

**USE OF HANDHELD COMMUNICATION MEDIA BY THE
FARMERS FOR INFORMATION ACCESS FOR THE SELECTED
AREAS OF NILPHAMARI DISTRICT**

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DHAKA -1207

June, 2020

**USE OF HANDHELD COMMUNICATION MEDIA BY THE
FARMERS FOR INFORMATION ACCESS FOR THE SELECTED
AREAS OF NILPHAMARI DISTRICT**

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Registration No.: 18-09034

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

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CERTIFICATE

This is to certify that the thesis entitled “Use of **Handheld Communication media by the farmers for Information Access for the Selected Areas of Nilphamari District**” submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of Master of Science in Agricultural Extension and information system, embodies the result of a piece of bona fide research work carried out by **Sultana Razia**, Registration No. **18-09034** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

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Dedicated
To
My Beloved Parents
& Teachers

ACKNOWLEDGEMENTS

One of the satisfied snapshots of composing this note of acknowledgement is to think back the whole voyage of my investigation and recollect every one of the general population, beginning from my supervisor, co-supervisor to course instructors, friends and family, or more all Almighty Allah.

At first, I devote an extraordinary pleasure and respect to express my ardent appreciation, most profound feelings of gratefulness, best respects and significant obligation to my reverend supervisor, **Md. Mahbubul Alam, PhD**, Professor, Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka, without whom I would not have been able to come this far. He did not only supervise this thesis but also guide me immensely to successfully accomplish this research work.

Second, I feel proud to express my deepest respect, sincere appreciation and immense indebtedness to my co-supervisor, **Prof. Md. Abul Bashar**, Professor, Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka, for his scholastic and continuous guidance during the entire period of course, research work and preparation of this thesis.

I am glad to stretch out my heartfelt thanks on account of the considerable number of resources of the Department of Agricultural Extension and Information System, SAU, for their important instructions, recommendations and consolation amid the time of the examination. I would like to extend my appreciations to **Md. Kamrul Hasan, UAO, Nilphamari** who helped me much for the collection of my data. I am happy to extend my heartfelt thanks to the **SAAOs** of Nilphamari district for their assistance during my data collection period.

To wrap things up, I might want to express my genuine gratefulness to my father **Abdus Sattar** and my mother **Mamtaz Begum** and the greater part of my well-wishers.

The Author

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USE OF HANDHELD COMMUNICATION MEDIA BY THE FARMERS FOR INFORMATION ACCESS FOR THE SELECTED AREAS OF NILPHAMARI DISTRICT

SULTANA RAZIA

ABSTRACT

The key concern of this study was to explore the extent of handheld communication media use by the farmers. Three unions of Nilphamari upazila under Nilphamari district were randomly selected as the locale of the study. 117 farmers were selected as the sample for this study. Data for this study were collected through personal interview by the researcher herself during July 31 to August 31, 2019. Data were analyzed by Multiple Regression Analysis using SPSS 23.0. Age, Education, ICT experience, ICT ownership, ICT self-efficacy, perceived usefulness were the selected variables for the study. An overwhelming majority (45.30%) of the respondents was middle aged, 49.3% of the respondents had secondary education. Among the farmers, 80 respondents had self-access to feature phone and 69 respondents had self-access to smart phone. Around half of the respondents (49.57%) had full access to the Internet while one-fifth of the respondents (22.22%) had no access to the Internet. Furthermore, 95.73% farmers used mobile phone on daily basis. Considering the inferential statistics, age, education, ICT ownership and perceived usefulness had positive and significant contribution to the extent of handheld communication media use which constitutes 68.7% ($R^2 = 0.687$) of the variance. This study also noticed that respondents' handheld communication device use experience and self-efficacy had also positive contribution (at 10% level of significance). Thus, the study concludes with the recommendation to enable favorable environment to promote handheld communication devices in receiving agricultural information.

CHAPTER I

INTRODUCTION

1.1 General Background of the Study

Bangladesh's economy is an emerging market economy. In nominal terms, it is the 39th largest in the world and 30th largest by purchasing power parity; it is ranked among the middle-income economies and a frontier market of the Next Eleven emerging market. Bangladesh was the seventh fastest-growing economy in the world in the first quarter of 2019, with a rate of 7.3 percent annual real GDP growth. Dhaka and Chittagong are the principal financial centers of the country, being home to the Dhaka Stock Exchange and the Chittagong Stock Exchange. Bangladesh is one of the world's fastest growing economies. Agricultural sectors play a very significant role in the growing economy of Bangladesh.

Bangladesh is a developing country with agro-based economy which has 167.56 million people which accounts for 14.23% of country's GDP and source of employment of 40.6% of its people (BBS, 2020). That is why agriculture is the main economic culture of Bangladesh. About 70% people lives in rural areas among them 44% use mobile phone as a communication media.

The ICT sector also contributed to Bangladesh's economic growth. In the last 3 years, Bangladesh has seen a tremendous growth in the ICT sector. Bangladesh is a market of 160 million people with vast consumer spending around mobile phones, and Internet. Bangladesh has 80 million Internet users, an estimated 9% growth in Internet use by June 2017 powered by mobile internet. Bangladesh currently has an active 23 million Facebook users. Bangladesh currently has 143.1 million mobile phone customers.

Diffusion of proper knowledge on modern agriculture among the rural people demands effective communication system. Farmers can have immediate access

to usefulness farm-related information using Information and Communication Technology (ICT)-enabled media. However, the flow of information should be fast as fast possible and should also be understandable, well interpreted and accepted by the farmers.

Sub Assistant Agriculture Officers (SAAOs) are the field level extension agent of Department of Agricultural Extension (DAE) and assume an essential part in dispersing diverse development or practices among the farmers. As SAAOs are attempting to realize change in conduct of farmers through inspiration and communication, their own particular state of mind towards a practice is an indispensable determinant for its diffusion. As various media are not yet prevalent among the farmers as a method for getting agricultural information, it is of verging on imperative to examine the issues in regards to their state of mind towards giving agricultural information to the farmers by using distinctive media. Diverse media including individual contact, group contact and mass contact and so forth have a crucial part to convey the back rub of enhanced agricultural practices from sources to the farmers. For dispersing agricultural learning to countless immediately printed materials additionally give precise, motivating, trustworthy and bending free information.

Communication is the imparting or exchanging of information by speaking, writing or using other medium of communication like radio, television, mobile phone and etc. Communication media refers to the means of delivering and receiving data or information. In telecommunication, these means are transmission and storage tools or channels for data storage and transmission.

Among all the communication medium Mobile phone is essential medium of communication in this fast changing world. A mobile phone is a portable telephone that can make and receive calls to communicate each other. Most modern mobile telephone services use a cellular network and therefore often called as cell phones. The importance of cell phone has grown over the years with more and more people getting addicted to its usage. It is not a luxury

commodity anymore; it serves as a basic need. A cell phone helps to be in touch with our family and maintain a smooth relation with our business associates. We can even communicate with the people of other side of the world within a second or a minute with the help of communication medium like mobile phone.

The internet has radically changed the way in which people communicate and connect with each other. As a means of social interaction, the web brings people together – friends, family, young people, or complete strangers that share interests or objectives – and this can foster a sense of belonging and identity. The web, however, has also been used to target people, to radicalize them into specific belief systems and divisive ways of seeing the world.

Mass media and other forms of communication technology have an enormous influence in helping to shape public opinion and underlying sentiment. Newspapers, TV and radio are all important sources of basic information about other people and other places and this can itself help to engender understanding if presented in a fair, even-handed and non-inflammatory way.

DAE and some other government and non-government organizations are working in the field in transferring information from a research system (source of technology) through an extension system (interpreter and dissemination of technology) to the client system (users of technology) (Kashem and Halim, 1991)

In most of the cases, the effectiveness of extension educational programs depends to a large extent on the proper selection and use of the communication media.

1.2 Statement of the Problem

In view of the preceding discussion, the researcher undertook this problem entitled “Use of Handheld Communication media by the farmers for Information Access for the Selected Areas of Nilphamari District.” In this study mainly Mobile phone with Internet or without Internet facilities are considered as the Communication media.

This study also tried to explain the relationship of some selected characteristics of the farmers such as age, education, mobile phone use experience, ICT ownership, ICT self-efficacy, Perceived usefulness of mass media with the farmers. The purpose of the study was to have answer to the following research questions:

- What are the selected factors that influence farmers to use handheld communication device like mobile phones for accessing farm-related information?
- To what extent farmers use of communication media for accessing farm-related information?
- To what extent farmers’ selected socio-economic characteristics influence their use of communication media for accessing farm-related information?

1.3 Objectives of the Study

The objectives of the study are as follows:

- i. To determine and describe the socio-economic characteristics of the respondent farmers;
- ii. To determine the extent of use of the handheld communication devices;
- iii. To identify the factors influencing the extent of use of handheld communication devices.

1.4 Scope and Limitations of the Study

The study was conducted at Nilphamari upazila of Nilphamari district. Nonetheless, the findings may likewise be appropriate to different regions of Bangladesh where the physical, financial and social conditions don't vary much with those of the study area. The motivation behind the study was to have a comprehension about Handheld Communication Media and Their Extent of Use by Farmers for Information Access. Considering the time and financial constraints the study was conducted with the listed limitations:

- The study was limited to Itakhola, Singdoi, Kundupukur union and Pourashava of Nilphamari upazila of Nilphamari district.
- The farmers had various characteristics but varied at a great extent. Among those only 6 (six) characteristics were chosen for this research study.
- Population of this study was limited. One hundred and seventeen farmers were selected randomly as a research sample of the study.
- The researcher relied on upon the information outfitted by the selected farmers during their interview.
- Different communication media used by the farmers had different purposes, for example, cultivating, business, legislative issues, religion and so forth. This study examined the use of various media by the farmers in receiving agricultural information specially, mobile phone.
- The statistical data gathered by the researcher connected to the circumstance prevailing during 31 July to 31 August,2019.

1.5 Assumption of the Study

The following assumptions were made in conducting the study:

- i. The respondents included in the sample of the study providing their opinions quite competently and satisfied the queries.
- ii. The information that was furnished by the farmers were reliable.

- iii. The mobile phone user farmers who included in the sample were the representative of the population.
- iv. The collected data were reliable because the researcher who acted as interviewer was well adjusted to the social environment of the study area.
- v. The finding of the study will be useful for planning and execution of the extensive and more helpful effective use of mobile phone in receiving agricultural information.

1.6 Definition of Important Terms

For clarity of comprehension certain the accompanying terms used frequently all through the study are characterized and defined in alphabetical order:

Age

Age of the respondent was characterized as the timeframe from his birth to the time of interview.

Communication

Communication is a process in which participants create and share information with one another in order to reach a mutual understanding. This definition implies that Communication is a process of convergence (or divergence) as two or more individuals exchange information in order to move toward each other (or apart) in the meanings that they ascribe to certain events (Rogers, 1995).

Education

Education alluded to the count of years of schooling finished by a respondent.

Group Media

Group media defines to the recurrence of exposure of the respondents to various group of information, for example, group discussion meeting, agricultural demonstration meeting, method demonstration meeting and result demonstration meeting.

Individual Media

Individual media defines to the recurrence of presentation of respondents to various individual information sources, for example, neighbors, companions, relatives, extension workers, local leader and so on.

Information Sources

The term data sources define the media or channels through which different data are diffused among the farmers on various aspects including crops, livestock, fisheries, social forestry, education and other similar matters.

Mass Media

The mass media are the mean of communication or instrument or device through which messages are transmitted towards generally extensive, heterogeneous and mysterious crowd inside a moderately shorter coordinated structure the source to the gathering of people. Mass media incorporated into the study were radio, TV, newspaper, internet, leaflet, poster etc.

Newspaper

It refers to a bundle of information accumulated in printed papers and appropriately folded. These contain news, views, opinions, advertisement, educational information and farming messages, published on every day or weekly basis, for the most part from the capital or large City.

Organizational Participation

Is characterizes as a relationship of two or more persons which have no less than one face to face meeting per year. Cooperation in an association defines to his participating in the association as general member, executive member or executive officer.

Social Media

Social media is defined by Kaplan & Haenlein (2009) as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the "creation and exchange of user-generated content."

Cell phone/ Mobile phone

A portable telephone that sends and receives radio signals through a network of short-range transmitters located in overlapping cells throughout a region, with a central station making connections to regular telephone lines. Also called cellular telephone, mobile phone. A small telephone that people can take with them and use outside their homes called also mobile phone, (chiefly US) cellular phone, (US, informal) cell, (British) mobile. Cell phone is popular and powerful interpersonal communication media.

Technology

The branch of knowledge that deals with the creation and use of technical means and their interrelation with life, society, and the environment, drawing upon such subjects as industrial arts, engineering, applied science, and pure science. The application of this knowledge for practical ends. Scientific or industrial process, invention, method, or the like. the sum of the ways in which social groups provide themselves with the material objects of their civilization. The purposeful application of information in the design, production, and utilization of goods and services, and in the organization of human activities

Computer Self-Efficacy

Individuals' belief of their capability to perform a specific computer task is called self-efficacy. An individual's perceived confidence regarding his/her ability to use a computer (Compeau & Higgins, as cited by Tsai et al., 2011). Computer self-confidence or perceptions of ability, beliefs about one's ability to perform a specific behavior or task on a computer.

Perceived usefulness

Perceived Usefulness (PU) is one of the independent constructs in the Technology Acceptance Model (TAM). This was defined by Fred Davis as "the degree to which a person believes that using a particular system would enhance his or her job performance". It means whether or not someone perceives that technology to be useful for what they want to do.

CHAPTER II

REVIEW OF LITERATURE

Review of related literature helps a researcher to carry out the research program successfully. It provides a scope for reviewing the stock of knowledge and information relevant to proposed research. This knowledge and information give a guideline in designing the future research problem and validating the new findings. With this end in view, literature and research of major past works in connection with the present study, were searched in the libraries and institutes. Therefore, attempt has been made in the present Chapter to review some pertinent reviews. The reviews are presented based on the major objectives of the study. Information collected from different sources are arranged into following four sections:

Section I: Concept and Use of Communication Media

Section II: Mobile phone as a Communication Media

Section III: Factors influencing Handheld Communication Media

Section IV: Conceptual Framework of the study

2.1 Concept and Use of Communication Media

Mass media and other forms of communication technology have an enormous influence in helping to shape public opinion and underlying sentiment. Newspapers, TV and radio are all important sources of basic information about other people and other places and this can itself help to engender understanding if presented in a fair, even-handed and non-inflammatory way.

The media is also an important accountability mechanism: it raises important issues, corruption for example, that might otherwise never be publicly debated or addressed. The media also has an important role in stimulating governments to take action on social policy: although stories about migrants or refugees might

reinforce prejudice in some quarters, they also expose problems that need to be addressed, for example poor living conditions or lack of access to services, the citizenship status of migrants, the response of local communities to their settlement and so on.

Alam (2015) showed that 89.7 percent of the respondents had no use to low use of Cell Phone for receiving agricultural information and 10.3 percent of the respondents had medium use to high use of Cell Phone for receiving agricultural information at Singair upazila of Manikganj district in Bangladesh.

Uddin (2015) revealed that about two third (64.5%) of the respondents had medium use of ICTs in receiving agricultural information compared to 13.6 % and 21.8 % having low and high use of ICTs in receiving agricultural information respectively at Homna upazilla of comilla district in Bangladesh.

Lucky (2012) stated that telephone is a quick way of making "contact" with the extension workers or farmers. Whenever we want to, it does not need any traveling up and down. Questions can be asked by farmers and answered by extension worker on the telephone on the spot without wasting too much time especially very urgent questions.

According to the World Bank (2011), market data feeds directly to farmers via electronic display boards in 31centers spread across Ethiopia as well as on the exchange"s website.

Fafchamps and Minten (2011) studied the benefits that Indian farmers derive from SMS asked markets weather and crop advisory information. Using a controlled randomized experiment in several villages of Maharashtra, they did not find statistically significant effect of treatment on the price received by farmers, on crop losses resulting from rainstorms, or on the likelihood of changing crop varieties and cultivation practices.

Gakuru et al. (2009) noted that 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.

Hoque (1990) in his paper concluded that mass media can perform a better role in technology diffusion than what those do today. Therefore, planned efforts to introduce more of mass media strategies that are proven effective by experiments are highly recommended.

Roy (1988) conducted a study on communication behavior of small income farmers receiving information on the use of balanced doses of fertilizer for transplanted Aman cultivation in Agricultural University Extension Project area. He found that the discussion with friends, neighbours received the largest number of score as 136, radio came next with 104 scores. Attending agricultural exhibition by the respondents secured the third position. Lecture at the field training spot also played an important role in the use of balanced dose of fertilizer having a score of 58. He also observed that office call, method demonstration, farm and home visit, poster, result demonstration and group meeting etc. were used significantly by the small income farmers of the entire study area which motivated in using the balanced doses of fertilizer to a great extent.

Kashem and Halim (1991) in a study found that the highest proportion of the farmers (35 percent) used interpersonal contact media in the adoption of modern rice technologies. Almost equal proportion (32 percent) of farmers had individual contacts. This was followed by mass contact method. Farmers very often discuss or seek advice from their friends. Relatives, neighbours and different input dealers regarding the use of modern practices in rice cultivation.

Alam(2004) revealed that based on media use index, among the 18 communication media the first five communication media were neighbours (1159), progressive farmers (1100), friends (921). Block Supervisor (779) and relatives (743) among the 18 communication media in receiving information on winter vegetable cultivation. However, the last five communication media were NGO workers (0), newspaper (17), agricultural fair (79), upazila level

agricultural officers (107) and television (156). Among five technologies of winter vegetable cultivation, the highest extent of communication media was used for modern varieties, for which media use index was 2113 and it was followed by pest management practices (1989), recommended seed rate (1796) and recommended irrigation (1362). Communication media were used at least extent on recommended dose of fertilizer (1233).

2.2 Mobile Phone as a Communication Media

Mobile phones have given new thinking and approach to farmers for making a decision about getting the information of market and weather from concern person. Now the farmers can communicate with customers to sell their product in good price same time they can keep up to date each other's about market as well as weather (Bayes et al., 1999, Goodman, 2005, Kwaku & Kweku 2006). Farmers easily can get information from market buyers about their commodities price from their working places and long distance of market. It can be said that Mobile phones have increased network among larger communities and market buyers in remote areas. Aker and 2008, Goyal, 2008) indicated that mobile phones have brought significant changes in the prices of the product and farmers are now getting reasonable prices of their produce from market.

The mobile phones have provided good opportunities to farmers to directly communicate with buyers and traders for sell their product in good price as well as arrive in market to avoid from waste. Furthermore, mobile phones also have given a new approach to decide either to sell their product in good price or stay for reasonable price in market. Another study was conducted in Ghana where result showed that before the mobile phones farmers spent many days to reach in market but now mobile phones have made their life easy to direct communicate with customers and sell their produce on the spot (Smale& Tushemereiruwe, 2007).

Mobile phones nowadays spreading very fast in developing countries and most of the people are getting benefit from this technology with any hurdle and

problem. In many areas of Africa farmers are using mobile phones where internet services are not good the farmers are obtaining the information about agriculture issues from related officers (Gakuru, et al. 2009).

2.3 Factors Influencing Use of Handheld Communication Media

2.3.1 Age and the Extent of Handheld Communication media

Jannat (2015) revealed that age had significant contribution to the impact of using ICT media by the farmers.

Kafura (2015) reported that there was negative significant relationship between the age of the farmers and the level of use of different ICT tools for agricultural purposes by them.

Ogotu et al. (2014) who reported that there was significant positive correlation between the age of the farmers and their participation in ICT based market information service projects for accessing to agricultural market information.

Ahmed (2012) it was observed that there was no significant relationship between age of the farmers and ICT utilization in agriculture by them.

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

Ali (2011) that age of the farmers had no significant relationship with adoption of mass media based information for decision-making in vegetable cultivation.

Anastasios et al. (2010) it was revealed that age of the farmers had no contribution to the adoption of ICT by the farmers.

Mwakaje (2010) observed that at least two types of ICT media were used by most of the respondents aged between 21 to 60 than respondents of other ages.

Ndag et al. (2008) reported that the younger farmers had more exposure to ICT usage and courses than the older farmers.

Pandian (2002) found that farmers' age had direct positive effect between age of the farmers and effect of use of video education on knowledge retention

2.3.2 Education and the Extent of Handheld Communication media

Alam (2015) found that education showed significant and positive relationship with their use of cell phone.

Uddin (2015) found that education had significant contribution on their use of ICT media.

Jannat (2015) revealed that level of education had significant contribution to the impact of using ICT by the farmers.

Mollah (2006) observed in his study that education of the farmers had significant positive relationship with the rice production technologies.

Anisuzzaman (2003) concluded that the education of the farmers had significant positive relationship with their use of information and communication media.

Nuruzzaman (2003) in his study observed that education of the farmers had significant positive relationship with their use of mass media.

Pandian (2002) found that education of the farmers had direct positive effect on the effect of video education on knowledge retention.

2.3.3 ICT use experience and the Extent of Handheld Communication media

While the author did not find any direct study of the relationship between mobile phone use experience and extent of ICT use in agriculture extension discipline, anecdotal evidence suggests, users skill increases over time with using of a particularly technology. He becomes more familiar with the technology. Therefore, their extent of use is expected to be higher with times. Considering

this analogy, this study formulates the hypothesis that past experiences positively influence users to use ICTs more for their work.

2.3.4 ICT ownership and the Extent of Handheld Communication media

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).

It can be assumed that smart phone users are most interested in communicating with extension agent than the farmers who have featured phone. Most of the farmers use internet in their phones. It also can be assumed that the people who have their own device are more fluent to communicate with the extension workers and for other activities.

2.3.5 ICT Self-efficacy and the Extent of Handheld Communication media

Compeau & Higgins, (1995) defined computer self-efficacy as “an individual's ability to apply his or her computer skills to a wider range of computer related tasks”. Therefore, computer self-efficacy represents an individual's perception of his abilities to use computers to perform a task.

Self-efficacy among farmers also causes positive effect in receiving agricultural information through different communication media.

Karimi et al. (2011) showed that among technical factors encouraging ICT usage, access to a specialized person who can solve technical difficulties when facing, got second rank by vocational agricultural educators in Iran. Moreover, other intimation found that there was a strong positive relationship between self-efficacy and application of ICTs in agriculture (Harker and Akkeren, 2002).

Burrell (2008) noticed that specifically focused on six variables that have the potential to influence conception towards ICT usage and the variables are self-efficacy, 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 self-efficacy, perceived usefulness and perceived ease of use compatibility, and subjective norm on ICT usage. Therefore, it can be concluded that self-efficacy was a dominant factor for ICT adoption and use.

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).

2.3.6 Perceived Usefulness and the Extent of Handheld Communication media

Many studies showed that the access of communication technologies have impact on the economic, poverty reduction as well as agriculture development. The use of mobile phones could increase the efficiency of farmers by affordable access of communication technologies in rural areas of developing countries. The study was conducted in Bangladesh indicated that use of mobile phones increased access of information among men and women and improved their living standard (Abraham, 2006; Aker, 2008; Galperin & Mariscal, 2007; Jensen, 2007, Bhavnani et al. 2008).

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 suggested 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.

2.3.7 Extent of Handheld Communication media by the Farmers'

Aminuzzaman et al., (2003) observed a study on induction of ICTs as a strategic tool for agricultural development and reported that ICTs helped farmers in crops production by using clear and focused services but the main limitations to the adoption of ICTs in agriculture appeared to lie in the education levels and cultural backgrounds of rural communities, as well as a lack of motivation

stemming from the farmers' perception of the scant usefulness of ICTs and their limited digital skills. Connectivity was another important obstacle, despite regional advances.

The overall goal or expected outcome of this research is to see the potential of modern ICTs to improve yields and income, and to disseminate knowledge to farmers to help them manage risk in an informed manner. Modern ICTs can play a role in bridging the information gap, and in reducing the information asymmetry that exists between farmers and between regions. The delivery of information through mobile phones has the potential to deliver localized content rapidly, and can thus enhance the dissemination of knowledge and information on technologies, inputs, markets and prices, and help in better risk management. This can act as a catalyst to enable better adoption of improved technologies, seed varieties, and farming practices (Mittal, 2009).

Action Aid (2011) defines the list of basic conditions for successful farming: land, water, farming inputs (seeds, breeds, farm tools and equipment, sustainable fertilizers and pesticides), extension services and training, credit and financial services, etc. If these three observations are taken as facts, modern ICT can be used as an efficient tool to enable non-progressive farmers to connect to extension information and to make them adopt technology faster. ICT can play an important role in the adoption of technologies that are in an early stage of development like no tillage and the genetically modification technology revolution (Fischer et.al., 2009).

Meera et al., (2004) reported that 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 programmers and ICT could help accessing these services. They found that ICTs helped farmers to get timely information however sufficient availability of ICT facilities was limited. ICT can help to exchange market information, weather report and business information. By the blessings of technology, the farmers can directly

contact with the brokers or agent to sell their products. One of the perceived benefits of modern ICT is greater access to information about marketing prices. It is expected that price information will have a beneficial impact by improving the bargaining power of farmers with traders. Thus enabling them to realize better prices and by reducing arbitrage, wastage or spoilage (Mittal et al., 2010). Jensen (2007) found that the introduction of mobile phones decreased price dispersion and wastage by facilitating the spread of information for fishermen in Kerala. Both consumer and producer can be benefitted by using ICTs. A produce may find the most profitable channel of selling products and consumers can compare the products' price across markets and decide about their shopping. The farmers who had no mobile phone were facing many problems in selling their products and getting market related information in comparison to mobile phone users. In rural areas most of the farmers cannot contact with the agricultural experts due to lack of communication. These people mostly depend on conventional methods of communication like personal contact, bulletin boards, price charts. Often they failed to obtain necessary information when needed. Thus, accurate and timely information remains as one of the main problems especially for the smallholder farmers (Duncombe, 2011).

2.4 Conceptual Framework of the Study

This study is concerned with the “ Handheld Communication Media and Their Extent of Use by Farmers for Information Access”. Thus, Extent of ICT use in receiving information was the dependent variable and 6 selected factors were considered as the independent variables viz. age, education, ICT use experience, device ownership, ICT self-efficacy, perceived usefulness for this study (Figure 2.1).

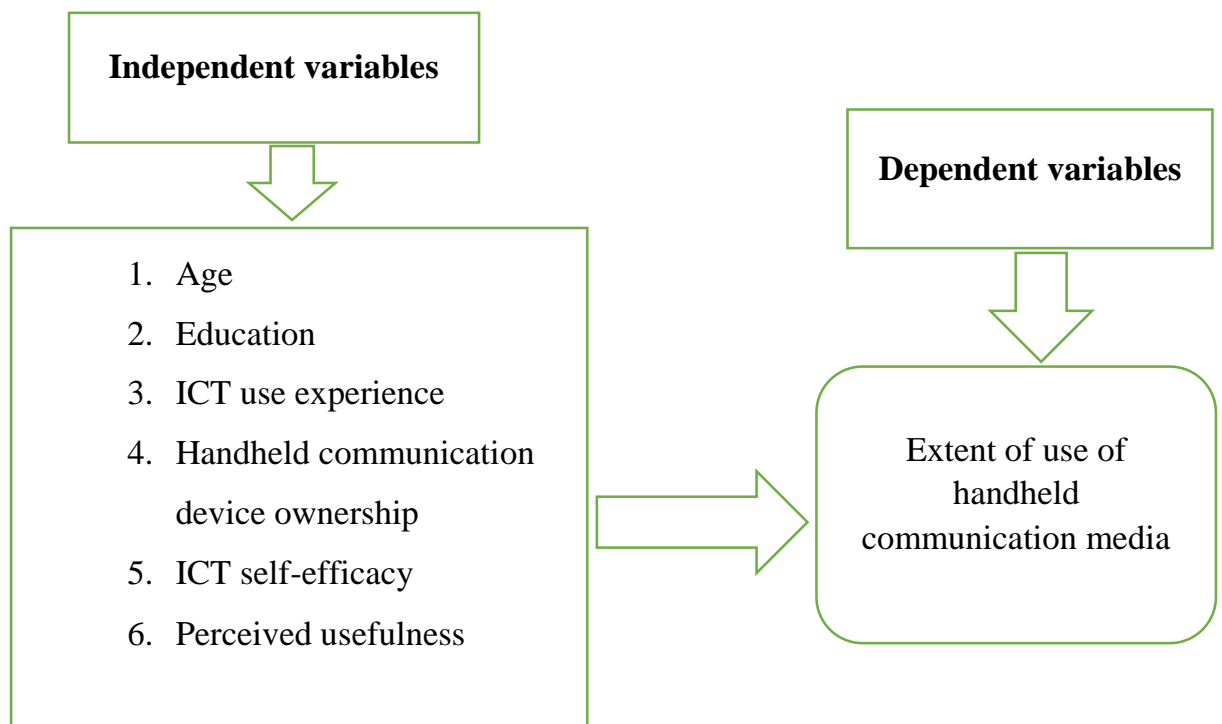


Figure 2.1 Conceptual framework of the study

CHAPTER III

METHODOLOGY

This section deals with the procedures and methods used in this study. This chapter is divided into three sections. First, it describes the overview of research design. Second, measurement of variables is described. Finally, the third section describes the methods applied in data analysis.

3.1 Research Design

3.1.1 Locale of the study

Nilphamari Sadar upazila was purposively selected as the study area. Nilphamari upazila has 15 unions. Three unions namely Itakhola and kundupukur and Pourashava of Nilphamari upazila under Nilphamari district were randomly selected as the locale of the study. There were two reasons to choose this upazila. First, the socio-economic and farming condition of this area was well known to the researcher. Second, this location was selected due to easy communication as well as easy contact with the respondents of the study. The study area constitutes of 2 blocks of Itakhola Union, One block of Kundupukur Union and Nilphamari Pourashava. Figure 3.1 and 3.2 show the map of the locale of the study.

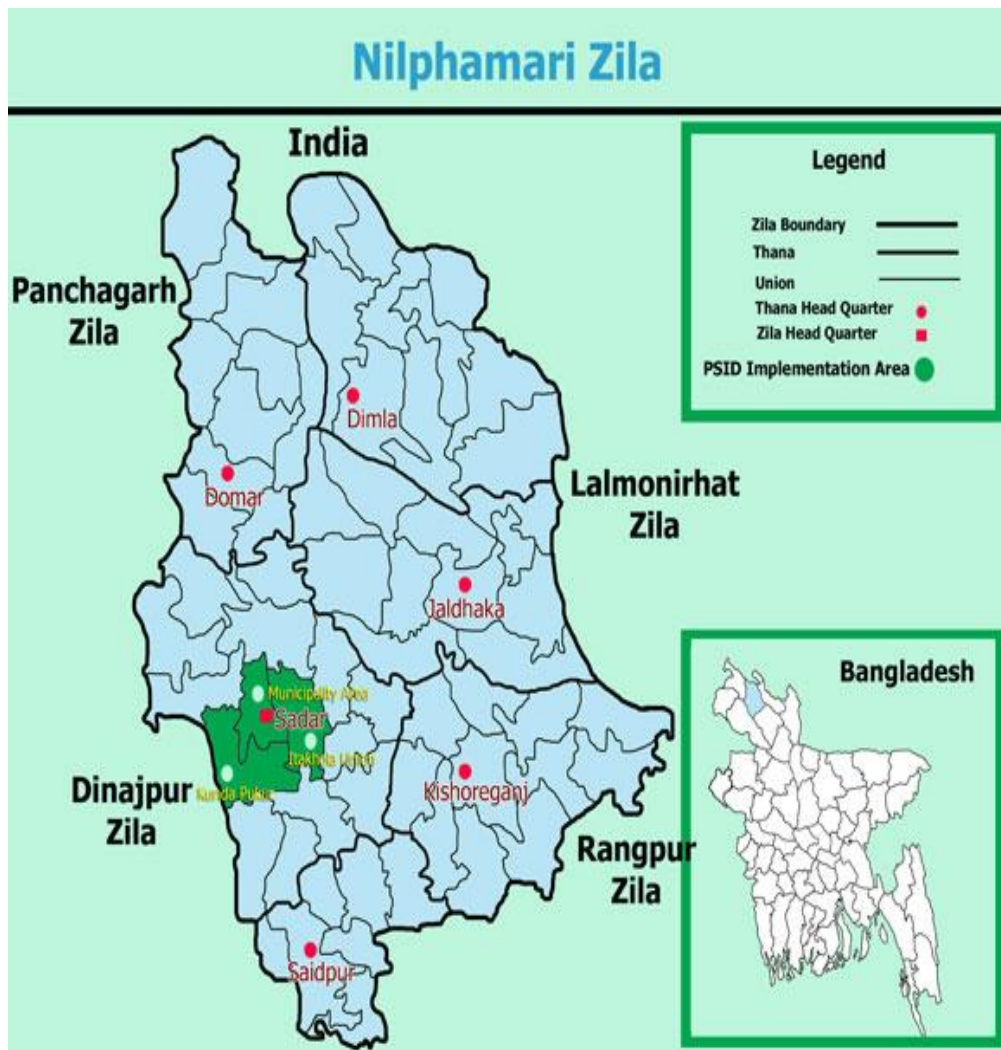


Figure 3.1 A Map of showing Nilphamari District



Figure 3.2 A Map of showing Nilphamari upazilla

3.1.2 Population and Sample Size

An up to date list was prepared of all the farm families of the selected blocks with the help of Agricultural Extension Officer (AEO) of Nilphamari Upazila and Sub Assistant Agriculture Officers (SAAOs) of Itakhola and Kundupukur unions and Nilphamari Pourashava. The total number of farm families in these blocks was 12902. Data were collected from the sample rather than whole population due to time and fund constraints. Farmers were selected randomly and proportionately from the villages as the sample by using a random number table. Thus, 117 farmers were selected as the sample for this study using an online sample determination application. A reserve list of 12 farmers was also prepared. Farmers in the reserve list were used only when a respondent in the original list was not available. Distribution of population, sample size and reverse list are shown in Table 3.1.

Table 3.1 Distribution of population and samples with reserve list

Name of Unions	Name of Blocks	Total Population	Sample Size	Reserve List
Itakhola	Itakhola	2047	19	2
	Singdoi	1643	15	2
Kundupukur	Kundupukur	1710	15	1
Pourashava	Pourashava	7502	68	7
Total		12902	117	12

3.1.3 Instrument for data collection

In order to collect necessary information from respondents, an easy and realizable interview schedule was carefully designed focusing the objectives of the research work. Majority of items of the selected variables were adapted from previous literature with little modifications considering the context of the study. The researcher seeks experts' opinion before finalizing the interview schedule. All the questions were systematically arranged to help the respondents to understand the consequence easily.

3.1.4 Collection of data

Data for this study were collected through personal interview by the researcher herself during July 31 to August 31, 2019. The interview schedule prepared earlier by the researcher was used to gather information. All possible efforts were made to explain the purpose of the study to the respondents in order to get valid and pertinent information from them. Interviews were conducted with the respondents at their homes. While starting interview with any respondent, the researcher took all possible care to establish rapport with them so that they did not feel uneasy or hesitation to furnish proper responses to the questions and statements in the schedule. The questions were explained and clarified whenever any respondent felt difficulty in understanding properly. None of the farmers was interviewed from the reserve list during final collection of data.

3.1.5 Variables of the study

Two variables were used for this study:

- 1. Dependent variable:** It is a variable that is the result or outcome or effect of other variables. This variable is often known as criterion or outcome variable. The value of the dependent variable depends on the value of the other variables, that is, independent variable. In this study, extent of use of Handheld Communication media by the farmers was considered as the dependent variable.

2. Independent variable: It is a variable that the researcher can control over or manipulate to predict other variable (i.e., dependent variable). Therefore, this variable is often called as predictor variable or causal variable. In an experimental setting, a researcher wants to manipulate the variable or introduce new variable to see its effect on the dependent variable. In this study, age, education, ICT use experience, ICT device ownership, ICT self-efficacy, perceived usefulness were considered as Independent variables.

3.2 Measurement of Variables

3.2.1 Age

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

3.2.2 Education

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

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

3.2.3 ICT use experience

ICT use experience means the experience which was gained by an individual from using Mobile phone and Internet. It was expressed in year. One (1) score was assigned for one year of Mobile phone and Internet using experience. In example, if a respondent started using Mobile or Internet 5 years past from the date of interview the score was noted 5 while if there is no using experience at all the score was given 0. ICT use experience was computed using the following formula:

$$\text{ICT use experience} = \sum (\text{Mobile phone use experience} * 0.5) + (\text{Internet use experience} * 0.5)$$

3.2.4 ICT ownership

Handheld communication device ownership means what type of device are used by the farmers. Three handheld communication devices were considered namely feature phone, smart phone and computer/laptop/tab. Respondents' possession of these three devices were captured into 'no access', shared access, and self-access. Score 0,1, and 2 were assigned, respectively for each type of possession. The overall, ICT ownership score (i.e. composite) was determined using the following formula

$$\text{ICT ownership} = \sum (\text{Feature phone} * 0.3) + (\text{Smart phone} * 0.3) + (\text{Computer} * 0.4)$$

Here three types of devices were used which score measurements according to their ownership is given below:

Score	Assigned items
0	No Access
1	Shared Access
2	Self

3.2.5 ICT self-efficacy

ICT self-efficacy score of a respondent was computed on the basis of his belief on how efficiently they use ICT in their regular activities. Respondents' responses were captured by using a five-point rating scale (1-5) ranging from 'strongly disagree' to 'strongly agree' against four statements.

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

ICT self-efficacy score was determined by summing the scores of all 4 items. Thus, the score could range from 4 to 20, where '4' indicates strongly disagreement and '20' indicates strongly agreement.

3.2.6 Perceived usefulness

Perceived usefulness score of a respondent was computed on the basis of his belief on how they are benefitted by using ICT based technology in their regular activities. Respondents' responses were captured by using a five-point rating scale (1-5) ranging from 'strongly disagree' to 'strongly agree' against four statements.

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

Perceived usefulness score was determined by summing the scores of all 4 items. Thus, the score could range from 4 to 20, where '4' indicates strongly disagreement and '20' indicates strongly agreement.

3.2.7 Extent of use of handheld communication media

The use of Handheld communication media are measured by measuring the Extent of Handheld Communication media use of a respondent. The Extent of Handheld Communication media was measured in terms of his/her nature to communicate with different media in his/her own social system. Respondents' responses were captured by using a five-point rating scale (0-4) ranging from 'not at all' to 'frequently' against five communication media. The scale used for computing the Extent of Communication media use score was presented below:

Score	Extent of use
0	Not at all
1	Rarely
2	Occasionally
3	Often
4	Frequently

Extent of ICT use score was determined by summing the scores of all 5 items. Thus, the score could range from 0 to 20, where ‘0’ indicates not at all and ‘20’ indicates frequently use of these Communication Media.

3.3 Data Analysis

3.3.1 Editing

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

3.3.2 Coding and tabulation

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

3.3.3 Categorization of data

For coding operation, the collected data were classified into various categories. These categories were developed for each of the variables. The procedures and

categorization of a particular variable were further discussed in the chapter 4 in detail.

3.3.4 Method of data analysis

The data were analyzed in accordance with the objectives of the proposed research work. The statistical measures such as range, means, standard deviation, number and percentage distribution were used to describe the variables. The analysis of data was performed using statistical treatment with SPSS (Statistical Package for Social Sciences) computer program, version 23. In order to estimate the contribution of the selected factors that might influence farmers in the extent of use of ICT media in receiving farm-related information, multiple regression analysis (β) as used. Throughout the study, five percent (0.05) level of significance was used as the basis for rejecting any null hypothesis. If the computed value of (β) was equal to or greater than the designated level of significance (p), the null hypothesis was rejected and it was concluded that there was a significant contribution between the concerned variable. Whenever the computed value of be rejected. Hence, it was concluded that there was no contribution of the concerned variables.

The model used for this analysis can be explained as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e;$$

Where, Y was the dependent variable i.e. extent of handheld communication media. Of the independent variables, x_1 was the respondent's age, x_2 was education, x_3 was ICT use experience, x_4 was ICT device ownership, x_5 was ICT self-efficacy, x_6 was perceived usefulness. $b_1, b_2, b_3, b_4, b_5, b_6$ were regression coefficients of the corresponding independent variables, and e is random error, which was normally and independently distributed with zero mean and constant variance.

CHAPTER IV

RESULT AND DISCUSSION

A consequential and detailed discussion on the findings of the scientific research study has been presented in this Chapter. This Chapter includes three sections. In the first section, independent variables i.e. selected factors that influence Handheld communication media use have been discussed. The second section dealt with dependent variable i.e., Extent of use of handheld devices for extension service and finally, the contribution of the independent variables on dependent variable have been discussed in the third section.

4.1 Respondents Characteristics and Descriptive Statistics

In this section the descriptive statistics are presented in Table 4.1

Table 4.1 Descriptive statistics of the respondents

Characteristics	Total No.	Min	Max	Mean	Standard deviation
Age	117	25	75	47.78	10.873
Education	117	.0	16.0	7.714	4.700
ICT experience	117	2.00	13.50	5.613	2.486
ICT ownership	117	.30	2.00	.923	.359
Self-efficacy	117	2.75	4.75	4.012	.400
Perceived usefulness	117	3.00	5.00	4.083	.451
Extent of ICT use	117	.80	3.00	1.885	.634

Selected Characteristics of the farmers

Ten characteristics of the several types of farmer were selected to describe and to find out their relationships with the Extent of use of handheld devices for extension service by the farmers. These selected characteristics were Age, Education, Annual family income, ICT use experience, Handheld device ownership, ICT self-efficacy, Perceived usefulness and Extent of use of handheld communication media.

4.1.1 Age

The age of the sample farmers ranged from 25 to 75 years with an average of 47.78 and standard deviation of 10.873. According to their age and based on the classification of Ministry of Youth and Sports, Peoples' Republic of Bangladesh, respondents were classified into three categories (Table 4.2).

Table 4.2 Distribution of the respondents according to their age

Categories	Frequency	Percent	Mean	STD
Young age (up-to 35 years)	20	17.1	47.78	10.873
Middle age (36- 50 years)	53	45.3		
Old age (above 50 years)	44	37.6		
Total	117	100.0		

Data showing that the highest value of proportion 45.3 percent of the farmers were middle aged compared to 37.6 percent old and 17.1 percent being young aged. According to Lionberger, (1960) elderly farmers seem to be somewhat less motivated to adopt new farm practices than younger ones. Middle and old aged people generally show more favorable attitude towards trying new ideas. Table 4.2 shows that middle aged farmers are more likely to adopt communication technologies.

4.1.2 Education

The education score of the farmers ranged from 0-16, with an average of 7.714 and standard deviation of 4.700. The respondents were classified into six categories on the basis of their education (Table 4.3).

Table 4.3 Distribution of the farmers according to their education

Categories	Frequency	Percent	Mean	STD
No education	9	7.7	7.714	4.700
Can sign only	15	12.8		
Primary education (1 to 5)	14	12.0		
Secondary education (6 to 10)	53	45.3		
Higher secondary education (11 to 12)	16	13.7		
Above higher secondary education (above 12)	10	8.5		
Total	117	100.0		

It is determined from the Table 4.3 that 45.3 percent comprised of secondary education, 12.0 percent comprised of primary education, 7.7 percent of the respondents were under can't read or sign, 12.8 percent can sign only, 13.7 percent had higher secondary education and only 8.5 percent had above higher secondary level education.

4.1.3 ICT use experience

The observed ICT experience of the farmers score ranged from 2 to 13.50 with an average of 5.613 and standard deviation of 2.486. Depending on the experience (mean & SD) in ICT use, farmers were classified into three categories as shown in Table 4.4

Table 4.4 Distribution of the farmers according to their ICT use experience

Categories	Frequency	Percent	Mean	STD
Less experience (up-to 5 years)	56	47.9	5.613	2.486
Moderate experience (5 to 10 years)	56	47.9		
High experience (above 10 years)	5	4.3		
Total	117	100.0		

Data contained in Table 4.4 revealed that the lowest proportion (4.3%) of the farmers had high experience as compared to 47.9 percent had low and also 47.9 percent had moderate experience in using ICT. Thus, low and medium had same percentage of ICT experience.

4.1.4 ICT ownership

The ICT ownership of the farmers score ranged from 0.30 to 2.00 with an average of 0.9239 and standard deviation 0.35975. Depending on ICT possession status farmers are classified into three categories which are shown in Fig.4.1

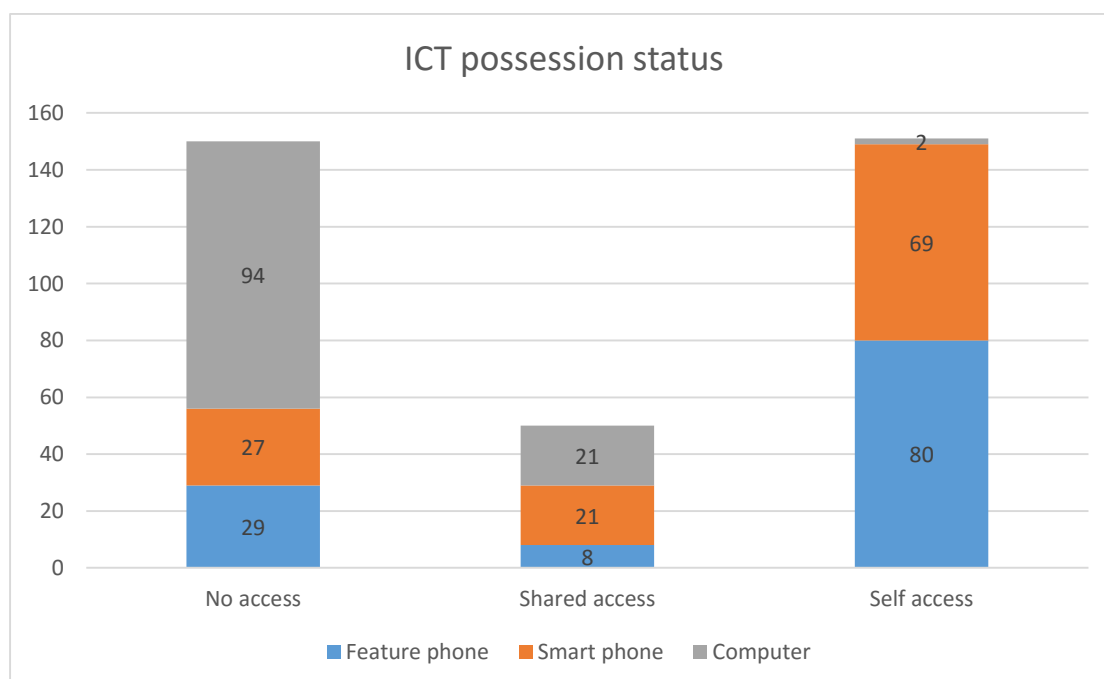


Figure 4.1 ICT possession status by respondents

From the Fig.4.1 we found that 80 respondents have self-access, 8 respondents have shared access and 29 respondents have no access in feature phone. Thus, 69 respondents have self-access, 21 respondents have shared access and 27 respondents have no access on smart phone and finally 2 respondents have self-access, 21 respondents have shared access and 94 respondents have no access in computer.

4.1.5 ICT self-efficacy

The observed ICT self-efficacy scores of the respondents ranged from 2.75 to 4.75. The average ICT self-efficacy score was 4.0128 and the standard deviation was 0.40049. Based on the possible range of ICT self-efficacy score (2.75- 4.75) The categories and distribution of the respondents were shown in Table 4.5

Table 4.5 Distribution of the farmers according to ICT self-efficacy

SL No.	Items	Strongly disagree	Disagree	Undecided	Agree	Strongly agree	Item Index
1	I can use mobile phone without the help of others	0	0	3 (2.56%)	52 (44.44%)	62 (52.99%)	527
2	I can use ICTs (e.g. mobile phone, Internet) by myself to access agricultural market information	0	1 (0.85%)	19 (16.24%)	88 (75.21%)	9(7.95%)	454
3	I can access to the agricultural market information by using electronic media (e.g. mobile phone, Internet, TV, Radio)	0	1 (0.85%)	24(20.51%)	85(72.65%)	7(5.98%)	447
4	I can updated myself about agricultural information by calling the input dealers by using mobile phone.	0	0	29(24.79%)	81(69.23%)	7(5.98%)	446

As it is shown in table 4.5, 52.99% of the respondents strongly agreed that they can use mobile phone without help of others considering as a part of ICT self-efficacy, While, 75.21% people agree with the fact that they can use ICTs (e.g. mobile phone, Internet) by them-self to access agricultural market information. 72.65% respondents believe that they can access to the agricultural market information by using electronic media, In-fact 69.23% respondents agreed that they can updated them-self about agricultural information by calling the input dealers by using mobile phone. Although 24.79% people cannot decide either they can be updated them-self about agricultural information by calling the input dealers by using mobile phone or not.

4.1.6 Perceived usefulness

The observed Perceived usefulness scores of the respondents ranged from 3.00 to 5.00. The average Perceived usefulness score was 4.0833 and the standard deviation was 0.45129. The categories and distribution of the respondents were shown in Table 4.6

Table 4.6 Distribution of the farmers according to their Perceived usefulness

SL No.	Items	Strongly disagree	Disagree	Undecided	Agree	Strongly agree	Item Index
1	I think ICTs (e.g. mobile, Internet, Apps) can save time to get agricultural information	0	0	9(7.69%)	81 (69.23%)	27 (23.08%)	486
2	I think I will be updated with latest farm related information using ICTs-based medium	0	0	23 (19.66%)	85 (72.56%)	9 (7.69%)	454
3	I think ICTs (mobile phone, Internet) will be the effective media to get market information	0	0	19 (16.24%)	76 (64.96%)	22 (18.80%)	471
4	I am much benefitted using ICTs for my farming	0	0	13 (11.11%)	69 (50.43%)	45 (38.46%)	540

The above table 4.6 shows the opinion of the respondents about the perceived usefulness, where it was agreed by 69.23% respondents that they think ICTs (e.g. mobile, Internet, Apps) can save time to get agricultural information, Furthermore, 72.56% respondents agreed that they think they will be updated with latest farm related information using ICTs-based medium. Besides all of these 64.96% people agreed with the statement that the ICTs (mobile phone,

Internet) will be the effective media to get market information and also 50.43% respondents agreed to be benefitted using ICTs for their farming.

4.2 Extent of use of handheld devices for extension service by the farmers

The observed score of Extent of ICT use ranges from 0.80 to 3.00. The average and standard deviation were 1.8855 and 0.63480 respectively. The categories and distribution of the respondents were shown in Table 4.7.

Table 4.7 Distribution of the farmers according to their Extent of use of handheld communication media

SL No	Items	Not at all	Rarely	Occasionally	Often	Frequently	Item Index
1	Internet	26 (22.22%)	4 (3.42%)	3 (2.56%)	26 (22.22%)	58 (49.57%)	320
2	Mobile phone	0	0	0	5 (4.27%)	112 (95.73%)	463
3	Social media	26 (22.22%)	38 (32.48%)	11 (9.40%)	42 (35.90%)	0	186
4	Apps (e.g. Krishi Jiggassa, Krishoker Janala, Krishoker Digital Tikana)	69 (58.97%)	37 (31.62%)	6 (5.13%)	5 (4.27%)	0	64
5	Call Centre	49 (41.88%)	67 (57.26%)	0	1 (0.85%)	0	70

The information gained from the field study (Table 4.7) shows that 49.57% farmers has full access to the internet service as extent of use of handheld communication media but about 22.22% farmers has no access at all to the internet, similar responses can be observed for the use of social media. On the other hand, 95.73% farmers use mobile phone on daily basis. Despite of being new concept, uses of apps and call center got extensive negative response as extent of use of handheld communication media, most of the farmer (58.97%) has no access to the Apps (e.g. Krishi Jiggassa, Krishoker Janala, Krishoker Digital Tikana) and towards the call center also where only 57.26% farmers rarely use the help of call center for information access as Extent of use of handheld communication media.

4.3 Contribution of Selected Characteristics of the Farmers in the Extent of use of handheld communication media

Table 4.8 Multiple regression coefficients of contributing factors related to the Extent of use of handheld communication media

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R ²	Adj. R ²	F
	Beta	Std. Error	Beta					
						.687	.670	40.241
1	(Constant)	-.398	.567		-.702	.484		
	Age	-.013	.004	-.218	-3.088	.003*		
	Education	.028	.010	.204	2.710	.008*		
	ICT experience	.038	.021	.148	1.774	.079#		
	ICT ownership	.283	.121	.160	2.337	.021*		
	Self-efficacy	.253	.129	.160	1.966	.052#		
	Perceived usefulness	.291	.094	.207	3.084	.003*		

Dependent Variable: Extent of ICT use
 *Significant at 5%, #Significant at 10% level

Remarks on the analysis:

Among the six variables, three variables namely education, ICT ownership and perceived usefulness of ICTs were found to be the significant positive influence to the Extent of use of handheld communication media for agricultural extension service except age contribute negatively. The remaining two variables, ICT use experience and self-efficacy while did not find significant at 5% but at 10% level of significance. ICT self-efficacy was found very close to 5% level (0.052). Therefore, it may conclude all the variables to some extent influence farmers' handheld communication media use behavior. These variables altogether contribute 67.0% of the variance of the extent of use of handheld communication media (adj. $R^2 = 67.0\%$). The overall model was found significant ($F=40.241^*$).

Contribution of age on the Extent of use of handheld communication media by the farmers

The contribution of age on the Extent of use of handheld communication media was measured by testing the following null hypothesis; “there is no level of contribution of Age on the Extent of use of handheld communication media”.

The adjusted p value of the concerned variable was found 0.003. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

□ The contribution of age was significance at 5% level. So the null hypothesis could be rejected.

Unstandardized coefficients are the 'raw' coefficients created by the regression analysis when the analysis is performed on the original unstandardized variables. The unstandardized coefficient represents the amount of change of the dependent variable Y due to the change of 1 unit of the independent variable X. A standardized beta coefficient compares the strength of the influence of each independent variable to the dependent variable. The higher the absolute value of the beta coefficient, the stronger the effect. From the table Unstandardized

coefficients beta was obtained $-.013$ and standardized beta coefficient $-.218$ which clearly represent the reverse effect of age on the extent of use of handheld communication media by the farmers. As higher the age, the Extent of use of handheld communication media by the farmers is lower and lower the age, higher the Extent of use of handheld communication media by the farmers.

Based on the above finding, it was concluded that a respondent who is older decreased the Extent of use of handheld communication media. Young aged people enhances the abilities of understanding the ICT methods at a short time than others which transformed them to adopt a technology. So, Middle and young aged people generally show more favorable attitude towards trying new ideas.

Contribution of education on the Extent of use of handheld communication media by the farmers

The contribution of education on the Extent of use of handheld communication media was measured by testing the following null hypothesis; “there is no level of contribution of education on the Extent of use of handheld communication media”.

The adjusted p value of the concerned variable was found 0.008 . The following observations were made on the basis of the value of the concerned variable of the study under consideration.

□ The contribution of education was significance at 5% level. So the null hypothesis could be rejected.

Unstandardized coefficients are the 'raw' coefficients created by the regression analysis when the analysis is performed on the original unstandardized variables. The unstandardized coefficient represents the amount of change of the dependent variable Y due to the change of 1 unit of the independent variable X. A standardized beta coefficient compares the strength of the influence of each independent variable to the dependent variable. The higher the absolute value of

the beta coefficient, the stronger the effect. From the table Unstandardized coefficients beta was obtained .028 and standardized beta coefficient .204 which clearly represent the positive effect of education on the extent of ICT use by the farmers. As higher the education, the Extent of use of handheld communication media by the farmers is higher and lower the education, lower the Extent of use of handheld communication media by the farmers.

Based on the above finding, it was concluded that a respondent had more education increased the Extent of use of handheld communication media. Education broadens the horizon and an educated person is more capable of judging the pros and cons of adopting a technology. Therefore, they can make more consent decision regarding technology adoption.

Contribution of ICT ownership on the Extent of use of handheld communication media by the farmers

The contribution of ICT ownership on the extent of ICT use was measured by testing the following null hypothesis; “there is no level of contribution of ICT ownership on the Extent of use of handheld communication media”.

The adjusted p value of the concerned variable was found 0.021. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

□ The contribution of ICT ownership was significance at 5% level. So the null hypothesis could be rejected.

Unstandardized coefficients are the 'raw' coefficients created by the regression analysis when the analysis is performed on the original unstandardized variables. The unstandardized coefficient represents the amount of change of the dependent variable Y due to the change of 1 unit of the independent variable X. A standardized beta coefficient compares the strength of the influence of each independent variable to the dependent variable. The higher the absolute value of the beta coefficient, the stronger the effect. From the table Unstandardized

coefficients beta was obtained .283 and standardized beta coefficient .160 which clearly represent the positive effect of ICT ownership on the Extent of use of handheld communication media by the farmers. As much the ICT ownership, the Extent of use of handheld communication media by the farmers is higher and lesser the ICT ownership, lower the Extent of use of handheld communication media by the farmers.

Based on the above finding, it was concluded that a respondent had more ICT ownership increased the extent of use of handheld communication media. ICT ownership enhances the abilities of the farmers to adopt a new technology at a short time than others. In fact, ICT ownership make up-to-date the farmers. Therefore, they can make more consent decision regarding technology adoption.

Contribution of perceived usefulness on the Extent of use of handheld communication media by the farmers

The contribution of perceived usefulness on the extent of ICT use was measured by testing the following null hypothesis; “there is no level of contribution of perceived usefulness on the Extent of use of handheld communication media”.

The adjusted p value of the concerned variable was found 0.003. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

□ The contribution of perceived usefulness was significance at 5% level. So the null hypothesis could be rejected.

Unstandardized coefficients are the 'raw' coefficients created by the regression analysis when the analysis is performed on the original unstandardized variables. The unstandardized coefficient represents the amount of change of the dependent variable Y due to the change of 1 unit of the independent variable X. A standardized beta coefficient compares the strength of the influence of each independent variable to the dependent variable. The higher the absolute value of the beta coefficient, the stronger the effect. From the table Unstandardized

coefficients beta was obtained .291 and standardized beta coefficient .207 which clearly represent the positive effect of perceived usefulness on extent of use of handheld communication media by the farmers. As higher the perceived usefulness, the Extent of use of handheld communication media by the farmers is higher and lower the perceived usefulness, lower the extent of use of handheld communication media by the farmers.

Based on the above finding, it was concluded that a respondent had more perceived usefulness increased the extent of use of handheld communication media. Perceived usefulness enhances the abilities of the respondents to adopt a technology at a short time than others. Therefore, they can make more consent decision regarding technology adoption.

Contribution of self-efficacy on the Extent of use of handheld communication media by the farmers

The contribution of self-efficacy on the extent of use of handheld communication media was measured by testing the following null hypothesis; “there is no level of contribution of self-efficacy on the Extent of use of handheld communication media”.

The adjusted p value of the concerned variable was found 0.052. The following observations were made on the basis of the value of the concerned variable of the study under consideration.

□ The contribution of self-efficacy was not significance at 5% level but significant at 10% level but it was closest to the 5% level. So the null hypothesis could be rejected.

Unstandardized coefficients are the 'raw' coefficients created by the regression analysis when the analysis is performed on the original unstandardized variables. The unstandardized coefficient represents the amount of change of the dependent variable Y due to the change of 1 unit of the independent variable X. A standardized beta coefficient compares the strength of the influence of each

independent variable to the dependent variable. The higher the absolute value of the beta coefficient, the stronger the effect. From the table Unstandardized coefficients beta was obtained .253 and standardized beta coefficient .160 which clearly represent the positive effect of age on the extent of use of handheld communication media by the farmers. As higher the age, the Extent of use of handheld communication media by the farmers is higher and lower the age, lower the Extent of use of handheld communication media by the farmers.

Based on the above finding, it was concluded that a respondent had more self-efficacy increased the extent of use of handheld communication media. Self-efficacy enhances the abilities of the respondents to adopt a technology at a short time than others. Therefore, they can make more consent decision regarding technology adoption.

Table 4.9 ANOVA table of regression analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	32.114	6	5.352	40.241	.000 ^b
	Residual	14.631	110	.133		
	Total	46.745	116			

Model F=40.241 with .000 level, that means, the model is significant.

From the ANOVA table it is found significant at 1% level of significance so null hypothesis rejected. A null hypothesis states that “there is no contribution on the selected characteristics of the farmers and their Extent of use of handheld communication media.” Therefore, a null hypothesis is rejected on the basis of this statistical test, so it is assumed that there is a contribution of the concerned variables.

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents 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 factors that influence farmers' Extent of use of handheld communication media

Findings in respect of the 7 selected factors that influence farmers' extent of ICT use are summarized below:

Age

An overwhelming majority (45.30%) of the respondents was middle aged and 37.6% was old aged and 17.1% was young aged. The standard deviation was 10.873 and mean was 47.78.

Education

Almost all of the farmers had different level of education. Among them 49.3% of the respondents were comprised of secondary education, 13.7 percent had higher secondary education, 12.8% can sign only, 12.0% were primary education, and rest 8.5% were above higher secondary education level.

ICT use experience

The ICT use experience of the farmers in the study area varied from 2 to 13.50. The average ICT use experience was 5.613 and standard deviation of 2.486. The lowest proportion (4.3%) of the farmers had high experience as compared to 47.9 percent had low and also 47.9 percent had moderate experience in using ICT.

ICT ownership

The ICT ownership of the farmers score varied from 0.30 to 2.00 with an average of 0.9239 and standard deviation 0.35975. Among the farmers 80 respondents have self-access, 8 respondents have shared access and 29 respondents have no access in feature phone. Thus, 69 respondents have self-access, 21 respondents have shared access and 27 respondents have no access on smart phone and finally 2 respondents have self-access, 21 respondents have shared access and 94 respondents have no access in computer.

ICT self-efficacy

The observed ICT self-efficacy scores of the respondents ranged from 2.75 to 4.75. The average ICT self-efficacy score was 4.0128 and the standard deviation was 0.40049. 52.99% of the respondents strongly agreed that they can use mobile phone without help of others considering as a part of ICT self-efficacy, While, 75.21% people agree with the fact that they can use ICTs (e.g. mobile phone, Internet) by them-self to access agricultural market information. 72.65% respondents believe that they can access to the agricultural market information by using electronic media, In-fact 69.23% respondents agreed that they can updated them-self about agricultural information by calling the input dealers by using mobile phone. Although 24.79% people cannot decide either they can be updated them-self about agricultural information by calling the input dealers by using mobile phone or not.

Perceived usefulness

The observed perceived usefulness scores of the respondents ranged from 3.00 to 5.00. The average perceived usefulness score was 4.0833 and the standard deviation was 0.45129. It was agreed by 69.23% respondents that they think ICTs (e.g. mobile, Internet, Apps) can save time to get agricultural information, Furthermore, 72.56% respondents agreed that they think they will be updated with latest farm related information using ICTs-based medium. Besides all of these 64.96% people agreed with the statement that the ICTs (mobile phone, Internet) will be the effective media to get market information and also 50.43% respondents agreed to be benefited using ICTs for their farming.

5.1.2 Extent of use of handheld communication media by the farmers

The observed score of extent of use of handheld communication media ranges from 0.80 to 3.00. The average and standard deviation were 1.8855 and 0.63480 respectively. 49.57% farmers had full access to the internet service as extent of use of handheld communication media but about 22.22% farmers has no access at all to the internet, similar responses can be observed for the use of social media. On the other hand, 95.73% farmers use mobile phone on daily basis. Despite of being new concept, uses of apps and call center got extensive negative response as extent of use of handheld communication media, most of the farmer (58.97%) has no access to the Apps (e.g. Krishi Jiggassa, Krishoker Janala, Krishoker Digital Tikana) and towards the call center also where only 57.26% farmers rarely use the help of call center for information access as extent of use of handheld communication media.

5.1.3 Contribution of the factors to farmers' Extent of use of handheld communication media

Multiple regression analysis revealed that six (6) selected factors altogether explained 68.7% ($R^2 = .687$) of the variance of Farmers' extent of ICT use. Among the factors, respondents' age, education, ICT ownership, perceived

usefulness were found to be positive and significantly contribute to their extent of use of handheld communication media while rest of the factors were found to be non-significant.

5.2 Conclusions

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

1. 49.57% farmers had full access to the Internet service as extent of use of handheld communication media and 95.73% farmers use mobile phone on daily basis. So, there is still a scope of higher extent of use of handheld communication media among the farmers.
2. ICT ownership has greatly led to the use of Handheld communication media by respondents. It can therefore be suggested that ICT ownership is one of the primary predictors of ICT use, and higher ICT ownership might lead to higher use of handheld communication media for gathering information on the agricultural market.
3. ICT self-efficacy has had a positive effect on handheld communication media use, and it is no surprise that ICT literacy respondents find ICT to be a simple tool that contributes to higher levels of use than those who either have a low level of ICT literacy or seek support from others while using ICT.
4. Perceived usefulness significantly contributed to the respondents' - use of handheld communication media. Therefore, it may be concluded that perceived usefulness is one of the important predictors of handheld communication media use and higher perceived usefulness will lead to higher use of handheld communication media for receiving agricultural market information.
5. Education significantly contributed to the respondents' use of ICTs. Therefore, it may be concluded that most of the respondents are educated

and they positively contributed to the extent of handheld communication media use.

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:

1. ICT ownership had a significant contribution on their use of handheld communication media and almost all the respondents either had direct or shared access to handheld communication media, 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.
2. Education had a significant contribution on the use of handheld communication media. Most of the respondents are educated whose are easily adopted the handheld communication media like internet or mobile phone. So, Farmers' should be educated well to spread the extent of handheld communication media s use.
3. 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.
4. Farmers also should learn about the usefulness of ICTs that they could easily look forward to using ICT devices as perceived usefulness also have positive relationship with the extent of handheld communication media use.

5.3.2 Recommendation for further study

1. The study was conducted Nilphamari upazila of Nilphamari District. Similar studies should be conducted in other parts of the country to get a clear picture of the whole country which will be helpful for effective policy formulation.
2. The present study was undertaken to explore contribution of six selected factors to farmers' extent of handheld communication media use. Therefore, it could be recommended that further studies should be designed considering other agricultural and nonagricultural activities and including other characteristics of the farmers that might affect the extent of handheld communication media use.
3. In the present study age, education, ICT ownership, ICT self-efficacy, perceived usefulness had significantly Contribute to farmers' extent of ICT use. In this connection, further verification is necessary for non-contributing characteristics.
4. It is difficult to determine actual Extent of handheld communication media use by the farmers. Measurement of extent of handheld communication media use by the farmers is not free from questions. Therefore, more reliable measurement of concerned variable is necessary for further study.
5. Research should also be undertaken to identify to other factors causing hindrance to the extent of handheld communication media use.

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APPENDIX-A

An interview schedule for collection of data on

Handheld Communication Media and their extent of use by farmers for Information access: Implication for Agricultural Extension for the selected areas of Nilphamari district

Serial no

Name of the respondent:

Village: Union:
.....

Upazila: District:
.....

(Please provide following information. Your information will be kept confidential and will be used for research purpose only)

Screening Question:

Do you have mobile phone or do you use mobile phone-based communication media?

- A. **Yes**, (Continue questions from Part –A.)
- B. **No**, (End the interview with thanks)

Part-A

1. Age: How old are you? Years.

2. Education

- i. Can't read and write
- ii. Can sign name only
- iii. Have study up to class:

3. Mobile phone/mobile-based device use experience

- i. How long have you been using ICT?
 - a) Mobile phone: Years.
 - b) Internet/Web/Apps: Years.

4. Handheld communication device ownership

Please mention your possession and access to the following ICTs:

Items	Possession status		
	Self	Shared Access	No Access
Feature phone			
Smart phone			
Computer			

5. 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 ICTs (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. mobile phone, Internet, TV, Radio)					
4	I can updated myself about agricultural information by calling the input dealers by using mobile phone.					

6. Perceived usefulness

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

SL No.	Items	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
1	I think ICTs (e.g. mobile, Internet, Apps) can save time to get agricultural information					
2	I think I will be updated with latest farm related information using ICTs-based medium					
3	I think ICTs (mobile phone, Internet) will be the effective media to get market information					
4	I am much benefitted using ICTs for my farming					

7. **Extent of use of handheld communication media:** Please mention the frequency of the following ICTs use:

SL No	Items	Not at all	Rarely	Occasionally	Often	Frequently
1	Internet		Once/Month	2-3 times/month	2-3 times/week	At least once in a day
2	Mobile phone		Once/Month	2-3 times/month	2-3 times/week	At least once in a day
3	Social media		Once/Month	2-3 times/month	2-3 times/week	At least once in a day
4	Apps (e.g. Krishi Jiggassa, Krishoker Janala, Krishoker Digital Tikana)		Once/Month	2-3 times/month	2-3 times/week	At least once in a day
5	Call Centre		Once/Month	2-3 times/month	2-3 times/week	At least once in a day

Thank you.

Signature of the interviewer: