteristics. Among the variation of characters only few characteristics that seem to be relevant in the context of this research were selected for investigation.
- iv. The respondents group use ICTs for various purposes, however this study only investigate ICTs use for receiving agricultural market information.
- v. The research was dependent on the data collected from the selected farmers.

1.5 Assumptions

The following assumptions were made in conducting this study:

- i. The respondents in the sample of the study were able to provide their opinions and were competent enough to satisfy the queries.
- ii. The information provided by the respondents were reliable.
- iii. The ICT users included in the sample were the actual representative of the population.
- iv. The researcher who acted as interviewer was well adjusted to the social and cultural environment of the study area. Hence, the data collected by her from the respondents were free from bias.
- v. The finding of the study will be useful to plan and design efficient ICT-based service that may facilitate users for receiving agricultural market information.

Study on the use of ICTs by the farmers for receiving agricultural market information was conducted in very limited area of Bangladesh. A very few studies in this regard had so far been conducted especially in the context of Bangladesh, therefore, the study is expected to add new insight to the body of knowledge about the ICTs used by the farmers for accessing agricultural market information.

1.6 Definition of the Terms

ICT: ICT stands for ‘Information and Communication Technologie’. ICT refers to technologies that provide access to information through telecommunications. It is similar to Information technology (IT), but focuses primarily on communication

technologies. This includes the Internet, wireless networks, cell phones and other communication mediums.

Agricultural Market Information: An agricultural market information refers to all time-sensitive market- and prices-related information for the farmers, traders, processors and others.

Age: Age in this study was measured in years from a respondent's date of birth to the date of interview.

Education: The act or process of acquiring knowledge systematically during childhood and adolescence.

ICT Ownership: It refers to the possession of different ICT tools by the respondent at the time of interview.

Internet: A global computer network providing a variety of information and communication facilities, consisting of interconnected networks using standardized communication protocols.

Radio: Radio is the technology that carries information, such as sound by transmitted electromagnetic energy through space. Radio system needs an antenna to convert electric currents into radio waves. A radio communication system sends signals by radio.

Television: Television is the system or process of producing on a distant screen a series of transient visible images, usually with an accompanying sound signal. Electrical signals, converted from optical images by a camera tube, are transmitted by UHF or VHF radio waves or by cable and reconverted into optical images by means of a television tube inside a television set.

Mobile phone: Mobile phone means a telephone with access to a cellular radio system so it can be used over a wide area, without a physical connection to a network.

Smartphone: A mobile phone that performs many of the functions of a computer, typically having a touchscreen interface, Internet access and an operating system capable of running downloaded applications.

Mobile application: A mobile application, most commonly referred to as an app, is a type of application software designed to run on a mobile device, such as a smartphone

or tablet computer. Mobile applications frequently serve to provide users with similar services to those accessed on PCs.

Website: A connected group of pages on the World Wide Web regarded as a single entity, usually maintained by one person or organization and devoted to a single topic or several closely related topics.

SMS: Short Message Service (SMS) is a text messaging service component of most telephone, World Wide Web and mobile telephony systems. It uses standardized communication protocols to enable mobile phone devices to exchange short text messages.

MMS: Multimedia Messaging Service (MMS) is a standard way to send messages that include multimedia content (e.g., image) to and from a mobile phone over a cellular network.

CHAPTER II

2 REVIEW OF LITERATURE

The available literature for the present research are made by the researcher herself. The literature were reviewed to find out the work in the world and in Bangladesh with most of the major objectives of this study. This chapter divided into three sections. First section deals with the historical background of AMIS (Agricultural Market Information Service) in developing countries. Second section deals with the conceptualizing agricultural marketing and ICTs' roles in agricultural marketing information dissemination. Finally, the third section deals with the relationship between farmers' personal, situational and ICT-related factors and their use of ICTs for accessing agricultural market information followed by the conceptual framework of the study.

2.1 History of Agricultural Market Information System in Developing Countries

Since early 1990s many governments from the developing world adopted economic reforms in agricultural market liberalization with an intention to reduce the bias against agriculture, open the sector to market forces and promote private sector activities and fostering competitive markets. Most government encourage liberalization as a means to reduce costs in the marketing system, thereby rising and stabilizing farm incomes, promoting farmers' incentives to use productivity-enhancing inputs, and reducing poor households' dependence on food aid for their survival. However, there was a concern that market liberalization might result in less transparent marketing and loss of market power by farmers. Thus, the need for a performing market information system (MIS) came up. Thus MIS in Sub-Sahara Africa (SSA) emerged as a result of economic liberalization policies and structural adjustment, when governments stopped intervening directly in the markets. These MIS were intended to correct the asymmetries created by economic liberalization giving more bargaining power to farmers, creating a more transparent, open trading environment and fostering more efficient market systems for all stakeholders.

African countries were the pioneer in developing and launching AMIS such as Zambia established an Agricultural Market Information Centre (AMIC) in 1993 as part of the policy of market liberalization to collect, analyze and disseminate market information on agricultural produces and inputs. In 1992, the Ethiopian government established

Ethiopian Grain Trading Enterprise (EGTE) after downsizing the Agricultural Marketing Corporation. The role of EGTE was to stabilize producer and consumer prices and maintain buffer stocks. The Malian government established the Agricultural Market Observatory (AMO) in 1989 to oversee the proper functioning of the data collection, transmission and diffusion of data and information i.e. the prices and the quantities of both agricultural products and inputs prior to establishment of OMA. The Malian government had the programme de Restructuration du Marche' Cerealier (PRMC) which among other functions, provided market information to consumers and others in the private and public sectors. In 1991, Mozambique started Agricultural Market Information System to provide agricultural market information including data on agricultural prices of the main crops cultivated in the country, input supply and seed availability, and information on production and demand estimates.

Access to agricultural market information was very limited initially. Different media such as radio, TV, newspapers, word of mouth and bulletin boards were used in the provision of marketing information at selected markets. Information was generally disseminated periodically and for selected markets and produces. Therefore, market information was limited to small number of markets and to a few individuals. Also, radio broadcasts could not cover large areas and information communicated was not timely. Although great costs were involved in collecting information, dissemination was inefficient. Consequently, remote farmers, traders, and consumers were not favored and could not participate in marketing activities effectively. In recent past, many ICT-based AMIS for example Xam Marse ("Know Your Market") of Senegal, CAMIS of Cambodia, Farmprice of Zambia, KACE-MILS of Kenya, TradeNet of Ghana, FoodNet of Uganda, RESIMAO/WAMISNet of Wet Africa and AMIS in Bangladesh (Islam and Alawadhi, 2008) have been launched to reduce price dispersion and information search costs, overcome information asymmetry and ensure more transparency in supply chain.

2.2 Conceptualizing Agricultural Marketing

Marketing is not simply an extension of the production process but it is a series of services involved in moving a product (or commodity) from the point of production to the point of consumption (Dixie, 1989). In other words, agricultural marketing is the performance of all business activities involved in the flow of food products and services from the point of initial agricultural production until they are in the hand of consumers (Kohls and Uhl, 1990). Traditionally in a supply chain management system, multiple

parties involved from production to sell to the consumer. Due to several socio-demographic factors, for example low literacy, less mobility and accessibility to different markets, growers often deprived of fair price for their produce while the intermediaries like wholesalers reap the best out of the process. Structural and institutional features of intermediation that tends to generate monopsony or oligopoly in the trade, resulting in depressed prices for producers or high consumer prices (Reardon and Timmer, 2005). Studies done by Harris (1979), Crow and Murshid (1994) also supported this thought. These works generally emphasis on the complexity in describing exchange relations and institutional arrangements between a large and diverse number of market actors (Olsen 1999, Crow 2001, Harriss-white, 2008). For example, Crow (2001) concluded that structure of grain and finance markets are mostly accrued by the rich.

Different studies conducted on the agricultural marketing system revealed that intermediaries are absorbing the major benefits from the market which lead to the farmers' unfair price getting and high price paid by the consumers. Masud (2012) conducted a study on the value chain of dried fish in Bangladesh. Their studies revealed that there are four to five channels through which dried fish reach to the ultimate consumers after being added value at different stages. Murshid (2011) divided the agricultural market into two circuits i) a simple local circuit that connects local localized demand; and b) a more complex long distant circuit that connects local supplies to distant markets where trades basically revolves around spatial arbitrage along with some degree of temporal arbitrage. Typically the market consists of a number of essential intermediation roles carried out by numerous specialized agents. Mondol (2010) reported that productive farmers of Bangladesh mainly belong to small and marginal categories yet they do not have any farmers association or co-operative to bargain for fair prices of their produce. They are thus forced to sell their products at a low price to intermediaries. In Philippine assemblers-wholesalers are the major players in the distribution of most agricultural commodities like potatoes and vegetables. Intermediaries have both the financial and logistic capability to procure and transport agricultural products to the major demand centers. Some of intermediaries also provide financing and cash advances to farmers to guarantee the volume of procurement (FRLD, 1995, p. 42). Bayes and Hossain (2007) showed the vulnerability forces small-scale farmers to sell their produce at very low price in the market. They also noticed

that the size of the farm is negatively related to the distress sale. It found that within a month after the harvest, small farmers have to take two-third of their products to the market for sale. For small, medium and large farms it is 59%, 40% and 27% respectively. It proves that small farmers are forced to sell their product in the market after the harvest to meet their necessary requirements rather than to get profit from the selling. Different studies on agricultural marketing of Bangladesh explores that farmers of this country are always deprived of fair price for their products due to plethora of middleman like beparis, farias, wholesalers, commission agents/aratdars, contract-buyers, cold storage operators, wholesaler-retailers, assembler-wholesalers, hawkers and retailers and they also force the farmers to sell their products to them by tying up some conditions (Sultana, 2012).

The middleman or intermediaries in the agricultural market create artificial shortage in the supply and increase the price of the product (Chowdhury, 2006). To overcome the unexpected interruptions by intermediaries in the market, an effective marketing system or structure is essential to ensure the proper distribution of agricultural products from growers to consumers and ensure the fair price for both parties. ICT-based solutions therefore might work well to reduce the unexpected interruption of the intermediaries in the supply chain of farm products and ensure fair price for farmers.

Imperfect information and high transaction costs were the major impediments in the agricultural marketing process (Dao, 2004). Kizilaslan (2006) argues that proper dissemination of information for agricultural and rural communities is a crucial tool to fight against poverty and deprivation. Information helps the poor to avail the opportunities and also reduce their vulnerability. Kiplang (1999) postulates that dissemination of relevant information to the farming communities can facilitate the effective adoption of agricultural inputs, decision making on markets and adoption of scientific methods. However, lack of dissemination of information across the agricultural supply chain is a major concern in the developing world. With the access to information, small-scale farmers are better able to compete with the big farmers thus increase their bargaining power. They can even develop knowledge regarding crop choices, develop products for the niche markets and even can market the products directly to the consumers.

2.3 Relationship between the Selected Factors and Farmers' Access to Agricultural Market Information Using ICTs

Selection and measurement of variables are the most important tasks in an empirical research. 'Independent' known as predictor variable and 'dependent' known as criterion variable are the two most important elements in a research model. When the researcher introduces, removes or displace the independent variables, the dependable variable appears or disappears. Farmers' access to agricultural market information using ICTs was the key focus of the study which might affect by several factors. In this study a total of five (5) selected factors were considered (

Figure 2.1) where age, education, farming experience and ICT use experience were used as control variables. The rest of the variables ICT ownership, ICT self-efficacy, distance between home to local market, perceived usefulness, and innovativeness were considered as the independent variables of this study which might exert a different degree of influence over farmers' choice of using ICTs for receiving agricultural market information (

Figure 2.1).

2.3.1 ICT ownership and farmers' use of ICTs for receiving agricultural market information

A microwave-radio telephone system installed in the remote region of Tumaca, Columbia, along with community access points resulted in better trade and market opportunities (Lio and Liu, 2006). Rural telephone and community radio services initiated in India and Sri Lanka had received a positive response from farmer communities (James, 2004).

The International Institute of Communication Development (IICD) at Manobi, an African telecom company have initiated a collaborative program to help the farmers of Burkina Faso, Ghana, Mali, Uganda and Zambia gain access to market price information via text messages. Wireless Application Protocol (WAP), or the mobile internet as well as personal computers and personal digital assistants (PDA). Also, Village Phone Program (VPP) of Grameen Bank of Bangladesh successfully converted telephones into production goods by lowering transaction costs (Bayes, 2001).

Use of mobile phones help farmers to make decisions much more easily than without mobile phone and farmers got, exchanged, and manipulated information quickly by using mobile phone. The ownership of mobile phones by agricultural stakeholders had widely spread and increasingly assist to overcome isolation and made communication between rural people easier. Mobile phones are, therefore, becoming increasingly important to agro-based entrepreneurs as an infrastructural device for improving efficiency of agriculture markets and contributing to empowerment (Mlozi *et al.*, 2012).

Mobile phones are becoming increasingly important to agro-based entrepreneurs as an infrastructure service for improving efficiency of agriculture markets, hence contributing to female farmers' empowerment. Mobile phones helped them to easily obtain agricultural information when they needed. Moreover other evidence found that farmers having mobile phone can decide the best time to sell crops and livestock as they could get instant information on prices at different market places (Ashraf *et al.*, 2005).

2.3.2 ICT self-efficacy and farmers' use of ICTs for receiving agricultural market information

Frequent use and exposure to ICT helps users to form a positive attitude towards ICT. Frequent use informs farmers' positive attitude towards ICTs that they might perceive it as useful and beneficial for their farming. Evidence suggest that ICT self-efficacy and use of ICTs in agricultural marketing information is highly correlated (D' Silva *et al.*, 2010).

Prior researches have also reported that ICT self-efficacy, perceived usefulness, perceived ease of use and subjective norm positively contribute to ICT use. In fact, ICT self-efficacy was found as a dominant factor for frequent ICT usage. Therefore, it can be proposed that ICT self-efficacy positively contribute to ICT use.

2.3.3 Perceived usefulness and farmers' use of ICTs for receiving agricultural market information

Role of ICTs in agricultural production on Africa reported that ICTs played a significant role in a country's development. (Horestone, 2012). The main objective of that paper was to assess if at all on the proliferation of ICTs of the African continent had any significant impact on agricultural production. The results found that ICTs played significant role in enhancing agricultural production while mobile phones remain a significant contributor to agricultural growth. The result also found that certain socio-

economic characteristics such as higher education level and skills were prerequisites for effective improvement in agricultural production due to the adoption and utilization of new technologies. Other evidence suggest that there was a strong relationship between usefulness of ICTs and influence of using ICTs in agriculture (Dixon, 2009).

Farmers had the real need to access about market information, land records and services, accounting and farm management information, management of pests and diseases, rural development programs and hence ICT could help accessing those services. ICT projects dealing such services are extremely limited. ICTs help farmers to get timely information yet availability of ICTs is remained limited (Meera et al., 2004).

Research conducted in Ghana reported that mobile phones stimulate the development of agricultural information and advisory services which positively impact farmers' income and agricultural production (Kora, 2010).

Result from India shows that ICTs helped farmers in receiving clear and focused services, simple and user friendly, accurate and timely information, well organized and easy to find agricultural information (Kataria, 2015). Furthermore, ICT would enable extension workers to gather, store, retrieve and disseminate a broad range of information needed by small producers such as information on best practices, new technology, better prices of inputs and outputs, better storage facilities, improved transportation links, collective negotiations with buyers, information on weather. Emergence of new agricultural development paradigms challenge the conventional methods of delivering important services to citizens. ICTs had been developed as a tool for achieving meaningful societal transformation, which was believed to provide a reliable network in agricultural sector. ICT had been utilized as an extension tool, which has enhanced the information flow between agricultural extension services and their clients (D' Silva *et. al.*, 2010). Therefore, it may be concluded that with the increase of perceived usefulness of using ICTs, respondents' use of ICTs will increase.

2.3.4 Distance from home to market and farmers' use of ICTs for receiving agricultural market information

Fafchamps (1992) looked specifically at cash crops in the developing world and the reason why large-scale farmers tend to allot a greater share of their land to cash crop

production than small-scale farmers. He reported that most of the farmers are tensed on transport cost because of high distance from their home to market.

Minten, (2003) conducted a research in Madagascar aiming to study the causes of transactions costs and came up with three conclusions. First, poverty increases with an area's remoteness; second, yields of major crops decrease with remoteness; and third, the intensity of input-use decreases with remoteness.

Distance to market is an important factor for agricultural households for their profitability and farming decision. Often, distance to market is negatively correlated with market participation, that is, as distance to the market increases, market participation declines, that improvements in roads and infrastructure can effectively reduce distance to market (as measured by travel time) and in turn improve the likelihood of market participation.

Dao, 2004 also support the claim that isolation from markets affects the crop mix decision, specifically the decision between staple crops and perishable crops. Several studies assert that the more isolated an agricultural household is, the more likely it is to produce staple crops over perishable crops. However, due to the ubiquitous nature of ICTs, it is highly likely that people living far from market overcome the physical distance by using mobile phone and updated themselves with latest market information. Therefore, distance from home to market is positively influence users to use ICTs more than the users who have easy access to market.

2.3.5 Innovativeness and farmers' use of ICTs for receiving agricultural market information

Innovativeness is a key characteristics of a farmer and it is expected that innovative farmers are ready to grasp new technology and embrace new way of doing business. Studies suggest that innovativeness had significant positive correlation with their use of communication media in adoption of market information (Kashem and Halim, 1991 and Nuruzzaman, 2003). It is also evident that farmers' use of ICT positively associated with their adoption of improved farming practices and agricultural technology (Rahim, 1963). Therefore, it may be concluded that innovative farmers use ICTs more than others for receiving agricultural market information.

Concerning the context and objectives, this research considered five factors which denotes users' access to ICTs (ICT ownership), their ICT skills (ICT self-efficacy),

personal characteristic to try out new things (innovativeness) and situational factor like distance from home to market and perceived benefit (usefulness) while users' demographic characteristics were used in control. This is done in an intention to find out the effects of ICT and its enabling factors on its use rather than individuals' demographic factors.

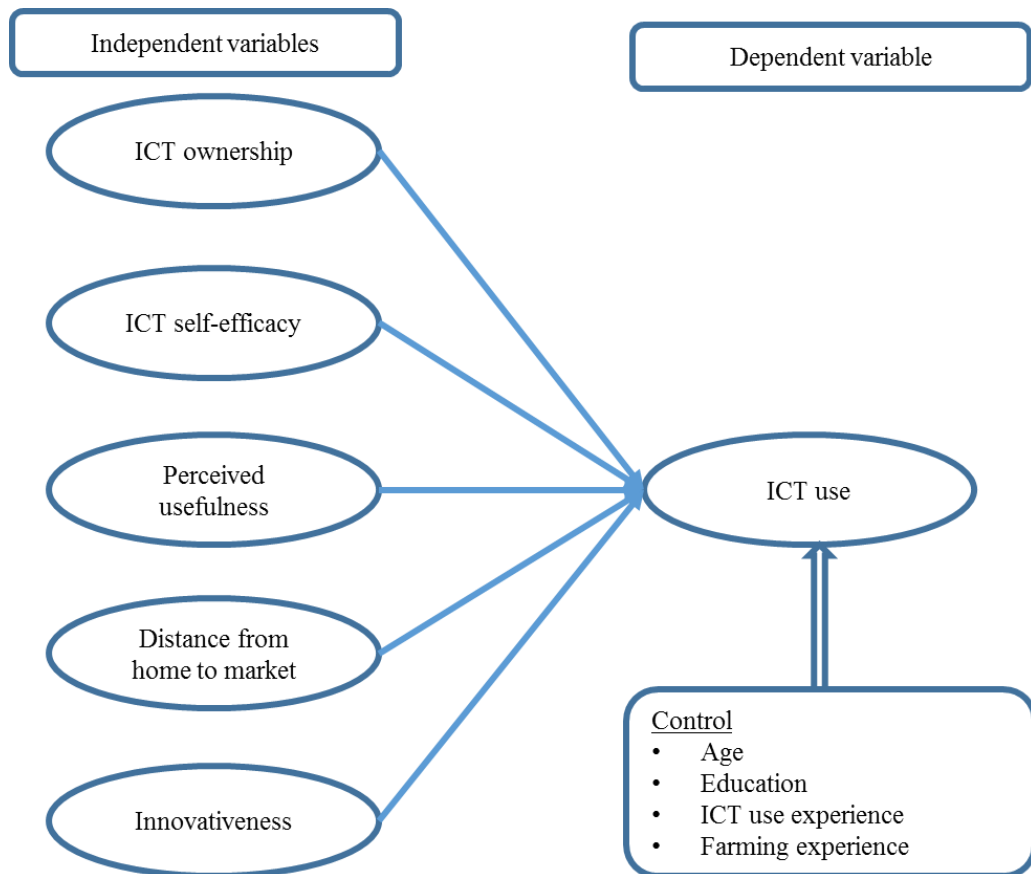


Figure 2.1 The Conceptual framework of the study

CHAPTER III

3 METHODOLOGY

The important part of a research is methodology. Collection of valid and reliable information methodology is needed. For analyzing the data correctly and achieving correct result methodology is very much important. Methodology enables the researcher to collect valid information to analyze them. Finally the researcher has arrived to take some decisions.

3.1 Locale of the Study

Two villages, Parshadipur and Roshora of Mulghor union at Rajbari sadar upazila under Rajbari district were purposively selected as the study area. The physical, social, cultural and heritage of this area were similar to many of the other parts of our country. However, due to the researcher's familiarity and good accessibility to this area was selected for the study purpose. A map of Rajbari district showing the Rajbari sadar upazila and another showing the locale of the study area have been presented in Figure 3.1 and Figure 3.2.

3.2 Population and Sampling Design

The researcher herself with the cooperation of local Agricultural Extension Officer (AEO), Sub-Assistant Agriculture Officers (SAAOs) and local leaders collected an update list of all the farmers of Parshadipur and Roshora village. The total number of farm families in these villages were 620; 280 family heads from Parshadipur and 340 family heads from Roshora village constituted the population of the study. The sample size was determine using a formula proposed by Kothari (2004).

$$n = \frac{z^2 p q n}{e^2 (N - 1) + z^2 P q}$$

Where,

n = Sample size

N= Population size = 620

e = Level of precision = 8 %

z = 1.96 with a confidence level of 95%

$P =$ The proportion of degree of variability = 50 % and, $q = 1-P = 0.50$

So, the sample size (n) = 127

Proportionate random sampling was used to determine the sample from each village (Table 3.1). A reserve list (10% of the sample) of the respondents was also determined and only used when any respondent in the sample list was found not available during the data collection period (28th December, 2016 to 12th February, 2017).

Table 3.1 The Population and sampling of this study

Name of Villages	Population in each unit	Sample in each unit	Reserve list
Parshadipur	280	57	6
Roshora	340	70	7
Total	620	127	13

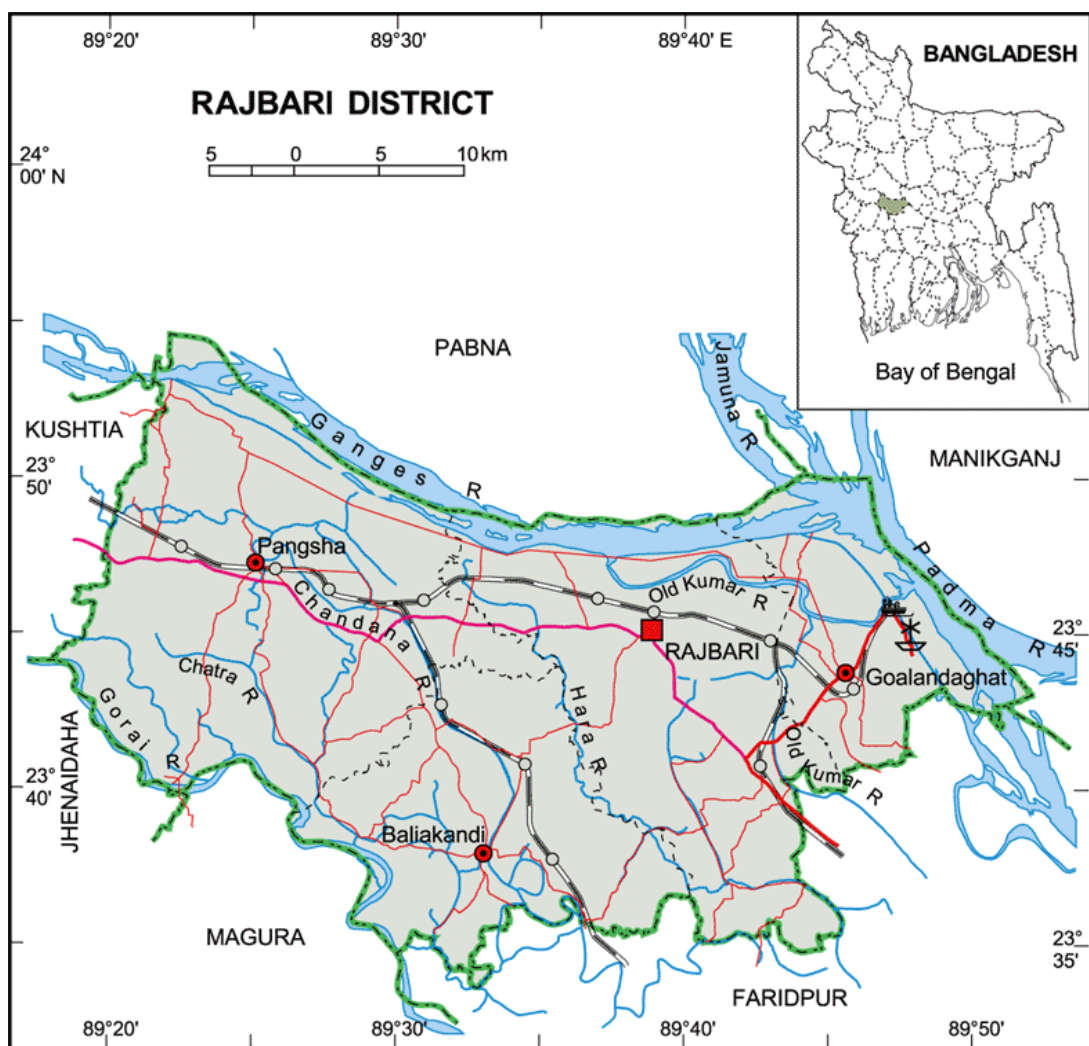


Figure 3.1 Map of Rajbari district showing Rajbari sadar upazila

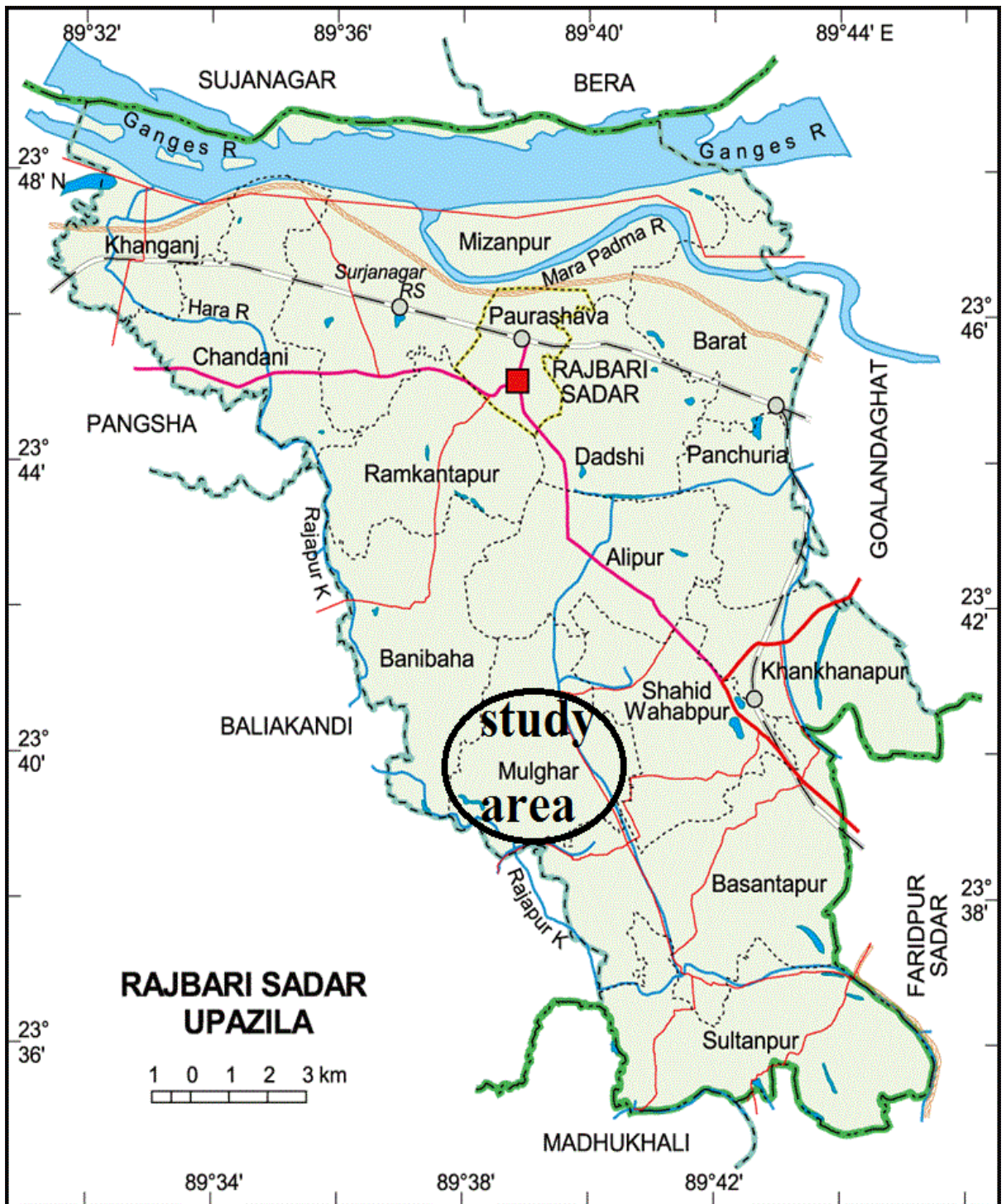


Figure 3.2 Map of Rajbari sadar upazila showing Mulghar union

3.3 Instrument for Data Collection

For collection of data or information an interview schedule was made and designed considering the objectives of the study. In interview schedule the questions and the statements were set very easily so that the respondents can easily understand the questions. The interview schedule contained both open and close ended questions. Before final preparation of interview schedule, pretested was arranged by the researcher herself with the farmers. An English version of interview schedule is enclosed in Appendix-A.

3.3.1 Variables of the study

In a descriptive social research, the selection of the variables is an important subject. Success of a research mostly depends on selection of exact variable. With the help of previous literature, researcher try to find out the nature and scope of the variables which is related to the research. Variable as any measurable characteristics, which can assume varying or different values in successive individual case. Independent variables are the factor which is manipulated by the experimenter in his attempt to ascertain the relationship to an observed phenomenon.

Dependent variable varies as experimenter introduces, remove or varies the independent variables.

This researcher took adequate care in selecting the dependent and independent variables of the study. Before selecting variables researcher visited the study area (Parshadipur, Roshora in Rajbari) and talked to local farmers and find out various factors. Based on experience, review of literature, discussion with experts in this field, and also with the research supervisor, the researcher selected the following variables for this study.

Two types of variables were selected for this study, such as-

1. Independent variables, and
2. Dependent variable

Independent variable: An independent variable is that factor helps the researcher to find out the relationship to an observed phenomenon.

Dependent variable: A dependent variable is that factor which you have to measure in the experiment and it is affected at the time of experiment.

3.4 Measurement of Variables

It was necessary to measure the selected variables for conducting the research with the study. For this reason the procedures that were used for measurement of both independent and dependent variables were presented. The procedure of measurement of selected variables are given below:

3.4.1 Measurement of independent variables

The independent variables constituted the selected characteristics. In this study nine (9) variables were selected including control variable. The measurement procedures of these variables are given below:

3.4.1.1 Age

Age of a farmer was measured in terms of years from the birth to the time of interview. If the age of a respondent 32 than his or her score would be 32.

3.4.1.2 Education

Education was measured when schooling was completed by a farmer in educational institution. If any respondent did not know how to read or write than his education score was taken as zero (0). The person who could sign only was given a score of 0.5 or if a respondent did not go to school but studied at home and if his or her knowledge status was equivalent to the student of class three, than his or her score was given 3. For example, when a respondent read up to class 4 than his score would be 4.

3.4.1.3 Farming experience

Farming experience was measured by how long the respondent have been engaged with the agricultural activities. If any respondent's experience of agricultural activities is 5 years then his or her score would be 5.

3.4.1.4 ICT use experience

ICT use experience of any respondent were measured by how long they have been using ICT e.g. mobile phone, Internet etc. The ICT use experience was measured by the following formula.

$$\text{ICT Use Experience} = \frac{(1 \times a) + (2 \times b)}{2}$$

Where, a = Score of mobile phone use experience

b = Score of Internet or Internet-based applications use experience

For example if any respondent use mobile phone 3 years and use Internet 2 years than score would be 3.5.

3.4.1.5 ICT ownership

ICT ownership was measured on the basis of nature of access of ICT devices or communication media. ICT ownership score was computed in the following manner of ICT devices.

Nature of Access	Score
Self	1
Shared	0.5
No Access	0

ICT ownership score range from 0 to 6. Where '0' means there is no ICT ownership of the respondent and '6' means the ICT ownership of the respondent is very high.

3.4.1.6 ICT self-efficacy

ICT self-efficacy was measured to the extent of respondents' judgments of their capabilities of completing various tasks related to their agriculture using ICTs or ICT-based applications. The scales of ICT self-efficacy were adapted from Compeau and Higgins (1995). Respondents' responses were captured in a five-point scale ranging from 'strongly disagree' to 'strongly agree' (1-5). ICT self-efficacy score range from 4 to 20, where '4' means respondent was not capable and '20' means she was highly capable of completing her tasks using ICTs.

3.4.1.7 Perceived usefulness

Perceived usefulness refers to the extent respondents perceived using ICTs would be beneficial to them for receiving farm-related marketing information. The scales of perceived usefulness were adapted from Davis (1989). A five-point rating scale ranging from 'strongly disagree' to 'strongly agree' (1-5) was administered to capture respondents' responses for four items. Thus, the score of perceived usefulness could range from 4 to 20, where '4' indicates no usefulness and '20' indicates highest usefulness in using ICTs for accessing agricultural market information

3.4.1.8 Distance from home to market

Distance measured by kilometer. The distance between homes to market was considered here. If the distance is 5 kilometer than the score would be 5.

3.4.1.9 Innovativeness

Innovativeness refers to an individual's willingness to try out any new technology once it is available to use. Innovativeness score was captured by a 5-point scale (1-5) ranging from 'strongly disagree' to 'strongly agree' and scales were adapted by Agarwal and Prasad (1998). Thus, the score could range from 3 to 15 where '3' indicates respondents' no innovativeness and '15' indicates highest innovativeness in using new technologies.

3.4.2 Measurement of dependent variable

Farmers' access to agricultural market information using ICTs was the dependent variable of this study. Here, ICT use was measured to the extent respondents use different ICT-based tools for receiving agricultural market information from various sources ranging from SAAO, input dealers to the Web-based pricing system, if any. Respondents' responses were captured in a 5-point scale (0-4) ranging from 'not at all' to 'frequently use'. Thus, the ICT use score could range from 0 to 28, where '0' means no use of ICT and '28' means frequent use of ICT to access agricultural market information. A summary of measurement of ICT use is given below.

Items	Nature of use	Score
Mobile Phone (Voice call, SMS, MMS, Video, etc.)	Frequently (4-6 times/day)	4
	Often (1-3 times/day)	3
	Occasionally (5-6 times/week)	2
	Rarely (1-3 times/week)	1
	Not at all (no use)	0
Internet	Frequently (4-6 times/day)	4
	Often (1-3 times/day)	3
	Occasionally (5-6 times/week)	2
	Rarely (1-3 times/week)	1
	Not at all (no use)	0
Computer/laptop/tab	Frequently (4-6 times/day)	4
	Often (1-3 times/day)	3
	Occasionally (5-6 times/week)	2
	Rarely (1-3 times/week)	1
	Not at all (no use)	0
Union Information Service Center (UISC)	Frequently (4-6 times/day)	4
	Often (1-3 times/day)	3
	Occasionally (5-6 times/week)	2
	Rarely (1-3 times/week)	1

Items	Nature of use	Score
	Not at all (no use)	0
ICT-assisted Service Centre (e.g. GPCIC, mobile banking, bkash, rocket)	Frequently (4-6 times/day)	4
	Often (1-3 times/day)	3
	Occasionally (5-6 times/week)	2
	Rarely (1-3 times/week)	1
	Not at all (no use)	0
TV program	Frequently (4-6 times/day)	4
	Often (1-3 times/day)	3
	Occasionally (5-6 times/week)	2
	Rarely (1-3 times/week)	1
	Not at all (no use)	0
Radio program	Frequently (4-6 times/day)	4
	Often (1-3 times/day)	3
	Occasionally (5-6 times/week)	2
	Rarely (1-3 times/week)	1
	Not at all (no use)	0

3.5 Hypotheses

3.5.1 Research hypotheses

The following research hypotheses were put forward to test the relationship between the selected factors and farmers' access to agricultural market information using ICTs.

SI No.	Hypotheses
H1	The more the respondents have the ICT ownership, the more the respondents use ICTs for receiving agricultural market information.
H2	The more the respondents are capable of using various ICT applications, the more the respondents use ICTs for receiving agricultural market information.
H3	The higher the perceived usefulness of using an ICT, the more the use of ICT for receiving agricultural market information.
H4	The more the distance between farmers' home to market, the more the use of ICTs for receiving agricultural market information.
H5	The more the innovativeness of the respondents to adopt new technology for farm- and home-related activities, the more the respondents use ICTs for receiving agricultural market information.

3.6 Collection of Data

Data were collected by the researcher herself during 28th December, 2016 to 12th February, 2017. The researcher gave all efforts to explain the purpose of the study to the respondents to get exact and valid information.

Interviews were taken with the respondents in their leisure period. During interviewing time, the researcher made a favorable environment so that the respondents did not feel awkward to give the answer of the question properly.

3.7 Data Processing

3.7.1 Editing

The total raw data were properly examined to find out the errors. The researcher made a careful scrutiny when she completed an interview so that all data were included to facilitate coding and tabulation.

3.7.2 Coding and tabulation

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

3.7.3 Categorization of data

For coding operation, the collected data were classified into various categories. These categories were developed for each of the variables. The percentile function of SPSS software v.23 was used to categorize the variables with few exceptions such as age, education. The procedure and categorization of a particular variable were further discussed in the Chapter 4 in detail.

3.8 Statistical Analysis

Data were analyzed according to the research objectives such as range, mean and standard deviation were used for describing the variables. Multiple regression was run to determine the contribution of the selected factors to farmers' access to agricultural market information using ICTs. The analysis of data was performed using statistical treatment with SPSS (Statistical Package for Social Sciences) v.23. Throughout the study 5% level of significance were used to test the significance level of each hypotheses. If the computed value of (β) was equal to or greater than the designated level of significance, than the hypotheses was supported and it was concluded that there was a significant contribution of the independent variables to dependent variable. And if the computed value of (β) is smaller than the designated level of significance than the hypothesis was not supported.

CHAPTER IV

4 RESULTS AND DISCUSSION

A sequential and detailed discussion on the findings of the study has been presented and discussed in this chapter. The chapter is divided into four sections. First section describes the demographic characteristics of the respondents. Second section deals with the selected factors that might influence farmers' choice of using ICTs in accessing agricultural market information. The third section describe respondents' extent of ICTs use for receiving agricultural market information. Final and the last section discusses the relationship between the selected factors and farmers' access to agricultural market information using ICTs.

4.1 Selected Characteristics of the Respondents

A summary of the analyzed results of the selected characteristics of the respondents for this study is shown in Table 4.1

Table 4.1 Respondents' characteristics

Sl. No.	Characteristics	Possible Range	Observed Range	Mean	Standard Deviation
1.	Age	Unknown	26-58	39.32	9.53
2.	Education	Unknown	0-12	5.24	3.87
3.	Farming experience	Unknown	11-45	24.68	10.75
4.	ICT use experience	Unknown	1.5- 5.50	7.25	1.06

4.1.1 Age

The observed age of the farmers ranged from 26 to 58 having an average of 39.32 with a standard deviation of 9.53. On the basis of the age of the farmers, they were classified into three categories: “young” (up to 35 years), “middle aged” (36-50 years) and old (above 50 years). The distribution of the farmers according to their age is shown in Table 4.2.

Table 4.2 Distribution of respondents according to their age

Categories	Frequency	Percent
Young (up to 35 years)	58	46.0
Middle aged (36 – 50 years)	49	38.0
Old (above 50 years)	20	16.0
Total	127	100.0

Findings indicates that about half (46.0 %) of the respondent farmers were young aged compared to 38.0 % and 16.0 % being middle aged and old, respectively.

4.1.2 Education

The observed age of the farmers ranged from 0 to 12 having an average of 5.24 with a standard deviation of 3.87. On the basis of education scores of the farmers, they were classified into five categories. Namely “illiterate” (0), “can sign only” (0.5), “primary education” (1-5), “secondary education” (6-10), “higher secondary education” (11-12). The distribution of the farmers according to their education is shown in Table 4.3.

Table 4.3 Distribution of respondents according to their education

Categories	Frequency	Percent
Illiterate	5	4.0
Can sign only (0.5)	42	33.0
Primary education (1-5)	17	13.0
Secondary education (6-10)	58	46.0
Higher Secondary education (11-12)	5	4.0
Total	127	100.0

It was found that the majority (46 percent) of the farmers had secondary education compared to 16 and 4 percent having primary and higher secondary education, respectively. Besides, 4 percent of the farmers are illiterate and 34 percent of the farmers were could write their name only.

The findings of the study reveals that 96 percent of the farmers were literate which is higher than the national average literacy rate of 63.0 percent (BBS, 2007). As the major part of the farmers under the study area are literate. It can be said that in this area, education of the farmers were relatively higher compared to typical rural area of Bangladesh. So, they could understand new technologies like market information by using ICTs.

4.1.3 Farming experience

The farming experience scores of the respondents ranged from 11 to 45 years with an average of 24.68 years and standard deviation 10.75. The respondent were classified into three categories on the basis of their farming experience as shown in Table 4.4.

Table 4.4 Distribution of respondents according to their farming experience

Categories	Frequency	Percent
Low experience (up to 16 years)	47	37.0
Medium experience (17- 30 years)	41	32.0
High experience (above 30 years)	39	31.0
Total	127	100.0

From the Table the highest proportion (37 percent) of the respondents were low experienced compared to 32 percent being medium experienced and 31 percent of the respondents were high experienced in farming activities. Given the distribution of the respondents' age, as majority of them were found young aged, this distribution seems to be reasonable in the study area.

4.1.4 ICT use experience

The observed ICT use experience scores of the farmers ranged from 1.5 to 5.5 years. The average ICT use experience was 3.30 and the standard deviation was 1.06. The respondents were classified into following three categories based on their ICT use experience in Table 4.5.

Table 4.5 Distribution of respondents according to their ICT use experience

Category	Frequency	Percent
Low (up to 2.5 years)	59	46.5
Medium (2.6-3.5 years)	33	26.0
High (>3.5 years)	35	27.6
Total	127	100.0

Table 4.5 revealed that 46.5 percent of the respondents had low ICT use experience where 27.6 percent had high and 26 percent farmers had medium ICT use experience. Given the low ICT experience of the users group, care must be taken once design and implement ICT-based solution in the given community.

4.2 Factors Contributing to ICTs Use in Accessing Agricultural Market Information

A summary of the descriptive statistics of the factors that influence users' ICT use behavior for receiving agricultural market information is given in Table 4.6.

Table 4.6 Descriptive statistics of the factors that influence users' ICT use for receiving agricultural market information

Sl. No.	Characteristics	Possible Range	Observed Range	Mean	Standard Deviation
1.	ICT Ownership	0-7	2-5	3.69	.94
2.	ICT Self-efficacy	4-20	4-16	12.37	3.20
3.	Distance from Home to Market	Unknown	2-5	3.57	1.16
4.	Perceived Usefulness	4-20	10-16	13.32	2.16
5.	Innovativeness	3-15	6-12	9.52	2.30

4.2.1 ICT ownership

The observed ICT ownership scores of the farmers ranged from 2 to 5. The average ICT ownership was 3.69 and the standard deviation was 0.94. The respondents were classified into following three categories based on their ICT ownership in Table 4.7.

Table 4.7 Distribution of respondents according to their ICT ownership

Category	Frequency	Percent
Low (up to 2.0 score)	10	7.9
Medium (2.1 to 3 score)	52	40.9
High (>3 score)	65	51.2
Total	127	100.0

Data in Table 4.7 revealed that 51.2 percent of the total respondent had high ICT ownership where 40.9 percent had medium and 7.9 percent farmers had low ICT ownership. So, there is a huge scope to use ICT devices for getting agricultural market information.

4.2.2 ICT self-efficacy

The observed ICTs self-efficacy scores of the farmers ranged from 4 to 16. The average ICTs self-efficacy was 12.37 and the standard deviation was 3.21. The respondents

were classified into following three categories based on their ICTs self-efficacy in Table 4.8.

Table 4.8 Distribution of respondents according to their ICT self-efficacy

Category	Frequency	Percent
Low (up to 11 score)	52	40.9
Medium (12-13 score)	32	25.2
High (>13 score)	43	33.9
Total	127	100.0

Data in the Table 4.8 reveal that 40.9 percent of the total respondent had low ICTs self-efficacy where 33.9 percent had high and 25.2 percent farmers had medium ICTs self-efficacy. That means, two-thirds of the respondents had low to medium level of ICTs self-efficacy. Therefore, rather than a complicated or web-based system, a low-complexity mobile-based agricultural market information solution would be a reasonable choice for this users group.

4.2.3 Perceived usefulness

The observed perceived usefulness scores of the farmers ranged from 10 to 16. The average perceived usefulness was 13.32 and the standard deviation was 2.16. The respondents were classified into following three categories based on their perceived usefulness in Table 4.9.

Table 4.9 Distribution of respondents according to their perceived usefulness

Category	Frequency	Percent
Low (up to 12 score)	79	62.2
Moderate (13 to 15 score)	11	8.7
High (>15 score)	37	29.1
Total	127	100.0

Data in the Table 4.9 revealed that 62.2 percent of the respondents perceived ICTs low useful where 29.1 percent perceived high and 8.7 percent perceived moderate useful, respectively. This signifies that majority of the respondents still traditionally receive agricultural market information using personal contact.

4.2.4 Distance from home to market

The observed distance scores of the farmers ranged from 2 to 5 km. The average distance was 3.57 and the standard deviation was 1.16. The respondents were classified into following three categories based on their distance in Table 4.10.

Table 4.10 Distribution of respondents according to their distance from home to market

Category	Frequency	Percent
Short distance (up to 3.0 km)	56	44.1
Moderate distance (3.1 to 4.0 km)	32	25.2
Long distance (>4.0 km)	39	30.7
Total	127	100.0

Data in the Table 4.10 revealed that 44.1 percent of the respondent had short distance from home to market where 30.7 percent had long and 25.2 percent farmers had moderate distance from home to market. Therefore, more than half of the respondents (54.9%) would be benefitted from an ICT-based solution for updating themselves with latest market related information, if design and implement properly.

4.2.5 Innovativeness

The observed innovativeness scores of the farmers ranged from 6 to 12. The average innovativeness was 9.52 and the standard deviation was 2.30. The respondents were classified into following three categories based on their innovativeness in Table 4.11.

Table 4.11 Distribution of respondents according to their innovativeness

Category	Frequency	Percent
Low (up to 7 score)	38	29.9
Medium (8-10 score)	32	25.2
High (>10 score)	57	44.9
Total	127	100.0

Data in the Table 4.11 revealed that 44.9 percent of the total respondent had high innovativeness where 29.9 percent had low and 25.2 percent farmers had medium innovativeness.

4.3 Use of ICTs

The observed ICTs use scores of the farmers ranged from 2 to 14. The average ICTs use was 7.25 and the standard deviation was 3.95. The respondents were classified into following three categories based on their use of ICTs in Table 4.12.

Table 4.12 Distribution of respondents according to their use of ICTs

Category	Frequency	Percent	Mean	Standard Deviation
Low (up to 5)	68	53.5	7.25	3.95
Moderate (6-9 score)	16	12.6		
High (>9 score)	43	33.9		
Total	127	100		

Table 4.12 revealed that 53.5 percent of the total respondent had low use of ICTs where 33.9 percent had high and 12.6 percent farmers had moderate Use of ICTs in receiving agricultural market information.

4.4 Contribution of the ICTs Related Factors with Respondents' Access to Agricultural Market Information Using ICTs

The purpose of this section is to examine the influence of five selected factors (as cited in the objectives) of the farmers with their use of ICTs for receiving agricultural market information.

Multiple regression analysis was used to test the contribution of the selected variables, ICT ownership, ICTs self-efficacy, perceived usefulness, distance from home to market and innovativeness on the extent of ICT use for receiving agricultural market information. Five percent, one percent and 0.1 percent level of significance were used as the basis for rejection of a hypothesis. The summary of the results of multiple regression coefficient indicating the contribution of each of the variables to the dependent variable is shown in Table 4.13.

Table 4.13 Multiple regression coefficients of the selected factors indicating their contribution to users' use of ICTs for receiving agricultural market information

Independent Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R ²	Adj. R ²	F
	B	Std. Error	Beta					
(Constant)	-9.929	1.009		-9.844	.000			
ICT Ownership	2.380	.277	.566***	8.590	.000			
ICTs self-efficacy	.255	.074	.207***	3.432	.001	.826	.818	114.566***
Perceived Usefulness	-.055	.126	-.030 ^{NS}	-4.36	.664			
Distance Home to Market	.901	.137	.264***	6.600	.000			
Innovativeness	.292	.119	.169**	2.449	.016			

Dependent variable: ICT Use

NS: Non-significant

*** Significant at .1% level of significance

** Significant at 1% level of significance

Table 4.13 shows that there is a significant contribution of respondents' ICT ownership, distance from home to market, ICT literacy and innovativeness by the farmers in ICT use. Here ICT ownership, distance from home to market, ICT literacy was the most important contributing factors (significant at the 0.1 % level of significance) followed by innovativeness. However, the perceived usefulness is non-significant with the ICT use. The variation 81.8% ($Adj. R^2 = .818$) in the respondents' changed use of ICTs can be attributed to their ICT ownership, distance between home to market, ICT literacy, innovativeness. The F value indicates that the model is significant (0.1% level of significance).

CHAPTER V

5 SUMMARY, CONCLUSION AND RECOMMENDATION

The chapter represents summary of findings, conclusions and recommendations of the study.

5.1 Summary of Findings

The major findings of the study are summarized below:

5.1.1 Selected characteristics of the farmers

Findings of the selected characteristics of the respondents are summarized below:

Age

A large proportion (46 percent) of the ICT users were young aged compared to 38 and 16 percent being middle aged and old, respectively. Young aged farmers are expected to be more dynamic and curious to adopt new technology. Therefore, the extension workers should target the young aged farmers when they design any ICT-based service.

Education

It was found that the majority (46 percent) of the farmers had secondary education compared to 16 and 4 percent having primary and higher secondary level education, respectively. Besides, 4 percent of the farmers are illiterate and 34 percent of the farmers were could write their name only.

Farming experience

Forty-seven (47%) percent of the respondents were low experienced compared to 41 percent being medium experienced and 39 percent of the respondents were high experienced in farming activities.

ICT use experience

In terms of ICT use experience, farmers were found to be less experienced. Less than half of the respondent (46.5%) had low ICT use experience where 27.6% had high and 26% farmers had moderate ICT use experience. Therefore, the extension worker or policy maker should be careful when design an ICT-based service and given the low ICT use experience, a user-friendly and low-complexity ICT application might be the effective tool for farmers for accessing agricultural marketing information.

5.1.2 Factors enabling ICTs use for accessing agricultural market information

ICT ownership

More than half of the respondents (51.2%) had high ICT ownership where 40.9 percent had medium and 7.9 percent had low ICT ownership, respectively. Therefore, there is a huge scope to use ICT devices for getting agricultural market information.

ICT self-efficacy

Around one-third of the respondents (33.9%) had high level of ICT self-efficacy whereas one-fourth of them (25.2%) had medium and 40.9 percent had low ICT self-efficacy. Therefore, the respondents had low to medium level of ICTs self-efficacy.

Perceived usefulness

It was found that 62.2 percent of the respondents perceived low usefulness where 29.1 percent highly and 8.7 percent moderately perceived ICTs as useful for receiving agricultural market information.

Distance from home to market

More than half of the respondents (55.9%) had high to medium distance from home to market while the rest of the respondents (44.1%) live close to market. Therefore, it is expected that respondents who live far from the market might be benefitted from using ICT-based solutions by reducing their agricultural market information search cost and transaction cost.

Innovativeness

Majority of the respondents (44.9%) were found as highly innovative whereas 29.9 percent and 25.2 percent were found as less and moderately innovative, respectively.

5.1.3 ICT use

Use of ICTs by more than half of the respondents (53.5%) was found low compared to 33.9 percent and 12.6 percent farmers had high and moderate ICT users, respectively for receiving agricultural market information.

5.1.4 Contribution of the selected factors to ICTs use

Among the five predictor variables, ICT ownership, ICT literacy, innovativeness and distance from home to market were found to be the significant contributors of

respondents' ICT use while perceived usefulness was found to be non-significant. ICT ownership was the strongest contributor ($\beta=0.566$) followed by distance from home to market ($\beta=0.264$) and ICT literacy ($\beta=0.207$) while the contribution of innovativeness was found the lowest ($\beta=0.169$) which jointly explained 81.8% ($\text{Adj. } R^2 = .818$) of the variance of the extent of ICT use.

5.2 Conclusion

- ✓ ICT ownership significantly contributed to the respondents' use of ICTs. Therefore, it may be concluded that ICT ownership is one of the important predictors of ICT use and higher ICT ownership will lead to higher use of ICTs for receiving agricultural market information.
- ✓ Distance from home to market was found one of the other strongest predictors of ICT use. That means, respondents living far from the market use more ICTs for receiving market related information compared to those who live closely to market. Therefore, it may be concluded that when the physical barrier is high respondents' use of ICT increases.
- ✓ ICT self-efficacy positively influenced ICT use and it is no surprised that the respondents with ICT literacy found ICT as an easy tool that lead to higher level of use than those who either have low level of ICT literacy or seek others' help when using ICTs.
- ✓ Respondents' innovativeness had a significant contribution on their use of ICTs. Innovativeness is unique characteristics of a human that influence him/her to try out new technology. Since, use of ICT to access to market related information is a new way of doing business, an innovative farmer may find it more interesting and use more compared to a technophobic person. Therefore, it may be concluded that when the innovativeness of the farmers is high than their use ICTs is also high.

5.3 Recommendations

5.3.1 Recommendation for policy formulation

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

- ✓ ICT ownership had a significant contribution on their use of ICTs and almost all the respondents either had direct or shared access to ICTs, particularly mobile phone. Therefore, more mobile-phone enabled applications should be designed and implemented so that small-scale farmers can easily access to those applications and receive updated market information.
- ✓ Respondents' distance from home to market had a significant contribution on their use of ICTs. Farmers who live far from the market may face higher transaction and information search cost. ICT-based service may help them in reducing those cost and save their valuable time for receiving agricultural market related information. It is important to ensure that the farmers living in remote villages must have the access to ICT-based service. Hence, sufficient IT-infrastructure should be developed and network coverage should be extended.
- ✓ Since ICT self-efficacy is very important for a user to access the ICT application, Ministry of Youth and Sports and ICT Division of Government of the People's Republic of Bangladesh along with private sectors should promote ICT self-efficacy training to the rural clientele. Therefore, rural farmers may upgrade their skills and enable them to minimize their economic loss due to market related inequalities.
- ✓ Farmers' innovativeness was found as one of the important indicators of ICT use. Therefore, innovative farmer groups should be identified and targeted when employ ICT-based services. Moreover, they may work as the key agents to promote ICT-based applications through positive word-of-mouth communication.

5.3.2 Recommendation for theory

- ✓ Parshadipur and Roshora village under Rajbari sadar upazila of Rajbari district was purposively selected as the study area due to resource and time constraints. Moreover, a cross-sectional survey methodology, as used in this study, is limited in generalizing the findings. Therefore, if the study could be conducted at the other parts of our country and compare the findings would be effective and helpful for policy formulation.

- ✓ Once selection of the variables, this study considered three ICT-related factors, ICT ownership, ICT literacy and perceived usefulness, one personal characteristics, innovativeness and one situational or physical factor, distance from home to market while controlled the demographic related variables like age, education, ICT use experience. Therefore, future research might be undertaken considering other ICT related or situational factors like ease of use and relative advantage.
- ✓ Since this research was particularly interested to identify the factors and their contribution to the extent of use of ICTs for receiving agricultural market information, respondents' demographic variables like age, education were controlled in the structural model. However, researches should be conducted to examine the impact of other demographic variables like gender on the respondents' choice of ICTs use for receiving agricultural market information.
- ✓ Unexpectedly, no significant relationship was found between the perceived usefulness of ICT and the extent of ICT use. So, further verification is necessary.

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APPENDIX-A

English Version of the Interview Schedule

Department of Agricultural Extension and Information System

Sher-e-Bangla Agricultural University, Dhaka-1207

Interview Schedule for data collection for the Research on

Farmers' Access to Agricultural Market Information Using ICTs

(This interview schedule is entitled for a research study)

Sl. no.:

Name of the respondent:

Village:

.....Block:.....

Upazila:.....District:.....

.....

(Please answer the following questions)

1. Age

What is your present age?Years.

2. Education

Please mention your educational status from the following g

- a) I cannot read and write.
- b) I can sign only.
- c) I cannot go to school but can read and write which will be equal toclass.
- d) I read up to Class / pass.

3. Farming experience: How long have you been engage in agriculture? Years.

4. ICT use experience

How long have you been using ICT?

- a) Mobile phoneYears
- b) Internet Years.

5. ICT ownership

Please mention your possession and access to the following ICTs:

Items	Possession Status		
	Self	Shared Access	No access
New Media			
Mobile Phone *			
Sim card			
Internet			
Computer /Laptop /Tab			
Traditional Media			
Television			
Radio			

* Please mention the type of your mobile phone device: Featured Phone/ Smart Phone

6. ICT self-efficacy

Please mention your degree of agreement or disagreement with the following statements:

Sl. No.	Items	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
1.	I can use Mobile Phone without the help of others.					
2.	I can use ICT(e.g. Mobile Phone, internet) by myself to access agricultural market information					
3.	I can access to the agricultural market information by using electronic media (e.g. TV , Radio)					
4.	I can updated myself about agricultural market information by calling the input dealers using mobile phone					

7. Perceived usefulness

Please mention your degree of agreement or disagreement with the following statements:

Items	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
I think AMIS can save time to get agricultural market information.					
I think I will be updated with agricultural market information by AMIS.					
I think ICTs (mobile phone, internet) will be the effective media to get market information.					
I think by using AMIS I would be able to get better price of my product.					

8. Distance from home to market

..... Km (approx.).

9. Innovativeness

Please mention your degree of agreement or disagreement with the following statements:

Sl. No.	Items	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
1.	I keen to adopt new technologies when they are available					
2.	I always look forward to new technologies					
3.	I feel excited when I learn & use new technology					

10. ICT use

Please mention your frequency of using the following ICTs for different purposes:

Items	Not at all	Rarely	Occasionally	Often	Frequently
New media					
Mobile phone (voice call, SMS, MMS, Video, etc.)	No use	1-3 times/week	5-6 times/week	1-3 times/day	4-6 times/day
Internet	No use	1-3 times/week	5-6 times/week	1-3 times/day	4-6 times/day
Computer/laptop/tab	No use	1-3 times/week	5-6 times/week	1-3 times/day	4-6 times/day
Union Information Service Centre (UISC)	No use	1-3 times/week	5-6 times/week	1-3 times/day	4-6 times/day
ICT-assisted Service Centre(e.g., GPCIC, mobile banking, bkash, Rocket)	No use	1-3 times/week	5-6 times/week	1-3 times/day	4-6 times/day
Traditional Media					
TV Program	No use	1-3 times/week	5-6 times/week	1-3 times/day	4-6 times/day
Radio Program	No use	1-3 times/week	5-6 times/week	1-3 times/day	4-6 times/day

Thank you for your kind co-operation.

.....
Signature of the Interviewer