EFFECTIVENESS OF KRISHOKER JANALA FOR STRENGTHENING AGRICULTURAL ADVISORY SYSTEM

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JUNE, 2016

EFFECTIVENESS OF KRISHOKER JANALA FOR STRENGTHENING AGRICULTURAL ADVISORY SYSTEM

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REGISTRATION NO. 10- 04116

A Thesis

Submitted to the Faculty of Agriculture,

Sher-e-Bangla Agricultural University, Dhaka

In partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

IN

AGRICULTURAL EXTENSION AND INFORMATION SYSTEM

SEMESTER: JANUARY-JUNE, 2016

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CERTIFICATE

This is to certify that the thesis enlighten, **"EFFECTIVENESS OF KRISHOKER JANALA FOR STRENGTHENING AGRICULTURAL ADVISORY SYSTEM"** 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 **MD. SABBIR, Registration no. 10- 04116** 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.

Dated:

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Dedicated to

My

Beloved Parents

ACKNOWLEDGEMENTS

The author would like to express his gratefulness and praise to the Almighty Allah who enabled the author in handling the related issues at different stages of conducting of this research for the degree of Master of Science (MS) in Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh.

The author also devotes an extraordinary pleasure and respect to express his ardent appreciation, most profound feelings of gratefulness, best respects and significant obligation to his reverend supervision, Md. Mahbubul Alam, PhD, Associate Professor, Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka for his efficient and scholastic guidance, significant and constructive criticisms and suggestions, immense help, consistent support in caring out the research work to successful completion and preparation of the thesis by necessary corrections through reviewing the text.

The author is pleased to express his profound appreciation and thanks to my honorable co-supervisor, Professor Dr. Md. Sekender Ali, Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka for his generous guidance, broad view of discussion and stimulating assistance during the period of research activities.

The author would like to extend cordial thanks to his wife Saima Shiddiqua for her co-operation, immense support during his study. Diction is not enough to express his profound gratitude and deepest appreciation to his parents who scaled their happiness during the period of study and his brothers and sisters for their never ending prayer, encouragement, sacrifice and dedicated efforts to educate him to this level.

The author expresses extraordinary gratitude to the UAO of Fulbaria sadar upazila and also the AEO and SAAOs for their genial backing and giving valuable information for collecting data. Last but not the least, respondents of the study area of Fulbaria upazila under Mymensingh district, deserves special appreciation for their patience and co-operation during the collection of data.

The Author

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ABBREVIATION AND ACRONYMS

AICC	=	Agriculture Information and Communication Centers
AIS	=	Agricultural Information Service
BAU	=	Bangladesh Agricultural University
BBS	=	Bangladesh Bureau of Statistics
DAE	=	Department of Agricultural Extension
FAO	=	Food and Agriculture Organization
GOB	=	Government of Bangladesh
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

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ABSTRACT

Agricultural extension service largely depends on the 'agent-based' service delivery model, however ICTs could efficiently be used as an alternative of this traditional approach. However, the question remains unexplained whether an ICT-based application is valued by the farmers as an alternative ways for receiving farming information. Therefore, this study aimed to investigate users' perceived effectiveness of Krishoker Janala as an ICT-based extension service as an agricultural advisory system. Attempts were also made to identify personal and technological level factors and their effects on users' perceived effectiveness of ICT-based service. A cross-sectional survey methodology was employed. All the blocks of Fulbaria upazila under Mymensingh district were selected as the study area. One hundred twenty two (122) farmers were selected as the sample by using proportionate random sampling technique from a population of 525 users who used Krishoker Janala at least once in last cropping year. Data were collected by the researcher himself using a well-structured interview schedule during the period from 20th December, 2016 to 10th February, 2017. Data revealed that majority of the respondents (79.5%) perceived ICT-based service like Krishoker Janala as moderately effective as an agricultural advisory system. A multiple regression analysis revealed that education, ICT ownership, ease of use, information richness were found to be significant predictors which altogether explained 51.6% of the variance of perceived effectiveness of Krishoker Janala as an ICT-based extension service. However, extent of ICT use (both general and agricultural purposes) were found to be non-significant to perceived effectiveness of Krishoker Janala as an ICT-based extension service. The finding indicates while ICT-based service may not be a direct alternative of 'agent-based' system, its effectiveness for disseminating time-sensitive farming information is promising.

CHAPTER I

1 INTRODUCTION

1.1 General Background

Research has already been shown the importance of information for agricultural and rural development (Swanson, 2010; Rajalahti, et al., 2010). Timely and appropriate information may also bring positive social and economic changes. However, often the small-scale farmers suffer from receiving time-sensitive farming information in duly-fashioned and face economic losses. Agricultural extension which largely depends on the information exchange between farmers and among members of a farming community has been proven to be inefficient to adequately addressed increasing information demand (Greenridge, 2003; Lightfoot, 2003) due to high Sub-Assistant Agriculture Officer (SAAO) and farmer ratio. Concerning this limitation, Information and Communication Technologies (ICTs), an electronic mean of communication, can greatly help farmers to receive time-sensitive farming information over the traditional agricultural advisory system. However the question remains unexplained that how best to harness ICTs for improving the condition of rural livelihoods or how effective it is perceived by users, particularly for receiving time-sensitive farming information like crop management, pest management, disease management.

Neighbors, input dealers and local extension officers are the key information sources for farmers for receiving farm-related advice and information. The role of agricultural advisory system in disseminating improved farm practices and time-sensitive information has already been well recognized. However, Department of Agricultural Extension (DAE), the leading agricultural extension service provider of Bangladesh along with other public and Non-government Organizations (NGOs) predominately depend on an ‘agent-based’ service delivery model. While farmers from developing countries are increasingly lacking time-sensitive information regarding their agriculture, the traditional ‘agent-based’ advisory system has been proven as an inadequate system that failed to meet farmers’ information needs in timely manner. Therefore, despite the different roles and functions that agricultural extension and advisory service currently play, extension agencies around the globe are increasingly adopting and depending on ICT-based advisory system which is expected to overcome the barriers of traditional ‘agent-based’ system.

ICTs are powerful tools for spreading and handling information. It has impact on all aspects of life by overcoming the geographical barrier, reducing the waiting time and the gap of information. It also allow to interact and communicate among members of a farming community irrespective of their status.

Taking the lesson from the early adopter countries as well as recognizing the potentiality of ICTs in agricultural technology transfer and information sharing among knowledge workers and farmers, DAE and other private organizations including NGOs, agro-based industries, telecommunication providers have launched several ICT-based initiatives to inform farmers about agro-related information. However, the success of this initiative is yet to be researched. Therefore, this study attempts to evaluate one of the agricultural advisory system projects '**Krishoker Janala', (**A 'Digital Completion and Standardization of Plants' Problem Identification System (DPPIS)**)'** which is a joint venture project of DAE, Access-to-Information (A2I) project, UNDP, USAID and Bangladesh Government.

'Krishoker Janala' is a mobile-based application. Users can download it in their mobile devices and use locally without the Internet. More than one thousands (1,000) problems of 120 crops are present in this mobile application. Generally field crops, vegetables, fruits and others plants' diseases, pests, nutritional deficiencies alone with their images are present in this system. A farmer can easily identify his/her problem of crops by seeing the images in the system. The app has been proven as a time saving system, because they don't have to go to others. Farmers often seek help to SAAOs about their farming problems. However, it becomes often difficult to clearly identify any disease or problem without knowing proper signs and symptoms. This mobile application therefore assists users to identify the problem or disease by searching the images and symptoms. Since quick identification of disease is vital for crop cultivation this application could work as an important weapon for the farmers.

1.2 Statement of the Problem

The role for agricultural extension service is to reach farmers with latest farm information and keep them updated with new technologies. However, the biggest challenge for agricultural advisory service is to reach farmers with information timely. In reality, it has been an immense pressure for extension workers to meet farmers' demand due to high farmers-extension worker ratio. Therefore, farmers have to suffer

economically from delayed receiving of information. Despite farmers dependent on other sources of information like input dealers or knowledgeable neighbors, it's been proven inadequate to meet the need of a demand-driven agriculture. Regarding this aspect, ICT-based solutions can provide an additional support to the traditional 'agent-based' agricultural advisory service and extend information directly to the farmers without any delay. This might on one hand assist farmers to directly receive farm related information and on the other hand help extension workers to upgrade their skills in delivering service. Realizing this double-pronged benefits, numerous ICT-based solutions have been developed and successfully implemented in various settings for strengthening agricultural advisory system, especially in developing countries. 'Krishoker Janala' is one of such prime initiatives by DAE, Bangladesh which is a repository of plants' diseases information with search option helps its users to find out problems of plants and suggest solutions. However, the success of such initiative is largely depend on how effectively it is serving its intended purposes to its users. Therefore, this study undertook an attempt to study the effectiveness of Krishoker Janala as an ICT-based agricultural advisory system in Bangladesh from its end-users viewpoints having the following questions in mind:

- ✓ What were the factors that influence users' perceived effectiveness of using Krishoker Janala?
- ✓ To what extent users' perceived ICT-based solution (Krishoker Janala) as an effective tool for receiving farm-related information?
- ✓ What were the contribution of the factors (includes both personal and technological) to users' perceived effectiveness of using Krishoker Janala as an ICT-based agricultural extension service?

1.3 Objectives of the Study

Considering the research questions stated above the following objectives were formulated for guiding the research:

- ✓ To determine and describe the selected factors that might contribute to users' perceived effectiveness of using Krishoker Janala.
- ✓ To determine and describe the extent of effectiveness of Krishoker Janala as an ICT-based extension service as perceived by the farmers.

- ✓ To explore the contribution of the factors (personal and technological) on their perceived effectiveness of using Krishoker Janala as an ICT-based extension service.

1.4 Scope and Limitations of the Study

The findings of the study will be particular applicable to the Fulbaria Upazila of Mymensingh district where the project of Krishoker Janala was first time launched. These findings may also be applicable in other areas of Bangladesh where the farmers and extension workers are informed about and have accessed to this initiative. The findings of the study will be beneficial for the extension personnel, farmers and particularly policy makers who are working towards digitalization of agricultural advisory system of Bangladesh.

The main purpose of the study was to assess the effectiveness of Krishoker Janala as an ICT-based information service delivery model as perceived by the farmers. It is expected that the findings obtained from this investigation will be generalized and applied to the other context however, in order to fulfil the research in purposeful and controllable way it becomes important to oblige certain limitations in regard to certain aspects of the study. Concerning the resources and time available to the researcher, the following limitations have been considered throughout the study.

- ✓ The study was conducted in only Fulbaria upazila of Mymensingh district.
- ✓ Population for the study was kept confined within the heads of the farm families.
- ✓ There are numerous factors that might influence users' perceived effectiveness of using ICT-based advisory system like 'Krishoker Janala', however among those factors only few personal and technological factors which deemed important were considered for this study.
- ✓ While longitudinal methodology might be the better approach to study how effectively ICTs help farmers for receiving agricultural information, this study adopted a cross-sectional survey methodology to interpret the phenomenon of interest.

1.5 Assumptions of the Study

The following assumptions were made in conducting the 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 ICTs 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 him from the respondents were free from bias.

v. The finding of the study will be useful for planning and execution of more ICT-based services facilitate its users for receiving agricultural information.

Study on the "effectiveness of Krishoker Janala for strengthening agricultural advisory system" is conducted in very limited area of Bangladesh. A few studies in this regard have so far been conducted, therefore, the study will add new insights to the body of knowledge about the ICTs' effectiveness in disseminating farm-related information to the rural clienteles.

1.6 Definition of the Terms

Information and Communication Technologies (ICTs)

ICTs refer to as any communication device or application, such as radio, television, cellular phone, computer and computer-based programs which predominately use for communication between parties. It is the technology that provides access to information through telecommunication.

Education

The act or process of acquiring knowledge, developing the power of reasoning and judgment, and generally preparing oneself or others intellectually for mature life. Here, education was measured based on the length of formal schooling received by a respondent.

ICT Ownership

ICT ownership refers to as a respondent's possession of ICT devices ranging radio, TV to mobile phone and computer. It includes both self and shared access.

Ease of use

It refers to the extent to which a respondent perceives a system is easy to operate.

Extent of ICT use

It refers to the frequency of ICTs use by a user. Extent of ICT use for agricultural purpose refers to the extent of ICTs use by farmers for farm-related activities while the non-farm-related purposes is referred to as general purpose.

Information Richness

Information richness refers to the quality and quantity of the information provided by a system itself. The ICT-based application provide information that seem to be more rich in content (e.g., text, image, multimedia message) than traditional media like printing materials, TV and radio because of its interactivity and customizability.

Radio

Radio is a powerful and very popular audio media which falls in mass media. It delivers message to a wide-dispersed area using electromagnetic waves.

Television

It is an audio visual media for diffusing information and falls under mass media. An electronic system of transmitting transient images of fixed and moving objects together with sound over a wire or through space by apparatus that converts light and sound into electrical waves and reconverts them into visible light rays and audible sound.

Internet

The Internet is a global system of interconnected computer networks that use the Internet protocol suit (TCP/IP) to link devices worldwide. It is a network of a computer networks that connects billion of webpages. The internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents and applications of the World Wide Web (WWW), electronic mail, telephony, and peer-to-peer networks for file sharing.

Mobile Application

A mobile application, most commonly referred to as an app, is a type of application software designed 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.

Mobile Phone

An electronic telecommunication device, often refers to as a cellular phone or cellphone. Mobile phones connect to a wireless communication network through radio wave satellite transmission. Most mobile phones provide voice communications, Short Message Service (SMS), Multimedia Message Service (MMS), and newer smart phones may also provide Internet services such as web browsing and e-mail.

Feature Phone

Feature phones typically provides voice calling and text messaging and with a very few multimedia support.

Smart Phone

A smart phone is a mobile phone (also known as cell phones or cell mobiles) with an advance mobile operating system and having Internet browsing system.

SMS

SMS means Short Message Service. This is a feature on a mobile that allows a user to send or receive written message or any kind of information.

MMS

MMS means Multimedia Message Service. This is a method of transmitting graphics, video or sound files, etc.

CHAPTER II

2 REVIEW OF LITERATURE

The available literature for the present research are made by the researcher himself by extensive search for studies relevant to the context of this study. A keywords based search strategy was developed using popular search engine like Google and Scholar Google. Besides, related references were collected from library search. The collected references were extensively reviewed keeping the objectives of this study in mind. The reviews were presented into three sections. First section deals with the concept of ICTs and their effectiveness in disseminating agricultural information. Second section deals with the factors and their influence on perceived effectiveness of ICTs. Third and the final section deals with the conceptual framework of the study.

2.1 Concept of ICTs and Their Effectiveness for Strengthening Agricultural Advisory System

ICTs as used in this paper refers to all information handling communication technologies both digital and non-digital, which are far more widespread, particularly in the rural areas of developing countries. Davenport and Prusak (1998) explained information handling technologies/ICTs to include digital ICTs (mostly referred to as "new ICT") but also encompass hard technologies such as radio, television and analogue telecommunication networks, and soft technologies based on information held as the written word such as used in books, manuals, and newspapers. The relevant ICT such as radio, TV, telephone and email provide information to the poor, which help them to improve on their productivity and income (Ssewanyana, 2007; Scott, et al., 2008) reported that mobile phone can often work well when integrated with more traditional means of communication in African rural setting. Bertolini (2004) argued that innovative ways of combining ICT-based information sources (such as agricultural information systems) with traditional ones (such as radio broadcasting) should be considered when looking at the costs and benefits of ICT development.

Modern communication technologies like mobile phone or Internet is very much important for development communication and may foster socio-economic growth of a nation. Study conducted by Lucky (2012) showed the importance of ICT-based communication channels in the dissemination of agricultural information and thus in agricultural development. Farmers can directly communicate with extension agents, ask

questions and get answers using ICTs without traveling to agricultural extension office or wasting too much time, particularly for urgent queries. Electronic media like Radio, television, the Internet can get information even to the remote areas where it is very hard to make direct contact.

The modern media of communication like radio, television, particularly the Internet are apparently accessible to urban individuals and elites (Samanta, 1986), however the emergence of low-cost computing device like mobile phone create huge scope for rural people as well to continuously be updated with advisory service.

The utilization of new technologies in farming information transfer and investigated future points of view of new technologies as a power of progress in developing countries. They found that print media, electronic media, radio, television broadcasts are the vital wellsprings of disseminating information (Wate and Rivera, 1991).

ICTs were very efficient in terms of time, cost and distance, developing agricultural programs through assisting access to new technologies, production inputs and market information. He also observed that ICT had its direct and indirect effect for poverty alleviation. The main direct effect was higher profits from agricultural production through adoption new technologies and direct effect was employment generation through commercialization of agriculture. So with the acceptance of ICT based service farmers are able to get more information, the get more productivity of their crops (Kaini, 2007).

Yckini and Hussein (2007) reported that transfer of technology for agricultural research and development in the developing countries is not optimal between the national and international research institutions. This problem is greatly exist even in the transfer of information from the research institutions to the national extension systems, particularly to the end-users, i.e., farmers. This means that there is a divide in knowledge between delivery institutions and rural farmers. Despite farmers' access to the Internet is still very low in the rural areas, mobile phone-based applications might help to overcome those barriers.

ICT enables the novel Ethiopian Commodity Exchange (ECX) to transmit commodity price information to farmers in real time – within two minutes of a deal being made at ECX from Addis Adaba. According to the World Bank (2011), market data feeds directly to the farmers via electronic display board in 31 centers spread across Ethiopia

as well as on the exchange's website. Market data is also provided via text messaging to the interested farmers those are the user of mobile phones.

Mobile phones can improve access to and use of information about agricultural technologies, potentially improving farmers' learning. Farmers require information on a variety of topics at each stage of the agricultural production process. In many developing countries, such information has traditionally been provided via personal exchanges, radio and perhaps landlines and newspapers. Compared with these mechanisms, mobile phones can significantly reduce the costs of obtaining agricultural information. Mobile phones are significantly less expensive than the equivalent per-search cost of personal travel or a newspaper, yet more expensive than landlines or radio. Nevertheless, landlines are not readily available in most regions of the country, and radio only provides price information for specific products and markets on a weekly basis. The reduction in search costs associated with mobile phones could increase farmers' access to information via their private sources, such as members of their social network (Bayes, *et al.*, 2007).

ICT-based initiatives which cater for non-market information and extension services including financial, utilization of best agricultural practices, research, weather, climate, and distribution and supply chain management. Some of the initiatives include: KenCall Farmers Helpline, M-PESA etc. KenCall is a real-time call center service staffed by agricultural experts that provide agricultural information, advice and support to smallholder farmers over the phone, using voice and voice call-back to farmers (Payne et. al., 2010).

Five potential mechanisms through which mobile phones can provide economic benefits to consumers and producers in Sub-Saharan Africa (Aker, 2010). First, mobile phones can improve access to and use of information, thereby reducing search costs, improving coordination among agents and increasing market efficiency. Second, this increased communication should improve firms' productive efficiency by allowing them to better manage their supply chains. Third, mobile phones create new jobs to address demand for mobile-related services, thereby providing income-generating opportunities in rural and urban areas. Fourth, mobile phones can facilitate communication among social networks in response to shocks, thereby reducing households' exposure to risk.

Mobile phone supports access to information about agricultural technologies and extension services. There are several potential mechanisms including improving access to information from private sources or through agricultural extension services; improving the management of input and output supply chains; facilitating the delivery of other services; increasing the accountability of extension services; and increasing linkages with research systems (Aker, 2011).

Information and communication technologies (ICTs) can play a significant role in rural development by empowering the rural farmers with new knowledge, up-to-date information and entrepreneurship skills. Parvyn-Wamahiu and Etta (2003) observed that telecentres have the potential to transform the lives and livelihoods of many in the developing world and especially those in remote locations. The work by Grameen Foundation in Uganda shows that use of mobile application has given farmers a broad range of information (Gantt and Cantor, 2010). The foundation works with a network of community knowledge workers (CKWs) who provide farming advice, market data, pest and diseases control training plus weather forecasts. The potential of Village Information Centres (VICES) as promoter of integrated information and communication technologies was demonstrated in 6 parishes of Rubaya sub-county in Kabale District, South Western Uganda over a period of six years since 2004. The goal was to improve the livelihoods of farmers through enhancing information access and use through improved flow of information between farmers, service providers, community members, and NGOs on NRM, agriculture and market.

A study in Tanzania, building on the utility of mobile phones as recording tools, listening devices, money-makers, and catalysts for dialogue, community radio stations are incorporating mobile technology into programming and it is being used for advisory services in agriculture (Gakuru et al. 2009). In Kenya and Malawi, mobile banking is another ICT-based service which has had a tremendous impact on the socio-economic status of farmers. Through innovative schemes such as M-PESA in Kenya, farmers are able to send and receive money using their mobile phones (ITU, 2010).

The International Rice Research Institute launched a program called nutrient manager for rice mobile (NMRiceMobile) to provide Philippine rice farmers with advice via their mobile phone on the optimal training, amount and type of fertilizer to apply to their rice crop to maximize production and profit, and reduce waste. The farmers and

extension works are able to dial a toll-free number at which they can hear a voice instruction in their preferred local language which prompts them to use their keypad to answer 12 to 15 questions about their rice crop. After answering all the questions, the farmer receives a tailored fertilizer recommendation via text message (IRRI, 2011).

Modern agricultural system befitting the spirit of the age is a crying need to establish a balance between ever increasing demand and gradually decreasing farmland. Bangladesh Rice Knowledge Bank (BRKB) has been conducting research work from a very long time. This app will provide detailed information on modern technology of rice cultivation, beside disease management, seed production and crop marketing etc.

The Soil Resource Development Institute (SRDI) under the Ministry of Agriculture has launched a digital fertilizer recommendation system for the farmers to help them get access to information on selecting precise dosage of different fertilizers for various crops through digital platforms. The system has been developed with the technical cooperation of Katalyst, a Swiss based marketing development project, which innovated online fertilizer recommendation software incorporating the soil related data prepared by SRDI.

Experiences from Ghana show that how mobile phones can be used by cocoa farmers to obtain production and marketing information. A pilot program called Cocoalink, launched by the Ghana Cocoa Board, provides cocoa farmers with useful information about improving farming practices, farm safety, crop disease prevention, post-harvest production, and crop marketing. In this program farmers receive information and specific answers to questions at no charge through voice and SMS messages in their local language or English (Martiz, 2011).

Overa (2006) found that both producers and traders benefited considerably from the use of mobile phones after their introduction in 2001 in Ghana. Speed of communication allowed for more efficient information flows within the network of value chain actors, which in turn, saved time and reduced transportation costs. This led to better matching of supply and demand, and improved monitoring of compliance within the terms of trading contracts. One effect was that early adopters of mobile phones strengthened their existing trader relationships and networks, which were built on strong lineage-based social structures. New market entrants managed (through using mobile phones) to quickly cement good trading reputations and facilitate the building of more efficient

trading networks. By contrast, existing traders and new entrants without phones were not able to attain these advantages.

A study of mobile phone users in South Asia also highlighted perceptions among users that the phones had increased the efficiency of daily activities due to greater contact ability and ability to obtain information (De Silva & Zainudeen, 2007). Looking at the use of mobile phones in agriculture more specifically, Furuholt and Matotay (2011) assessed how farmers took advantage of mobiles throughout the farming cycle, they found that mobile phones affected all stages of the cycle, including preparations, farming, harvesting and post-harvesting. Overall, farmers felt that mobile phones help to raise incomes by improving their ability to deal with risks and take advantage of income opportunities.

Jensen (2007) showed that fishermen using mobile phone to access to market information obtained higher prices. This also be effective to broadcast weather information. The Mozabique Agricultural Marketing Service (SIMA) collects and disseminates nation-wide and provincial data on market prices, processing of product and availability through a variety of media including text messages, e-mail, Internet, national and rural radios, television and newspapers. Therefore, ICTs, if properly designed and implemented, could be an effective medium to strengthen agricultural advisory service along with the traditional way of technology dissemination.

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. ICTs help farmers to get timely information yet availability of ICTs is remained limited (Meera et al., 2004).

In Kenya, market information is provided through SMS so that smallholders have access to daily agricultural commodity prices, extension messages and opportunities to sell or bid through text messages and/or voicemail; there are other rural-based market information points which are linked through an electronic information system that allows farmers to link with buyers in different urban centers (KBDS, 2004; Muriithi *et. al*., 2009). Manobi, in Senegal provides access to price data on various crops, collected from different markets across the country. Manobi personnel use mobile phones to send

the price data to the Manobi database using the wireless application protocol (WAP) (ITU, 2010).

2.2 Review of Studies on the Selected Factors and their Contribution on Effectiveness of ICTs for Strengthening Agricultural Advisory System

This study framed to assess ICTs' roles for strengthening agricultural advisory system which was measured by farmers' perceived effectiveness of an ICT-based service delivery system 'Krishoker Janala'. Effective dissemination of information by ICTs instead of traditional agent-based system and their acceptance by farmers signify the roles of ICTs for strengthening agricultural advisory system. Nonetheless, users' acceptance of an ICT might be influenced by many factors. Seven, comprises of personal and technological, salient factors were considered for this study. Two factors, education and ICT ownership, were considered as individual factors. Two factors, ease of use and information richness, were considered as the technological quality of the system. The rest of the two factors, extent of ICT use for general and agricultural purpose, were considered as the users' behavioral related factors of the research model.

2.2.1 Education and perceived effectiveness of ICTs

Education is one of the unique characteristics of an individual helps him to try out new things and explore new knowledge. Since use of ICTs require individuals to be skilled at operating the devices, an educated person may learn the system quickly and perceive better outcome out of it than the unlettered person. In addition, an educated person might be better capable of judging the relative advantage of ICT-based advisory system over the traditional agent-based system. Anecdotal evidences plus numerous prior studies have already documented that educated individuals are keener to use different information and communication media for receiving agricultural information (Bhuiyan, 1998, Sarker, 1995, Nuruzzaman, 2003, Pandian el. al., 2002) except few exceptions. Therefore, it can be concluded that the more the education of the respondents, the more they perceived ICTs as an effective alternative of receiving agricultural information.

2.2.2 ICT ownership and perceived effectiveness of ICTs

Various studies have examined the role of ICT ownership in perceived effectiveness of ICTs. Several assessments concluded that mobile phones had reduced search times and costs (Bayes *et al.*, 1999; Jagun*et et al.*, 2007; Overa, 2006). The growth of mobile phone coverage induces greater market participation of farmers who produce perishable

crops in remote areas. While some evidence suggests that the use of mobile phones to obtain price information has induced producers to move to other markets (Jensen, 2007). Goodman (2005) studied the social impacts of mobile phones in Tanzania and South Africa and found that mobile phones were being used to maintain social networks and provide access to information on socio-economic opportunities. Souter *et al.* (2005) also assessed the economic impact of telephones on rural livelihoods in Mozambique, Tanzania and India and reported that the impact of telephones on peoples' livelihoods were more evident in emergencies, social networks, and saving costs and time.

2.2.3 ICT uses and perceived effectiveness of ICTs

Research conducted by Lio and Liu (2006) found strong correlation between the use of ICT and farmers' productivity. They consider that use of ICTs can also increase farmers' bargaining power. With the access to information, small-scale farmers are better able to compete with the larger operators. They can even develop knowledge regarding crop choices, develop products for the niche markets and even can market the products directly to the consumers. Without the access to knowledge and communication capabilities the small farmers remain at the mercy of the global market forces.

While few studies suggest a significant positive contribution of ICT to development, others have been more cautious or even skeptical. Cullen (2003) argues that new technologies may co-exist with the old and often lead to digital divide. It also suggests that the opportunity cost of the resources engaged in bridging the digital divide may lead to the neglect the other development priorities.

Mutula (2005) argues that resources utilized to bridge the digital divide would have more impact if they were directed to meet the basic needs of the poor. He further questions about the outcome of the effective use of ICTs. Other researchers like Nikam, et al., (2004), Kirlidog and Aydemir (2005) express concerns regarding the appropriation of western born ICTs in the setting of developing societies. However, it has now been well documented that ICT can contribute positively to development if it is used appropriately (Heeks, 2002). Use of ICTs either for home- or farm-related purposes indicate acceptance of those systems by its users. In order words, the more the use of ICTs, the more its users' perceived it as effective. Therefore, it may be concluded that the more use of ICT positively lead to higher perceived effectiveness.

2.2.4 Ease of use and perceived effectiveness of ICTs

Frequent usage and exposure to ICT must be considered if someone wants to form a positive attitude towards ICT. When people frequently use and expose to ICT, it informed them that ICT was helpful, easy to use and beneficial to them thus creating a positive attitude towards ICT usage.

Specifically focused on six variables that have the potential to influence conception towards ICT usage and the variables are ICT literacy, perceived usefulness, perceived ease of use, subjective norm compatibility and job relevance. There were a lot of existing papers that have proven that influence of ICT literacy, perceived usefulness and perceived ease of use compatibility, and subjective norm on ICT usage. Ease of use is a strong predictor of ICT use and thus its perceived effectiveness (D' Silva *et al*., 2010).

2.2.5 Information richness and perceived effectiveness of ICTs

Information richness is the quality of a communication medium to reproduce the information sent over it without loss or distortion (Daft & Lengel, 1986). The theory of media richness suggests that all communication media vary in their ability to produce and sent information over to its users. While face-to-face medium, like farm-&-home visit by extension workers, is richer in content as it creates a greater immediacy and warmth of the communication by providing more cues than text-based communication media like poster, circular letter, bulletin, pamphlets. While ICTs may not be an alternative of farm-&-home visit, the latter becomes more infrequent due to high farmers and extension workers ratio. Therefore, compared to other text-based communication media, Krishoker Janala as an ICT-based extension service is richer as it provides information with image and text. Therefore, it can be conclude that the higher the information richness of a media, the higher the effectiveness perceived by its users.

2.3 The Conceptual Framework of the Study

In scientific research, selection and measurement of variables constitute an important task. Effectiveness of Krishoker Janala for strengthening agricultural advisory system was the main focus of the study. Effectiveness of Krishoker Janala as an ICT-based service as perceived by the farmers was used as proxy for assessing ICTs' roles for strengthening agricultural advisory system. In this study, six selected factors, education,

ICT ownership, ease of use, extent of ICT use (general purpose), extent of ICT use (agricultural purpose) and information richness were considered which might positively contribute to farmers' perceived effectiveness of Krishoker Janala as an ICT-based service. The conceptual framework for this study is shown in Figure 2.1.

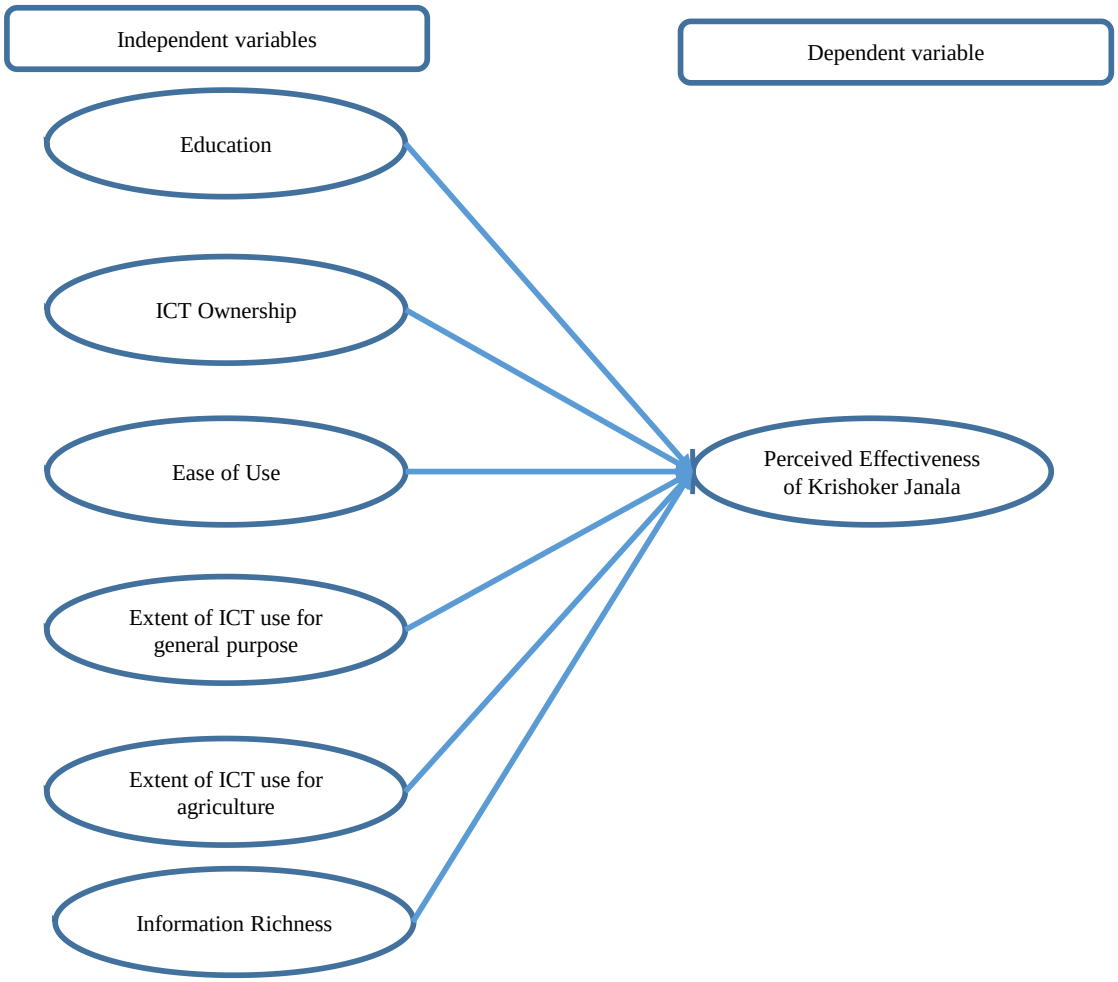

Figure 2.1 The conceptual model of the study

CHAPTER III

3 METHODOLOGY

This research is explorative in nature. Therefore, a cross-sectional survey methodology was used for the study purpose. Data were collected from the known population by interviewing respondents in a face-to-face situation using structured interview schedule. Appropriate data analysis tools were used to interpret the data. The details of the methodology used in this study is presented in this chapter.

3.1 Locale of the Study

Fulbaria upazila of Mymensingh district was selected purposively as the study area since the selected case of ICT-based advisory system 'Krishoker Janala' was first time piloted in this upazila. The study area consists of 40 blocks and all the blocks were considered as the locale of the study. A map Fulbaria upazila of Mymensingh district showing the locale of the study have been presented in Figure 3.1.

3.2 Population and Sampling Design

Users of ICT-based agricultural advisory system (Krishoker Janala) constituted the population of the study. With the help of Upazila Agriculture Officer (UAO), Agriculture Extension Officer (AEO), Sub-Assistant Agriculture Officers (SAAOs) and local leaders the researcher himself collected an update list of all the farmers of Fulbaria upazila who used 'Krishoker Janala' at least once in the last cropping season. Thus, the total number of population was found 525. The sample size was determine using a formula proposed by Kothari (2004).

$$n = \frac{z^2 pqn}{e^2(N-1) + z^2\, Pq}$$

Where,

n = Sample size

N= Population size = 525

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) = 122

The proportionate random sampling was used to determine the sample from each block (Table 3.1). A reserve list (10% of the sample = 12) 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 (20th December, 2016 to 10th February, 2017).

Table 3.1 The Population and sampling of this study

Block No.	Population	Sample
Nauga	10	2
Badihati	15	3
Sontoshpur	20	5
Putijana	10	2
Patuli	15	4
Komlapur	7	2
Kushmail	10	2
Chokradhakanai	9	2
Niugi Kushmail	8	2
Baliyan	13	3
Noyanbari	27	8
Teligram	5	1
Deukhola	15	4
Kalibajail	6	1
Vatipara	18	4
Fulbariya	13	3
Andhariyapara	7	2
Jorbariya	4	1
Bakta	8	2
Koiarchola	12	3
Valukjan	19	4
Rangamatiya	15	3
Bishnurampur	8	2
Onontopur	5	1
Enayetpur	19	4
Kahalgau	8	2
Betbari	9	2

Kaladoh	4	1
Bidyanondo	10	2
Shibrampur	19	4
Radhakanai	21	5
Roghunathpur	7	1
Polashtoli	15	3
Acim	18	4
Langol Shimul	16	3
Ramnogor	22	6
Vobanipur	18	4
Joypur	20	5
Kandaniya	20	5
Pourosova	20	5
Total	525	122

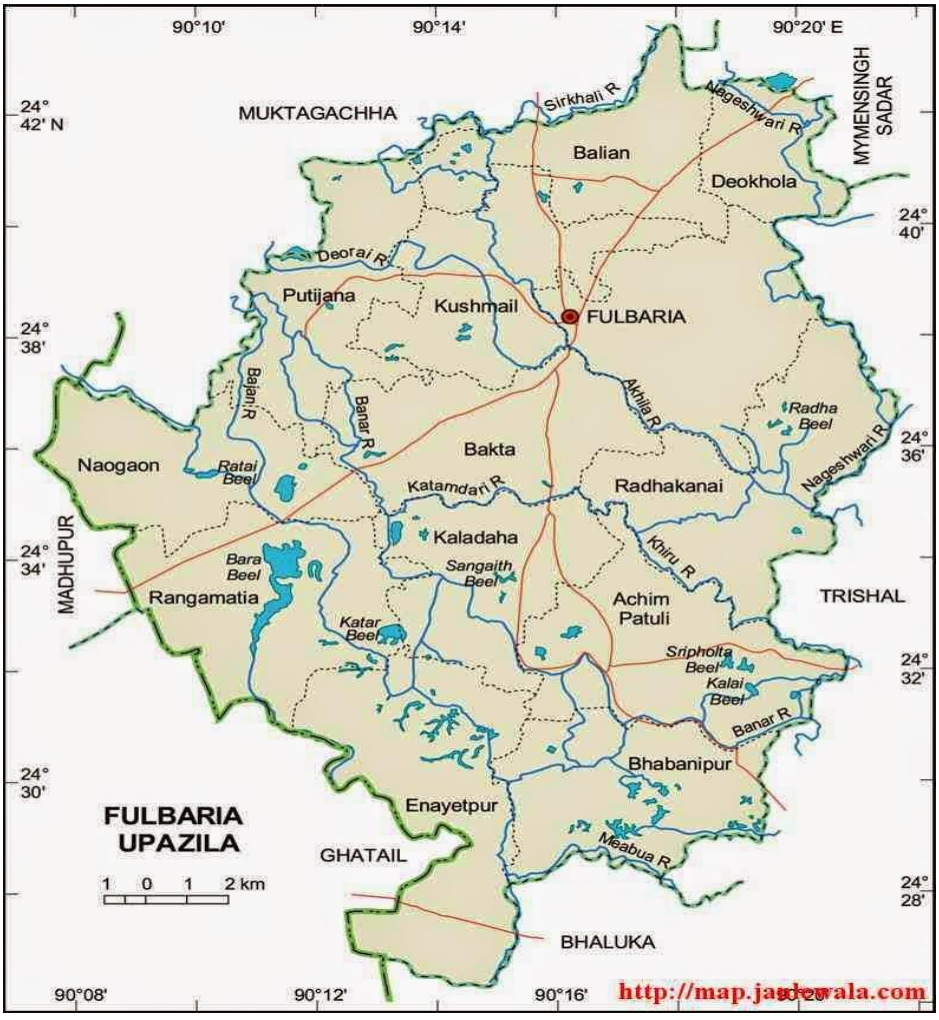

Figure 3.1 A map of Fulbaria upazila of Mymensingh district showing the study area

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. Items of the interview schedule was prepared by reviewing prior research and consulting with experts. To test the validity of the selected items used in the interview schedule, a pre-test was carried out using 10 respondents. The interview schedule was finalized based on the findings of the pre-test. 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. Reviewing the 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 research study. Before selecting variables the researcher visited the study area (Fulbaria, Mymensingh) and talked to the Sub-Assistant Agriculture Officers (SAAOs), 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 factors that influence farmers' perceived effectiveness of ICTs. A total of six (6) factors were selected as independent variable. The measurement procedures of these variables are given below:

3.4.1.1 Education

Education was measured by a number of years of formal schooling received by a respondent from educational institution. If any respondent did not know how to read or write than his/her 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 as 3. For example, when a respondent read up to class 4 than his score will be 4.

3.4.1.2 ICT ownership

ICT ownership of the respondents were measured on the basis of nature of access of six selected ICT devices or communication media. ICT ownership score was computed in the following manner of each ICT device.

Nature of Access	Score Assigned
Self	1
Shared	0.5
No Access	0

Thus the ICT ownership of a respondent could range from 0 to 6. Where '0' indicates no access and '6'indicates highest access of ICT devices or communication media.

3.4.1.3 Ease of use

Ease of use refers to the extent of ease of using ICTs (Krishoker Janala) as perceived by the respondents. Scales were adapted from Davis (1989) and responses were captured by a 5-point Likert scale against four statements as follows:

Degree of ease of use	Score
Strongly Agree	5
Agree	4
Undecided	3
Disagree	2
Strongly Disagree	1

Ease of use could range from 4 to 20. Where '5' indicates the lowest perceived ease of use and '20' indicates the highest perceived ease of use of Krishoker Janala.

3.4.1.4 Extent of ICT use (general purpose)

Extent of ICT use (general purpose) means the frequency of using ICTs devices in general purpose. Five point rating scale was used for this purpose.

Items	Nature of Use	Score
Mobile Phone (voice call, SMS, MMS, Video, etc.)	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
Internet	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
Computer/laptop/tab	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
Union Information Service Centre (UISC)	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
ICT-assisted Service Centre(e.g. GPCIC, mobile banking, bkash, Rocket)	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
TV Program	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
Radio Program	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week)	4 3 2

	Rarely (1-3 times/week) Not at all (No use)	1 0

Extent of ICT use (general purpose) was measured by 7 items. Thus, the score could range from 0 to 28. Where '0' means no use of ICTs and '28' means the highest use of ICTs for the purpose rather than agriculture.

3.4.1.5 Extent of ICT use (agricultural purpose)

Extent of ICT Use (agricultural purpose) means the frequency of using ICTs devices for farm-related purpose. Five point rating scale was used for this purpose as follows:

Items	**Nature of Use**	**Score**
Mobile Phone (voice call, SMS, MMS, Video, etc.)	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
Internet	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
Computer/laptop/tab	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
Union Information Service Centre (UISC)	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
Agricultural Information Service (AIS) Krishoker Janala	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
Farmers' Help line (Krishi Jigyasha (7676), Banglalink Krishibazar (2474), GP Krishisheba (27676)	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
TV Program	Frequently (4-6 times/day) Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	4 3 2 1 0
Radio Program	Frequently (4-6 times/day)	4

	Often (1-3 times/day) Occasionally (5-6 times/week) Rarely (1-3 times/week) Not at all (No use)	3 2 1 0

Farmers' extent of use of ICTs for agriculture was captured by eight items. Therefore, the score could range from 0 to 32. Where '0' means no use of ICTs for agriculture and '32' means the highest use of ICTs for agriculture purpose.

3.4.1.6 Information richness

Information richness refers to the information produced by 'Krishoker Janala' is clear, complete, easily understandable and detail as perceived by the respondent farmers. For this purpose five point rating scale was used against three selected statements as follows:

Extent of Information Richness	**Score**
Strongly Agree	5
Agree	4
Undecided	3
Disagree	2
Strongly Disagree	1

Information richness score range from 3 to 15, where '3' means respondents perceived information produced by 'Krishoker Janala' is lean in content and '15' means respondents perceived information produced by 'Krishoker Janala' is rich in content.

3.4.2 Measurement of dependent variable

Perceived effectiveness of ICT-based service (Krishoker Janal) was the dependent variable of this study. Perceived effectiveness of 'Krishoker Janala' was measured on the basis of opinion provided by the respondents regarding the extent of effectiveness of Krishoker Janala as an ICT-based extension service. Five point scales namely "strongly agree", "agree", "undecided", "disagree", and "strongly disagree", were used to measure the extent of effectiveness of Krishoker Janala as an ICT-based agricultural advisory service perceived by the respondent farmers.

Extent of effectiveness	**Score**
Strongly Agree	5
Agree	4
Undecided	3
Disagree	2
Strongly Disagree	1

The effectiveness score of a respondent was obtained by adding the scores and it could range from 6 to 30, where '6' indicates no perceived effectiveness of Krishoker Janala as an ICT-based extension service and '30' indicates the highest effectiveness of Krishoker Janala as an ICT-based extension service as perceived by the farmers.

3.5 Hypotheses

3.5.1 Research hypotheses

The following research hypotheses were put forward to test the contribution of the selected factors of the farmers' to their perceived effectiveness of Krishoker Janala as an ICT-based extension service

Sl No.	Hypotheses
H1	The more the respondents have the education, the more the perceived effectiveness of Krishoker Janala as an ICT-based extension service.
H2	The more the respondents have the ICT ownership, the more the perceived effectiveness of Krishoker Janala as an ICT-based extension service.
H3	The more the respondents perceived ICTs as ease to use, the more the perceived effectiveness of Krishoker Janala as an ICT-based extension service.
H4	The higher the extent of ICTs use (general purpose), the more the perceived effectiveness of Krishoker Janala as an ICT-based extension service.
H5	The more the extent of ICTs use (agricultural purpose), the more the perceived effectiveness of Krishoker Janala as an ICT-based extension service.
H6	The more the information produced by Krishoker Janala as an ICT-based extension service is rich in content, the more the perceived effectiveness of Krishoker Janala as an ICT-based extension service.

3.6 Collection of Data

Data were collected by the researcher himself during 20th December, 2016 to 10th February, 2017. To get appropriate and valid information, the researcher made all possible efforts to explain the purpose of the study to the respondents.

Interviews were executed with the respondents in their leisure period. At interviewing time, the researcher took all possible care to establish rapport with the respondents so that they did not get feel awkward and unexpected situation to furnish proper responses to the questions and statements in the interview schedule. Sometimes the questions were clearly explained wherever the respondents had any difficulties to understand.

3.7 Data Processing

3.7.1 Editing

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

3.7.2 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 respondent 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 accordingly 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 to the selected factors to effectiveness of Krishoker Janala as an ICT-based extension service. 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 hypothesis was supported and it was concluded that there was a significant contribution of the independent variables to the dependent variable. And if the computed value of (β) is smaller than the designated level of significance than the hypotheses 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 deals with the selected factors that might influence the perceived effectiveness of Krishoker Janala as an ICT-based extension service. The second section describe effectiveness of Krishoker Janala as an ICT-based extension service. Final and the last section discusses the contribution of the selected factors to effectiveness of Krishoker Janala as an ICT-based extension service.

4.1 Factors Contributing Effectiveness of Krishoker Janala as an ICT-based Extension Service

A summary of the descriptive statistics of the factors that influence farmers' perceived effectiveness of Krishoker Janala as an ICT-based extension service is given in Table 4.1.

Table 4.1 Descriptive statistics of the factors that influence perceived effectiveness of Krishoker Janala as an ICT-based extension service

Sl. No.	Characteristics	Possible Range	Observed Range	Mean	Standard Deviation
1.	Education	Unknown	0-18	12.03	4.10
2.	ICT ownership	0-6	2-6	3.92	.99
3.	Ease of use	4-20	10-16	12.83	1.55
4.	Extent of ICT use (General Purpose)	0- 28	4-21	9.52	4.15
5.	Extent of ICT use (Agricultural Purpose)	0-32	3-25	10.17	4.10
6.	Information richness	3-15	6-12	9.27	1.16

4.1.1 Education

The observed education of the farmers ranged from 0 to 18 having an average of 12.03 with a standard deviation of 4.10. On the basis of education scores of the farmers, they were classified into six categories. Namely "illiterate" (0), "can sign only" (.5), "primary education" (1-5), "secondary education" (6-10), "higher secondary education" (11-12) and "higher education" (>12). The distribution of the farmers according to their education is shown in Table 4.2.

Table 4.2 Distribution of farmers according to their education

Categories	Frequency	Percent
Illiterate (0)	4	3.3
Can sign only (0.5)	2	1.6
Primary education (1-5)	5	4.1
Secondary education (6-10)	32	26.2
Higher Secondary education (11-12)	13	10.7
Higher Education (>12)	66	54.1
Total	122	100

It was found that the majority (54.1 percent) of the farmers had higher education compared to 26.2 and 10.7 percent having secondary and higher secondary education, respectively. Besides, 4.9 percent of the respondents never received any formal education.

The findings of the study reveals that almost 95 percent of the farmers were literate which is higher than the national average literacy rate of 63.0 percent (BBS, 2007). The findings indicated that ICT-based service is mostly used by educated members of a farming community. Therefore, extension service should identify the educated members of a community once deploy ICT-based service. At the same time, they should solely or jointly work with other service providers to provide ICT training to the illiterate farmers so that they can access to the service without the help of others.

4.1.2 ICT ownership

The observed ICT ownership scores of the farmers ranged from 2 to 6. The average ICT ownership was 3.92 and the standard deviation was 0.99. The respondents were classified into following three categories based on their ICT ownership in Table 4.3.

Table 4.3 Distribution of farmers according to their ICT ownership

Category	Frequency	Percent
Low (up to 3.00 score)	49	40.2
Moderate (3.1-5 score)	65	53.2
High (above 5 score)	8	6.6
Total	122	100

Data in the Table 4.3 reveals that 53.2 percent of the total respondent had moderate ICT ownership where, 40.2 percent had low and 6.6 percent farmers had high ICT ownership.

4.1.3 Ease of use

The observed ease of use scores of the farmers ranged from 10 to 16. The average ease of use was 12.83 and the standard deviation was 1.55. The respondents were classified into following three categories based on their ease of use in Table 4.4.

Table 4.4 Distribution of farmers according to their ease of use

Category	Frequency	Percent
Low (up to 12 score)	78	63.9
Moderate (13-15 score)	30	24.6
High (>15 score)	14	11.5
Total	122	100

Data in Table 4.4 reveals that nearly two-thirds (63.9 percent) of the respondents perceived Krishoker Janala as an ICT-based extension service as less easy to use compared to one-fourth (24.6 percent) and a little above one-tenth (11.5 percent) of the respondents perceived as moderate and high ease of use, respectively. Given the findings, the developers of 'Krishoker Janala' should identify the reason why most of the respondents perceived it as difficult and accordingly suggest improvements in the design features and thus ensure more traffic to the service.

4.1.4 Extent of ICT use (general purpose)

The observed extent of ICT use (general purpose) scores of the farmers ranged from 4 to 21. The average extent of ICT use (general purpose) was 9.52 and the standard deviation was 4.15. The respondents were classified into following three categories based on their extent of ICT use (general purpose) in Table 4.5.

Table 4.5 Distribution of farmers according to their extent of ICT use (general purpose)

Category	Frequency	Percent
Low (up to 7 score)	51	41.8
Medium (8-11 score)	33	27.1
High (>11 score)	38	31.1
Total	122	100

Data in Table 4.5 reveals that ICT use is low by most of the respondents (41.8 percent) while 31.1 percent of the respondents used ICTs highly for various purposes. Above one-fourth (27.1 percent) of the respondents moderately use ICTs.

4.1.5 Extent of ICT use (agricultural purpose)

The observed extent of ICT use (agricultural purpose) scores of the farmers ranged from 3 to 25. The average extent ICT use (agricultural purpose) was 10.17 and the standard deviation was 4.10. The respondents were classified into following three categories based on their extent of ICT use (agricultural purpose) in Table 4.6.

Table 4.6 Distribution of farmers according to their extent of ICT use (agricultural purpose)

Category	Frequency	Percent
Low (up to 8 score)	54	44.3
Medium (9-12 score)	38	31.1
High (>12 score)	30	24.6
Total	122	100

Data in Table 4.6 reveals that 44.3 percent of the respondents had low extent of ICT use (agricultural purpose), where 31.1 percent had medium and 24.6 percent farmers had high extent of ICT use (agricultural purpose). Therefore, there is a huge scope to increase the use of ICTs in the study area for agricultural purposes.

4.1.6 Information richness

The observed information richness scores of the farmers ranged from 6 to 12. The average information richness was 9.27 and the standard deviation was 1.16. The respondents were classified into following three categories based on their perceived information richness in Table 4.7.

Table 4.7 Distribution of farmers according to their perceived information richness

Category	Frequency	Percent
Low (up to 7 score)	4	3.3
Medium (8-10 score)	106	86.9
High (>10 score)	12	9.8
Total	122	100

An overwhelming majority of the respondents (86.9%) perceived that the information produced by Krishoker Janala is moderately rich in content while only 3.3 percent of them perceived it as low in richness and near about one-tenth (9.8 percent) of them found it as highly rich in content.

4.2 Perceived Effectiveness of Krishoker Janala as an ICT-based Extension Service

The observed perceived effectiveness of ICT-based service (Krishoker Janala) scores of the farmers ranged from 16 to 24. The average perceived effectiveness of ICT-based service was 18.96 and the standard deviation was 1.84. The respondents were classified into following three categories in Table 4.8.

Table 4.8 Distribution of farmers according to their perceived effectiveness of Krishoker Janala as an ICT-based extension service

Category	Frequency	Percent	Mean	Standard Deviation
Low (up to 17 score)	9	7.4	18.96	1.84
Moderate (18-20 score)	97	79.5		
High (>20 score)	16	13.1		
Total	122	100		

Data in Table 4.8 reveals that 79.5 percent of the respondents reported 'Krishoker Janala' was moderately effective as an agricultural advisory service while 13.1 percent and 7.4 percent of them respectively found it as highly and less effective as a medium for receiving agricultural information. The findings showed that while ICTs as an agricultural advisory service has yet not been capable enough to replace traditional face-to-face extension service, it might useful for farmers to intermittently receive information for their farming activities.

4.3 Contribution of the Factors of the Farmers to their Perceived Effectiveness of Krishoker Janala as an ICT-based Extension Service

The purpose of this section was to examine the effect of six selected factors on perceived effectiveness of Krishoker Janala as an ICT-based extension service. Multiple regression analysis was used to test the contribution of the selected variables, education, ICT ownership, ease of use, extent of ICT use (general purpose), extent of ICT use (agricultural purpose), and information richness on the effectiveness of Krishoker Janala as an ICT-based extension service. Five percent (5%) 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 4.9.

Table 4.9 Multiple regression coefficients of the selected factors indicating contribution on perceived effectiveness of Krishoker Janala as an ICT-based extension service

Independent Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R^2	Adj-R^2	F
	B	Std. Error	Beta					
(Constant)	4.256	1.337		3.183	.002			
Education	.084	.033	0.188**	2.583	.011			
ICT ownership	.550	.161	0.296***	3.425	.001			
Ease of use	.532	.121	0.449***	4.388	.000			
Extent of ICT use (general purpose)	-.079	.050	-0.179^{NS}	-1.591	.114	.54	.516	22.473***
Extent of ICT use (agricultural purpose)	.009	.041	-0.020^{NS}	.224	.823			
Information richness	.579	.149	0.365***	3.885	.000			

Dependent Variable: Perceived Effectiveness of ICT-based Service (Krishoker Janala)

^{NS}Non-significant

*** Significant at .1% level of significance

** Significant at 1% level of significance

Table 4.9 shows that there was a significant contribution of respondents' education, ICT ownership, ease of use, information richness on farmers' perceived effectiveness of Krishoker Janala as an ICT-based extension service. Here, ICT ownership, ease of use, information richness was the most important contributing factors (significant at the 0.1 % level of significance) followed by education (significant at 1% level of significance). However, ICT use (both general and agricultural purpose) were found non-significant with perceived effectiveness of Krishoker Janala as an ICT-based extension service. All the factors jointly explained 51.6% ($Adj.R^2 = 0.516$) of the variance of perceived effectiveness of Krishoker Janala. The F value indicates that the model is significant (.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 the Findings

The major findings of the study are summarized below:

5.1.1 Factors enabling perceived effectiveness of ICT-based extension service

Education

It was found that the majority (54.1 percent) of the farmers had higher education compared to 26.2 and 10.7 percent having secondary and higher secondary education, respectively. Besides, 4.1 percent had primary education, 3.3 percent were remained illiterate and 1.6 percent could write their name only. The findings indicated that ICT-based service is mostly used by educated members of a farming community. Therefore, extension service should identify the educated members of a community once deploy ICT-based service.

ICT ownership

Above half (53.2 percent) of the total respondent had moderate ICT ownership where 40.2 percent had low and 6.6 percent farmers had high ICT Ownership. All the respondents were found either have self or shared access to mobile phones. Therefore, more mobile-phone based service should be launched to target members of a rural community.

Ease of use

Two-thirds (63.9 percent) of the respondents perceived ICT-based service ‘Krishoker Janala’ as less easy to use compared to one-fourth (24.6 percent) and a little above one-tenth (11.5 percent) of the respondents perceived as moderate and high ease of use, respectively. Given that the developer should identify how to make ‘Krishoker Janala’ more user-friendly and attract more traffic to the service.

Extent of ICT Use (general purpose)

ICT use is low by most of the respondents (41.8 percent) while 31.1 percent of the respondents used ICTs highly for various purposes. Above one-fourth (27.1 percent) of the respondents moderately use ICTs.

Extent of ICT Use (agricultural purpose)

Less than half (44.3 percent) of the respondents had low extent of ICT use (agricultural purpose), where 31.1 percent had medium and 24.6 percent farmers had high extent of ICT use (agricultural purpose). Therefore, there is a huge scope to increase the use of ICTs in the study area for agricultural purposes.

Information Richness

An overwhelming majority of the respondents (86.9%) perceived that the information produced by Krishoker Janala is moderately rich in content while only 3.3 percent of them perceived it as low in richness and near about one-tenth (9.8 percent) of them found it as highly rich in content.

5.1.2 Perceived effectiveness of Krishoker Janala as an ICT-based extension service

Majority (79.5 percent) of the respondents reported 'Krishoker Janala' was moderately effective as an agricultural advisory service while 13.1 percent and 7.4 percent of them respectively found it as highly and less effective as a medium for receiving agricultural information.

5.1.3 Contribution of the selected factors on the perceived effectiveness of Krishoker Janala as an ICT-based extension service

Among the six predictor variables, education, ICT ownership, ease of use, information richness were found to be the significant contributors on perceived effectiveness of ICT-based service while extent of ICT use (general purpose) and extent of ICT use (agricultural purpose) were found to be non-significant. Ease of use was the strongest contributor (β=0.499) followed by information richness (β=0.365) and ICT ownership (β=0.296) while the contribution of education was found the lowest (β=0.188) which jointly explained 51.6% ($Adj.R^2 = .516$) of the variance of perceived effectiveness of Krishoker Janala as an ICT-based extension service.

5.2 Conclusion

- ✓ Findings revealed that most of the farmers (79.5%) perceived that Krishoker Janala was moderately effective as an ICT-based agricultural extension service.
- ✓ Education had a significant contribution on perceived effectiveness of Krishoker Janala as an ICT-based extension service. Therefore, it may be concluded that higher education will lead to higher perceived effectiveness and plays an important role in realizing the benefits of using ICTs for receiving agricultural information. Therefore, ICT-based agricultural advisory service like 'Krishoker Janala' might be welcomed and accepted by the educated members of a farming community.
- ✓ ICT ownership significantly contributed to perceived effectiveness of Krishoker Janala as an ICT-based extension service. Therefore, it can be said that ICT ownership is one of the important predictors of perceived effectiveness of Krishoker Janala as an ICT-based extension service. ICT ownership indicates respondents' access to various ICTs and access is one of the important preconditions of ICT use. Therefore, it can be concluded that higher ownership might lead to higher use which in turns lead to higher perceived effectiveness of Krishoker Janala as an ICT-based extension service.
- ✓ Ease of use of Krishoker Janala had a significant contribution on perceived effectiveness of Krishoker Janala as an ICT-based extension service. Therefore, it may be concluded that when the ease of use of Krishoker Janala as an ICT-based extension service is high than the perceived effectiveness of Krishoker Janala as an ICT-based extension service is also high.
- ✓ Information richness had a significant contribution on perceived effectiveness of Krishoker Janala as an ICT-based extension service. Information richness is the quality of information itself. Information which is rich in content help to understand the message clearly so that users make their farming decisions quickly. Therefore, it may be concluded that when the information richness is high, perceived effectiveness of Krishoker Janala as an ICT-based extension service is also high.

5.3 Recommendations

5.3.1 Recommendations for policy

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

- ✓ Most of the farmers perceived moderate effectiveness of Krishoker Janala. Therefore attempts should be taken by the concerned authority to increase the effective use of ICT-based extension service like Krishoker Janala.
- ✓ Education had a significant contribution on perceived effectiveness of ICT-based service (i.e., Krishoker Janala). Therefore, ICT-based service is more perfect for the educated person of a farming community though non-educated person can also use it with the help of others. Therefore it may be recommended that attempts should be taken by the concerned authorities to increase the use of ICT-based extension service like Krishoker Janala by providing motivational campaigns and trainings.
- ✓ ICT ownership had a significant contribution on perceived effectiveness of ICT-based service (i.e., Krishoker Janala) 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 use ICT-based services.
- ✓ Since ease of use is very important for a user to access to any ICT application or service, the developers of ICT-based service and policy makers should careful enough to design more user-friendly applications so that the rural people can use the service with little efforts. In addition, Ministry of Youth and Sports and ICT Division of Government of the People's Republic of Bangladesh along with private sectors should arrange more ICT-trainings for the rural clienteles. Therefore, rural farmers may upgrade their skills and be benefitted from ICT-based application.
- ✓ Information richness had a significant contribution on perceived effectiveness of ICT-based service (i.e., Krishoker Janala). Therefore, once plan for an ICT-based service, it is important to ensure that the ICT can produce information which is rich in content. The text message can be presented along with image

or multimedia so that it would be more responsive and communicable to the users.

5.3.2 Recommendations for theory

- ✓ Fulbaria upazila under Mymensing dristrict 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, ease of use and information richness, three personal characteristics, education, extent of ICT use (general purpose), extent of ICT use (agricultural purpose) while controlled the demographic related variables like age. Therefore, future research might be undertaken considering other ICT related or situational factors such as system quality, service quality.
- ✓ Since this research was particularly interested to identify the factors and their contribution on perceived effectiveness of ICT-based service (i.e., Krishoker Janala), respondents' demographic variable like age was controlled in the structural model. However, researches should be conducted to examine the impact of other demographic variables such as gender.
- ✓ Unexpectedly, no significant relationship were found between the extent of ICT use (both general and agricultural purpose) and perceived effectiveness of ICT-based service (i.e., Krishoker Janala)**.** 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

EFFECTIVENESS OF KRISHOKER JANALA FOR STRENGTHENING AGRICULTURAL ADVISORY SYSTEM

(This interview schedule is entitled for a research study)

Serial no.: …….

Name of the respondent:……..……

Village/Mohollah:……. Block: ……

Ward No. :…… Thana : ……

District: ……

Have you ever been used **Krishoker Janala** ? Yes / No

Please answer the following questions

1. Education

Please mention your educational status from the following:

a) I cannot read and write

b) I can sign only

c) I did not go to school but can read and write which will be equal to ……class

d) I read up to ……Class/passed

2. 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

Score: One (1) for 'Self –owned device', 0.5 for 'shared access' and 0 for 'no access'.

3. Ease of use

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

Items	**Strongly Disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
Use of the Krishoker Janala is easy for me					
I find it easy to get the Krishoker Janala to do what I want it to do					
My interactions with the Krishoker Janala is clear and understandable					
Overall , I find the Krishoker Janala easy to use					

4. Extent of ICT use (general purpose):

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

5. Extent of ICT use (agricultural purpose):

Please mention your frequency of using the following ICTs for receiving farm related information e.g., talking to input dealers or marketers or extension support staffs in seek of agricultural information:

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
Agricultural Informatin Service (AIS) Krishoker Janala	No use	1-3 times/ week	5-6 times/ Week	1-3 times / Day	4-6 times / Day
Farmers' Help line (Krishi Jigyasha (7676), Banglalink Krishibazar (2474), GP Krishisheba (27676)	No use	1-3 times/ week	5-6 times/ Week	1-3 times / Day	4-6 times / Day
Traditional media					
Farm related TV program	No use	1-3 times/ week	5-6 times/ Week	1-3 times / Day	4-6 times / Day
Farm related Radio Program	No use	1-3 times/ week	5-6 times/ Week	1-3 times / day	4-6 times / Day

6. Information richness

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

Items	**Strongly Disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
The information that I obtained from Krishoker Janala is clear to me.					
The information that I obtained from Krishoker Janala is complete to me.					
The information that I obtained from Krishoker Janala is easily understandable to me .					

7. Perceived Effectiveness of Krishoker Janala

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

Items	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I think Krishoker Janala saves time to get agricultural related information.					
I think Krishoker Janala is very helpful for agricultural work.					
I think I will be updated with agricultural information by Krishoker Janala.					
I get instant solution (s) from Krishoker Janala.					
I think all the information are found in Krishoker Janala are useful.					
Overall I am satisfied with Krishoker Janala					

Thank you for your kind co-operation.

……

Signature of the Interviewer