

**EFFECTIVENESS OF CELL PHONE IN DISSEMINATING
AGRITULTURAL INFORMATION AS
PERCEIVED BY THE SAAOs**

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**EFFECTIVENESS OF CELL PHONE IN DISSEMINATING AGRITURAL
INFORMATION AS PERCEIVED BY THE SAAOs**

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CERTIFICATE

*This is to certify that the thesis entitled “EFFECTIVENESS OF CELL PHONE IN DISSEMINATING AGRICULTURAL INFORMATION AS PERCEIVED BY THE SAAOs” submitted to the Department of Agricultural Extension & Information System, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (MS) in AGRICULTURAL EXTENSION**, embodies the results of a piece of bona fide research work carried out by **MD. JIAUL ISLAM**, Registration No. **13-05308** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

I further certify that such help or source of information, as has been availed during the course of this investigation has been duly acknowledged and style of this thesis has been approved and recommended for submission.

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DEDICATED
To
MY BELOVED
PARENTS

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EFFECTIVENESS OF CELL PHONE IN DISSEMINATING AGRITUTURAL
INFORMATION AS PERCEIVED BY THE SAAOs

ABSTRACT

The main purpose of this study was to determine the effectiveness of cell phone in disseminating agricultural information and to explore the contribution of the factors of the SAAOs on their effectiveness of cell Phone. The selected characteristics were age, length of job experience, extent of using cell phone, farmers coverage by SAAO, training received on ICT and Agriculture, complexity of using cell phone, income beyond Job and Effectiveness of cell Phone. Data were gathered from 79 SAAOs of three upazilas namely Kushtia Sadar, Bheramara and Mirpur under Kushtia district by using personal interview schedule during the period from 25 March to 20 May, 2019. The Findings revealed that 60.8 percent of the respondents had medium effective, while 16.4 percent and 22.8 percent of them respectively found it as highly and less effective as a medium for disseminating agricultural information. Multiple regression analysis showed that extent of using cell phone and farmers coverage by SAAO had significant positive contribution and complexity of using cell phone had significant negative contribution to the effectiveness of cell phone in disseminating of agricultural information as perceived by the SAAOs variety while rest of the variables showed no significant contribution to the effectiveness of cell phone. Complexity faced Index (CFI) in using cell phone, it was observed that “video call” ranked first complexity followed by “SMS/MMS” and “Voice call”.

Key words: Effectiveness, cell phone, disseminating agricultural Information

CHAPTER I

INTRODUCTION

1.1 General Background

Agriculture is the backbone of the Bangladesh economy. Agricultural information dissemination is a key component in improving rural farmer's agricultural production, and it is the basis of extension service delivery thus, leading to improved rural livelihoods, food security and Socio-economic development. Higher agricultural productivity will be released when the right information in the right format at the right time is disseminated to the farmers by the extension workers. The use of conventional communication channels such as farm/home visit, personal letters, and use of contact farmers, for disseminating agricultural information is counterproductive. This calls for the adoption and application of Information and Communication Technologies (ICTs) devices such as cell phone by both researchers and extension workers to transmit relevant information to farmers in a most efficient way (Salau E. S. and Saingbe N.D. 2011).

Agricultural data, information and knowledge generated by the farmers themselves by interacting with fellow farmers influence agricultural productivity in various ways. It can help farmers take the right decision about the land, labor, variety, fertilizer, capital and management. Agricultural productivity can be arguably improved by relevant, reliable and useful information and knowledge (Demiryurek et al., 2008). The present famous acronym ICT serves best means to provide information to the stakeholders like farmers. The global attention has come to the impact of ICTs on agriculture as its buzz rings that ICTs should be hailed to be integrated with agriculture to boost its production. The ICTs have shown evidence for easier access to agricultural development to the standard livelihood of farmers (Roy et al., 2003). The computers, internet, geographical information systems, cell phones, as well as traditional media such as radio or TV stimulate participation and enhance the value of productivity. In this backdrop, an attempt was made to study and examine the impact of ICTs on agricultural production in Bangladesh.

Technologies composed of ICTs are the blessing to agriculture as they provide the farmers with data, information and knowledge with which they can empower themselves with modern

agricultural technology and act accordingly for increasing the production of higher value crops, reduction in expenses of production, increase in selling price, less use of pesticides for vegetables on their farms. As mentioned, it is now proved that the use of ICT has become increasingly integrated to address the farmers' information need in all over the world (Islam & Islam, 2008), the ICTs have transferred most important information about agriculture in developed countries. The developing countries, which are now being connected with developed nations with the connectivity and are now able to get the access to the latest information and technologies regarding weather, natural resources and other related information (Rao, 2007).

Agricultural development cannot be understood without the use of modern technologies like Information and Communication Technologies (ICTs). The recent developments in ICTs offer a unique opportunity to bring the production enhancing tools and technologies to the growers with much cost-effective manner. Agricultural extension is an educational service which brings information and new technologies to farming communities to enable them improve their production, incomes and standards of living (Samuel Gebre-selassie, 2001). With the problem that extension agents face in facilitating direct contact with farmer clients and with researchers due to the physical distances involved and lack of transportation needed for their mobility, the application of cell phone offers excellent possibilities, for strengthening research – extension systems and beyond the urban focus. Agricultural information enhances and facilitates farming decisions to sustain growth of agricultural activities. Cell Phone emphasized that in the information age, dissemination of information and applying this information in the process of agricultural production will play a significant role in the development of farm settlements (Samuel Gebre-selassie, 2001).

It is a fact beyond dispute that Information and Communication Technology (ICT) tools such a Cell Phone can play an important role in increasing production, income and efficient use of resources for the economic development of the country. Improvement of agricultural productivity will be released when farmers are linked to the right information through an appropriate medium or tool. A cell phone (also known as a cellular phone, cell phone, hand phone, or simply a phone) has the capacity to make and receive calls over a radio link while moving around a wide geographic area. The Bangladesh Telecommunication Regulatory Commission (BTRC) has reported that the total number of Cell Phone subscribers has reached 165.615 Million at the end of January (BTRC, 2020). The use of cell phones can be considered

to have the potential to deliver relevant, innovative and useful farm information to farmers at much reduced costs. Cell phones are transforming the lives of many users in developing countries and are widely recognized as an important current and future technology platform for developing nations. In addition to voice communication, cell phones allow for the transfer of data in multi-media form, which can be used in the context of applications for the purposes of health, education, commerce or governance.

Extension delivery according to DAE is a process and medium of disseminating information from the research Centre to the farmers' door step via the extension agents. It is a process of transfer of technology from the point of formulation to the receiving clientele or user.

SAAOs regularly seek information to carry out their day-to-day work. They frequently communicate with a variety of information sources. Prominent among these were: farmers, other SAAOs, extension specialists, their immediate supervisor, local news agencies, input dealers, officers of research institute and NGO workers. Viewing the role of extension service performed by SAAOs, it is apprehensive that they have good interaction with rural people in sharing any kind of agriculture related information. However, SAAOs face different problems and barriers in collecting information properly as well. SAAOs face unique challenges in finding precise information when trying to meet the specific needs of their clientele. Serving as a liaison between extension organization and the general public i.e. farmers is a daunting task, particularly when an agent is trying to decipher what information is most credible. Technological advances have changed the way of professionals' access to information in every field, and extension is no exception. But very few studies were conducted on it. So, the researcher is keenly interested to conduct a research entitled: "Effectiveness of Cell Phone in disseminating agricultural information as perceived by the SAAOs".

Sub-Assistant Agricultural Officers (SAAOs) are responsible for providing extension services to the farm families within a block as well as for planning and programming of related activities. SAAOs are working for the dissemination of technology and collection of feedback among the farmers, the success of extension work largely depends on their information seeking behavior. However, very few researches have so far been conducted for studying the information seeking behavior of the SAAOs in Bangladesh.

The present study was undertaken to have an understanding about the perceived effectiveness of Cell phone related to their job of the SAAOs of DAE. Findings of the present study would

specify the roles of intra and inter-system communication as well as highlight the bottlenecks in effective transfer of technology in the government extension organization i.e. DAE. It was also expected that the findings of the study would be useful for designing a communication strategy for achieving the organizational goal through SAAOs. The findings of the study would also help in identifying some of the personal and situational characteristics of SAAOs to assess the effectiveness of Cell Phone in disseminating agricultural information.

1.2 Statement of the Problem

Effective agricultural information dissemination is an important element in achieving rural farmer's high yield and it is the basis for extension service delivery thus, leading to improved rural livelihoods, food security and socioeconomic development. In Bangladesh, there is poor dissemination of agricultural information to farmers. Farmers seldom feel the impact of agricultural innovations either due to lack of access or poor dissemination of such vital information. This has become a key constraint or limitation to agricultural development in the country. The use of conventional agricultural information dissemination channels such as farm/home visit, personal letters, and use of contact farmers, for disseminating agricultural information is counterproductive. It is a fact beyond dispute that Information and Communication Technology (ICT) facilities such as cell phones, if properly used in disseminating agricultural information can play an important role in increasing production, income and efficient use of resources for the economic development of the country. Similarly, there will be quick exchange of agricultural information between the extension workers and farmers if cell phones are integrated in delivery of agricultural information to farmers in Bangladesh. Consequently, this research is set out to investigate the application of cell phones in disseminating agricultural information to farmers through SAAOs.

However, this study undertook an attempt to study the effectiveness of Cell Phone as an ICT-based agricultural advisory system in Bangladesh from its end users' viewpoints having the following questions in mind:

- i. To what extent Cell Phone is effective tool in disseminating agricultural information?
- ii. What were the characteristics of the SAAOs those influence effectiveness of Cell Phone in disseminating agricultural information?

- iii. What was the contribution of the SAAOs to effectiveness of using Cell Phone in disseminating agricultural information?

1.3 Objectives of the Study

The study is designed to achieve the following objectives:

- i. To describe some selected characteristics of the SAAOs
- ii. To determine the effectiveness of cell phone in disseminating agricultural information
- iii. To explore the contribution of the SAAOs characteristics on their effectiveness of cell phone in disseminating agricultural information

1.4 Scope of the Study

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 cell phone in disseminating agricultural information. It is expected that the findings obtained from this investigation will be generalized and applied to the other context however; in order to fulfill the research in purposeful and controllable way it becomes important to oblige certain limitations in regard to certain aspects of the study.

1.5 Limitations of the Study

Concerning the resources and time available to the researcher, the following limitations have been considered throughout the study.

- i. The study was confined to three upazilas namely Kushtia Sadar, Bheramara and Mirpur of Kushtia district.
- ii. There are numerous factors that might influence users' effectiveness of 'Cell Phone', however among those factors only few personal and technological factors which deemed important were considered for this study.
- iii. Data furnished by the respondent SAAOs were considered to be valid and reliable.
- iv. Facts and figures collected by the investigator considering prevailing situation.

1.6 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 was reliable.
- iii. The ICTs as well as Cell Phone users included in the sample were the actual representative of the population.
- iv. The researcher who acted as Interviewer was well adjusted to the social and cultural environment of the study area. Hence, the data collected by her from the respondents were free from bias.
- v. The finding of the study will be useful for planning and execution of more ICT-based services facilitate its users for receiving agricultural information.

Study on the “effectiveness of cell phone for disseminating agricultural information” 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 effectiveness in disseminating agricultural information to the rural clientele.

1.7 Definition of the Important Terms

Age of a respondent defined as the span of his/her life and is operationally measured by the number of years from his/her birth to the time of interviewing.

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

Extent of using cell phone refers to the frequency of use by a user. Extent of cell phone use in agricultural purpose refers to the extent of cell phone use by farmers for farm-related activities while the non-farm-related purpose is referred to as general purpose.

Cell phone application, most commonly referred to as an app, is a type of application software designed run on a cell phone device, such as a smart phone or tablet computer. Cell phone applications frequently serve to provide users with similar services to those accessed on PCs.

Cell phone is an electronic telecommunication device, often refers to as a cellular phone or cell phone. Cell phones connect to a wireless communication network through radio wave satellite transmission. Most cell 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.

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

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

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

Income beyond job means Income beyond Job referred to the total earnings of a respondent from agricultural and non-agricultural sources (business, farming, etc.) except service.

CHAPTER II

REVIEW OF LITERATURE

Exploring the effectiveness of Cell phone in disseminating agricultural information and its relationship with selected characteristics of the SAAOs were the main tasks of the study. This Chapter contains synthesis of selected literature those were related to the present study. The researcher made an elaborate search of available literature for this purpose. The researched topic is considerable newer and therefore very few studies were found that directly related to this study topic. However, this researcher made the best efforts to find relevant studies on the effectiveness of Cell phone used for disseminating agricultural information. This chapter is divided into four sections. **First section** deals with roles of SAAOs in agricultural extension and their job performance, the **second section** deals with concept of ICTs as well as Cell phone and their effectiveness, and the **third section** deals with the relationship between SAAOs characteristics and their effectiveness of Cell phone and **fourth section** deals with the conceptual framework of the study.

2.1 Roles of SAAOs in Agricultural Extension and their Job Performance

Professional leaders are the individuals who are assigned to a job and normally paid or receives remuneration for their tasks. They are responsible to carried out duties and responsibilities as assigned by their organization. Considering this definition, all the employees of agricultural extension service provider like SAAOs are the professional leaders. Performance of professional leader refers to the degree to which an individual performs various duties and responsibilities assigned to them (Mahboob et al., 1978).

Employees performance in an organizational context often synonymous to the job performance. A job can be defined as a collection of tasks assigned to a worker (Lanham, 1955 and Yukl, 1998) while performance implies how an individual actually performs in a given position, as distinct from how is expected to perform (Davis, 1948).

Performance often is the outcome of an individual's response to stimulus objects (Herman,1973). It may further define as the manner and extent to which an employee performs different responsibilities of their job in a practical and/or critical situation (Rizvi, 1967).

Employees' job performance is however influenced by a number of factors. Both extrinsic and intrinsic factors might influence their performance. Environmental condition and organizational culture often influence individual's job performance yet employees' personal capabilities and their motivation towards work have been considered as the most influential factors for better performance (Lynch, 1971). Similarly, Lawler and Porter (1968) argued that performance depends on an individual's ability to perform the specific task as assigned to him/her. The ability is however largely determined by his characteristics. A number of personal characteristics of individual may affect the quality and quantity of his/her performance (Vinake, 1962).

2.2 Concept of ICTs and their Effectiveness

ICTs as used in this paper refer to all information handling communication technologies 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, who help them to improve on their productivity and income (Ssewanyana, 2007; Scott, et al., 2008) reported that cell 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. According to Asia-Pacific Association of Agricultural Research Institutions (APAARI) (2004) for farmers' information needs to be satisfied through use of ICTs are for market related information including price trends, accessing input and support services to be met and getting solutions to individual and community agricultural problems, especially diagnosis of disease and pest problems.

Balaji et al. (2007) the use of ICTs radio, television and cell phones in particular, can accelerate agricultural development by improving access to informational knowledge services. From the

perspective of agricultural knowledge and information systems (AKIS), ICT can be seen as a useful tool in improving linkages between research, farmers and agricultural extension systems.

Sife et al. (2010) described ICTs as effective tools for the provision of information services as it allows a two-way communication and can provide more than one service simultaneously.

Aker, Mbiti and Jensen, (2010) the use of ICT for development has attracted considerable attention in development policy and research.

De Janvry, Fafchamps, & Sadoulet, (1991) reported that farmers often respond to price signals in ways that differ from those predicted using standard micro-economic demand and supply analysis.

Schultz (1964) notes that given the constraints these farmers face and the environment in which these farmers operate, farmers are surprisingly efficient.

Singh, Squire, & Strauss (1986) subsequent work on agricultural household models that explicitly accounts for the dual role of farm households as both producers and consumers of often the same consumables and production factors has led to a substantial literature that is able to explain smallholder behavior as a rational response to missing, incomplete or inefficient markets.

Foster and Rosenzweig (2010) model technology adoption through extension, and show how learning can reduce uncertainty about the profitability of a new technology. One can think of various ways in which ICTs can alter the above ex-ante risk management strategies available to households. ICTs may facilitate access to agricultural knowledge and best practice through call centers or information presented online.

Dercon (2002) access to price information in other markets, as well as contact information of traders and agro-processors, is likely to substantially reduce price risk. Weather forecasts will also affect the (perceived) riskiness of crops. ICTs may also make risk coping through sale of assets more effective. When common shocks occur, many households may decide to sell off assets at the same time, leading to a collapse of the market. This negative correlation between food prices and asset prices greatly reduces the effectiveness of savings as a risk management strategy. There are a number of studies that investigate the effect of ICT on overall market efficiency and arbitrage.

There are also quite a number of studies on the effect of ICT use for price information provision on surplus sharing. Svensson and Yanagizawa (2009) found large effects of price information delivered through radio, resulting in a 15% increase in the price farmers receive.

Goyal (2010) looks at the provision of price information using Internet kiosks in the context of Indian soybean growers who sell to traders in wholesale markets. She found that price information translates to a 1–3% increase in farmer prices.

Jensen (2007) found that the introduction of cell phones in Indian fishing communities reduces price dispersion between markets and eliminates waste, consistent with increased spatial arbitrage. Aker (2010) found that the introduction of cell phones increases grain market integration in Niger, while Aker and Fafchamps (2015) found that producer price dispersion decreases after the introduction of cell phones, but only for perishable crops.

Futch and McIntosh (2009) did not find price effects resulting from the introduction of cell phones in Rwanda. Another characteristic of smallholder farmer is the under-adoption of yield-increasing investments amid low and stagnating agricultural yields, despite the fact that these investments seem to be highly profitable (Duflo, Kremer, & Robinson, 2008).

Experts believe a lack of knowledge about (improved) crops and farming techniques is an important constraint. It is argued that if this knowledge gap can be narrowed through agricultural extension, this may lead to significant improvements in rural welfare. We see different areas where ICTs may outperform traditional extension services. One of the main threats to sustainability of agricultural extension services is high recurrent costs (Quizon, Feder, & Murgai, 2001), and cell phone technology provides a cost-effective way to transfer information to remote locations (Nakasone, Torero, and Minten, 2014).

Anderson and Feder (2004) mentioned that timeliness of information is also key to the success of extension systems. Again, ICTs may be particularly suited to disseminate reminders at particular points in time through, for example, SMSs. But also access to consumer markets is important for the sustainability of improved technology adopted through agricultural extension, as in better integrated markets, returns to increased output diminish less rapidly than in locally segmented markets characterized by more price inelastic demand (Gabre-Madhin, Barrett, & Dorosh, 2002). The use of ICTs to obtain price information mentioned above may thus also affect technology adoption. There appears to be relatively less ICT-based initiatives that provide information on

agricultural practices and inputs, compared to those that disseminate information on prices, weather forecasts, or buyer and seller information.

Aker (2011) suggests this may be because such information is more nuanced and difficult to convey. To our knowledge, there are no studies as yet that investigate the effect of extension information delivered through ICTs on agricultural knowledge, practices and outcomes. Modern communication technologies like cell 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 cell 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 existing 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, cell 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 cell phones.

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: Ken Call Farmers Helpline, M-PESA etc. Ken Call 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 cell phones can provide economic benefits to consumers and producers in Sub-Saharan Africa (Aker, 2010). First, cell 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, cell phones create new jobs to address demand for cell phone-related services, thereby providing income generating opportunities in rural and urban areas. Fourth, cell phones can facilitate communication among social networks in response to shocks, thereby reducing households' exposure to risk.

Fafchamps and Minten (2012) investigated the impact of an SMS-based price dissemination service in India and found no effect on the price reportedly received. Courtois and Subervie (2015) found that price information disseminated through the well-known eSoko project resulted in a 10% increase in the price of maize and 8% increase in the price of groundnuts in Northern Ghana.

Cell 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).

Cell 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, cell phones can significantly reduce the costs of obtaining agricultural information. Cell 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 cell phones could increase farmers' access to information via their private sources, such as members of their social network (Bayes, et al., 2007).

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 (Davis, 1948). Manobi, in Senegal provides access to price data on various crops, collected from different markets across the country. Manobi personnel use cell phones to send the price data to the Manobi database using the wireless application protocol (WAP) (ITU, 2010).

Jensen (2007) showed that fishermen using cell phone to access to market information obtained higher prices. This also be effective to broadcast weather information. The Mozambique 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 20 designed and implemented, could be an effective medium to

strengthen agricultural advisory service along with the traditional way of technology dissemination.

A study of cell 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 cell phones in agriculture more specifically, Furuholt and Matotay (2011) assessed how farmers took advantage of cell phones throughout the farming cycle, they found that cell phones affected all stages of the cycle, including preparations, farming, harvesting and post-harvesting. Overall, farmers felt that cell phones help to raise incomes by improving their ability to deal with risks and take advantage of income opportunities.

Agricultural higher productivity is facilitated through effective dissemination of agricultural information to farmers. Bokor R.K (2005) Viewed agricultural information as agricultural messages via extension services embodied in agricultural technologies and shared between the actors in the agricultural extension system. Rashid A. T and Elder, L. (2009) Conceptualized agricultural information as information passed on to farmers through extension services primarily to help improve economic yield from farm produce and by extension the farmers' living condition

2.3 Relation between the Selected Characteristics of the Respondents and the Perceived Effectiveness of Cell phones

Age: Age of a respondent vary much influencing factors in case of ICTs as well as Cell phone uses. However, Sultana. S. M., (2017) found having no significant relationship between age extension worker with effectiveness of Krishoker Janala for Disseminating of Agricultural Information as perceived by the SAAOs.

Length of job experience: Austman (1961) found that professional experience had significant relation with information exposure. Bhatia (1975) found that the experience of Village Level Workers in the same blocks was positively related with their job effectiveness. This may be due to the fact that longer tenure in the same Blocks enables the VLW to better understand his clientele and the problem of the area. Akhouri (1973) reported that the positive relationship of information seeking behavior with work experience. He stated that those who have sufficient

experience of extension work are most efficient in information seeking. But Gholamreza and Zamani (2006) described that there is negative relationship between experience of extension work and information-seeking behavior of Iranian extension agents. Sultana. S. M., (2017) found having no significant relationship between job experience extension worker with effectiveness of KrishokerJanala for Disseminating of Agricultural Information as perceived by the SAAOs.

Extent of using Cell phone: Research conducted by Lio and Liu (2006) found strong correlation between the use of ICT and SAAOs productivity. They considered 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) expressed 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, 1999). 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 leads to higher perceived effectiveness. Sultana. S. M., (2017) found that positive significant contribution between ICTs use of extension worker with effectiveness of KrishokerJanala for Disseminating of Agricultural Information as perceived by the SAAOs.

Farmers coverage by SAAO: Number of farmers exist his/ her (SAAOs) block who are managed and received farm related information. If a SAAO need to manage a huge number of farmers, he/ she will not be able to manage properly at all. Unfortunately, no findings were noticed on this aspect to the researcher at the time of reviewing literature.

Training received on ICT and Agriculture: Pandey (1979) revealed that in-service training of extension personnel was significantly and positively correlated with information input process. This statement was also established by Ambastha (1974), Akhouri (1973) and Shete (1979) who reported that information processing had significantly positive correlation with output among the extension personnel. Rahman (2007) reported that the majority (38 percent) of the SAAOs had low in-service training compared to 36 and 26 percent having medium and high training respectively.

Complexity of using cell phone: The use of cell phones can be considered to have the potential to deliver relevant, innovative and useful farm information to farmers at much reduced costs. [7&8]. Cell phones are transforming the lives of many users in developing countries and are widely recognized as an important current and future technology platform for developing nations Mgbada, J.U., (2006). However, Sultana. S. M., (2017) found that positive non-significant relationship between Problem faced by SAAOs with effectiveness of KrishokerJanala for Disseminating of Agricultural Information.

Income beyond job: Rahman (1973) reported that expenditure of a personnel as well as income was positively related with behavior pattern towards in information receive and diffusion. Karim (1994) found a positive and significant relationship between expenditure and information behavior of extension workers.

2.4 The Conceptual Framework of the Study

In scientific research, selection and measurement of variables constitute an important task. Effectiveness of Cell phone for dissemination of agricultural information was the main focus of the study. In this study, seven selected factors like age, length of job experience, extent of using Cell phone, farmers coverage by SAAO, training received on ICT and agriculture, complexity of

using cell phone, income beyond Job and effectiveness of cell phone were considered which might positively contribute to SAAOs perceived effectiveness of Cell phone for disseminating agricultural information. The conceptual framework for this study is shown in Figure 2.1.

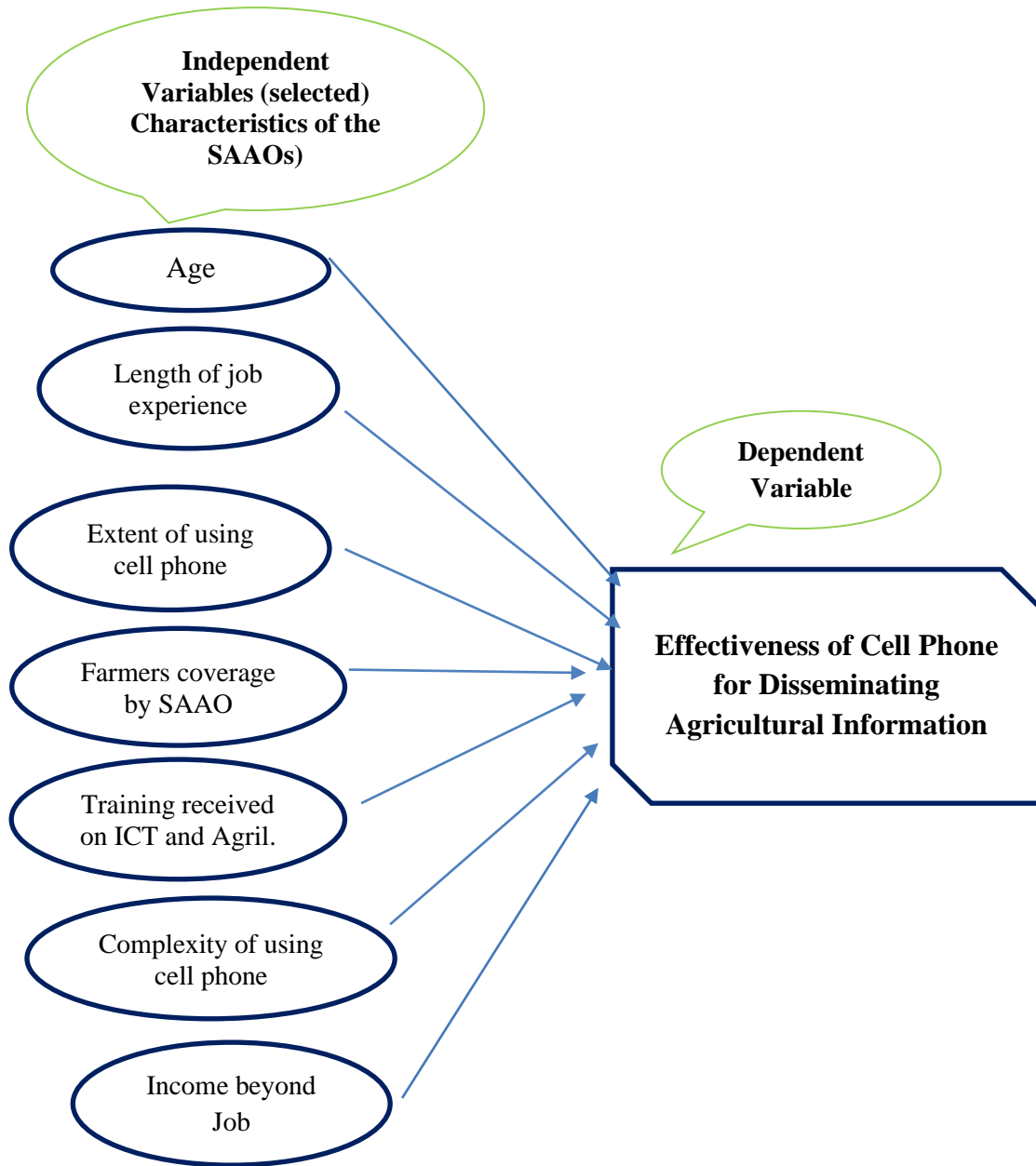


Figure 2.1 The Conceptual framework of the study

CHAPTER 3

METHODOLOGY

Methodology is the only way to collection and analysis of data in any scientific research. The researcher has great responsibility to clearly describe as to what sorts of research design, methods and procedures he would follow in collecting valid and reliable data and to analyses and interpret those to arrive at correct conclusion. Keeping this point in view, the researcher took utmost care for using proper methods in all the aspects of this piece of research work. So, the methods and procedures followed in conducting this study have been discussed in this Chapter. Further, the Chapter includes the operational format and comparative reflection of some variables used in the study. Also, statistical methods and their use have been mentioned in the later section of this Chapter.

3.1 Locale of the Study

Kushtia district of Khulna division was selected purposively as the area for this research work. There are six Upazilas in Kushtia district within which Kushtia Sadar, Bheramara and Mirpur, were purposefully selected due to easy communication and easy contact with the SAAOs who use cell phone in disseminating agricultural information. A map of three upazilas of Kushtia district showing the locale of the study have been presented in Figure 3.1.

3.2 Population and Sampling of the Study

The Sub-Assistant Agriculture Officers (SAAOs) of the selected upazilas were the population of the study. Three separated lists of the selected SAAOs were prepared with the help of Upazila Agricultural Officers of three Upazilas in Kushtia district. The total numbers of SAAOs in these three Upazilas were 94. Fifteen SAAOs were considered for pre-testing and the rest were selected as the sample of the study. Thus, the sample SAAOs were 79.



Figure 3.1 A map of Kushtia district showing study area

Table 3.1 Distribution of the population

Name of district	Name of upazilas	Population (No. of total SAAOs)	Sample (No of the SAAOs)	SAAOs for pre-testing
Kushtia	Kushtia sadar	38	32	6
	Bheramara	19	16	3
	Mirpur	37	31	6
Total		94	79	15

3.3 Instrument for Data Collection

In order to collect reliable and valid Information from the SAAOs, an interview schedule was prepared carefully keeping the objectives of the study in mind. The interview schedule contained both open and closed form questions. Appropriate schedule was also developed to operationalize the selected characteristics of the SAAOs. Pre-test with the draft interview schedule with 6 SAAOs was accomplished. Data was collected by face to face interviewing of the respondents. The duration for this imposes was from 25 March to 20 May, 2019. Based on the pre-test result, necessary corrections, modifications, addition, alternation were made in the interview schedule and then finalized it. This pre-test facilitated the researcher to examine the suitability of different questions and statements in general. The interview schedule may be seen at Appendix-A.

3.4 Measurement of Variables

A variable is any characteristic, which can assume varying, or different values in successive individual cases. An organized research usually contains at least two important variables, viz. an independent and a dependent variable. An independent variable is that factor which is maintained by the researcher in his attempt to ascertain its relationship to an observed phenomenon. A dependent variable is that factor which appears, disappears or varies as the researcher introduces, removes or varies the independent variable (Parvyn-Wamahiu, 2003). According to the relevant research area, the researcher selected seven (7) characteristics of the SAAOs as the independent variable and perceived effectiveness of Cell phone was dependent variables of the study.

3.5 Measurement of Independent Variables

The independent variables of the study were seven (7) selected characteristics of the SAAOs. These were age, length of job experience, extent of using Cell phone, farmers coverage by SAAO, training received on ICT and agriculture, complexity of using cell phone and income beyond job. The procedures followed in measuring the independent variables are briefly discussed below:

3.5.1 Age

Age of the respondents is one of the most important characteristics in understanding their views about the particular problems or complexity. Age of the respondents was measured in terms of actual years from their birth to the time of interview. It was measured in terms of actual years. No fraction of year was considered. A score of one (1) was assigned for each years of age. Age was placed in item number 1 of the interview schedule.

3.5.2 Length of job experience

Job experience was operationalized by counting the number of years a respondent actively involved in job. For each year, the score of the respondent was assigned by 1 and so on. Question regarding this variable appears in the item number 2 in the interview schedule (Shown in Appendix-A).

3.5.3 Extent of using Cell phone

Extent of Cell phone using means the frequency of using the following cell phone related items for receiving agriculture related information in the purposes of disseminating agricultural information. A unit score 1 was assigned for each hour / week of the SAAOs passing for gathering and disseminating agriculture related information. Question regarding this variable appears in the item number 3 in the interview schedule (Shown in Appendix-A).

3.5.4 Farmers coverage by SAAO

Farmers coverage by SAAO means the number of farmers exist his/ her (SAAOs) block who are managed and received farm related information. A unit score 1 was assigned for each farmer of

the block. Question regarding this variable appears in the item number 4 in the interview schedule (Shown in Appendix-A).

3.5.5 Training received on ICT and Agriculture

Training on ICT and Agriculture indicates the depth of knowledge of a respondent. This refers to the days of training which an individual received during his service carrier pertaining to his job. Each training was given attention by considering its duration in days. The scores obtained in respect of all the training received by an individual respondent which were measured in days. A score of 1 was given for each days of training. Question regarding this variable appears in the item number 5 in the interview schedule (Shown in Appendix-A).

3.5.6 Complexity of using cell phone

It was measured by using a four-point rating scale. A list of three probable that SAAOs could face in different aspects were listed and asked to indicate the extent of their complexity confrontation. For each complexity score of 3, 2, 1 and 0 were assigned to indicate extent of complexity as high, moderate, low and not at all respectively. Question regarding this variable appears in the item number 6 in the interview schedule (Shown in Appendix-A). The complexity confrontation score was computed for each respondent by adding his /her scores for all the three complexity. The possible range of complexity scores thus could be 0 and 9. A total score of 9 indicated highest complexity in respect of use of Cell phone while a score of 0 indicated no complexity.

To ascertain the comparison among the complexity a Complexity Faced Index (CFI) was computed using the following formula:

$$CFI = C_h * 3 + C_m * 2 + C_l * 1 + C_n * 0$$

Where,

CFI = Complexity Faced Index

C_h = Number of SAAOs faced high complexity

C_m = Number of SAAOs faced moderate complexity

C_l = Number of SAAOs faced low complexity

C_n = Number of SAAOs faced no complexity at all complexity.

Thus, CFI of an item could range from 0 to 237, where ‘0’ indicated no complexity at all and ‘237’ indicated high complexity faced by the SAAOs in using Cell phone.

3.5.7 Income beyond Job

Income beyond Job referred to the total earnings of a respondent from agricultural and non-agricultural sources (business, farming, etc.) except service during the previous year. Income beyond Job was expressed in '000' taka. Question regarding this variable appears in the item no. 7 in the interview schedule (Shown in Appendix-A).

3.6 Measurement of Dependent Variable

Effectiveness of Cell phone was the dependent variable of this study. Effectiveness of ‘Cell phone’ was measured on the basis of opinion provided by the SAAOs regarding the extent of effectiveness of Cell phone for disseminating agricultural information. A variety of agro based information such as information on weather, market, pest control, subsidy, etc. were collected through literature survey. Later four-point scales namely “highly effective”, “effective”, “low effective”, and “not at all effective” were used to measure the extent of effectiveness of Cell phone for disseminating agricultural information perceived by the SAAOs.

Extent of effectiveness	Score
Highly effective	3
Effective	2
Low effective	1
Not effective	0

The effectiveness score of a respondent was obtained by adding the scores from all selected items and it could range from 0 to 30, where ‘0’ indicates no perceived effectiveness of Cell phone for disseminating agricultural information and ‘30’ indicates highest effectiveness of Cell phone for disseminating agricultural information as perceived by the SAAOs.

3.7 Statement of Hypothesis

A set of hypotheses was formulated for empirical testing. The following null hypothesis was formulated to test the relationship of 7 independent variables with effectiveness of cell phone for disseminating agricultural information. “There is no contribution as the regression analysis done of each of the independent variables to the effectiveness of cell phone for disseminating of agricultural information as perceived by the SAAOs.”

3.8 Data Processing

3.8.1 Editing

The collected raw data were examined thoroughly to detect errors and omissions. As a matter of fact, the researcher made a careful scrutiny of the completed interview schedule to make sure that necessary data were entered as complete as possible and well arranged to facilitate coding and tabulation. Very minor mistakes were detected by doing this, which were corrected promptly.

3.8.2 Coding and tabulation

Having consulted with the research supervisor and co-supervisor, the investigator prepared a detailed coding plan. In case of qualitative data, suitable scoring techniques were followed by putting proper weight age against each of the traits to transform the data into quantitative forms. These were then tabulated in accordance with the objective of the study.

3.8.3 Categorization of data

Following coding operation, the collected raw data as well as the respondents were classified into various categories to facilitate the description of variables. These categories were developed for each of the variables by considering the nature of distribution of the data and extensive literature review. The procedures for categorization have been discussed while describing the variables under consideration in chapter IV.

3.9 Statistical Analysis

Data collected from the respondents were analyzed and interpreted in accordance with the objectives of the study. The analysis of data was performed using statistical treatment with SPSS (Statistical Package for Social Science) computer program.

Data were analyzed accordingly to the research objectives such as range, mean, and standard deviation were used for describing the variables. Multiple regression analysis was run to determine the contribution of the selected factors to effectiveness of Cell phone for disseminating agricultural information. The analysis of data was performed using statistical treatment with SPSS (Statistical Package for Social Sciences). Throughout the study 5% level of significance were used to test the significance level of each hypothesis. If the computed value of ' β ' was equal to or greater than the designated level of significance, than the hypothesis was rejected and it was concluded that there was a significant contribution of the independent variables to the dependent variable. If the computed value of ' β ' was smaller than the designated level of significance than the hypothesis was accepted and it was concluded that there was no contribution of the independent variables to the dependent variable.

CHAPTER IV

FINDINGS AND DISCUSSION

This chapter deals with the result and discussion of present research work. Necessary explanations and appropriate interpretations have also been made showing possible and logical basis of the findings. The **first** section deals with the selected characteristics of the SAAOs. The **second** section deals with the extent of the effectiveness of cell phone for disseminating agricultural information. The third section describes the contribution of the factors (selected characteristics of SAAOs) to the effectiveness of Cell phone. However, for convenience of the discussions, the findings are systematically presented in the following sections.

4.1 Socio-economic profile of the SAAOs

Seven (07) characteristics of the respondents were selected for the study which are:

- Age,
- Length of job experience,
- Extent of using Cell phone,
- Farmers coverage by SAAOs,
- Training received on ICT and Agriculture,
- Complexity of using Cell phone,
- Income beyond job.

These characteristics of the SAAOs are described in this section which focused the as respondents' socio-economic profile.

Table 4.1 Salient features of the selected characteristics of respondents

Categories	Measuring unit	Range		Mean	SD
		Possible	Observed		
Age	Actual years	Unknown	30 – 54	39.94	4.89
Length of job experience	Years of profession as SAAO	Unknown	6 – 31	12.62	4.94
Extent of using cell phone	Number of hours passing	Unknown	7 – 16	11.32	3.25
Farmers coverage by SAAO	Number of farmers in the block	Unknown	8.50 – 16	11.66	2.51
Training received on ICT and Agriculture	Number of days	Unknown	6 – 15	9.71	2.01
Complexity of using cell phone	Score	0 - 9	1 – 8	4.47	2.41
Income beyond Job	‘000’BDT	Unknown	0.00 – 150	47.81	46.11

1. Age

The observed age of the respondents ranged from 30 to 54 years, the average being 39.94 and the standard deviation was 4.89. On the basis of their age, the respondents were classified into three categories considering National Youth Policy: “young” (up to 35 years), “middle aged” (36 - 50 years) and “old” (above 50 years). The distribution of the respondents according to their age was shown in Table 4.2.

Table 4.2 Distribution of the respondents according to their age

Categories	Basis of categorization (years)	Respondents	
		Number	Percent
Young aged	≤ 35	12	15.2
Middle aged	36 – 50	64	81.0
Old aged	Above 50	3	3.8
Total		79	100

Data contained in Table 4.2 indicated that the highest proportion (81.0 percent) of the SAAOs were in middle aged category while 3.8 percent and 15.2 percent belonged to old aged and young aged categories respectively. The data in the table also showed there was a good combination of young and middle aged SAAOs of the organization. Data revealed that most of the respondents in the study area were middle aged. It might be due to the middle-aged respondents comparatively give more preference to agricultural activities than the young and old aged respondents.

2. Length of Job experience

The length of job experience score of the respondents ranged from 6 to 31. The mean score was 12.62 with the standard deviation 4.94. On the basis of job experience, the respondents were classified into three categories namely, ‘low experience’, ‘medium experience’ and ‘high experience’ as shown in Table 4.3.

Table 4.3 Distribution of respondents according to their length of job experience

Categories	Basis of categorization (years)	Respondents	
		Number	Percent
Low experience	≤ 7	10	12.7
Medium experience	8 – 17	59	74.6
High experience	Above 17	10	12.7
Total		79	100

Data contained in the Table 4.8 revealed that the majority (74.6%) of the respondents had medium job experience as compared to 12.7% and 12.7% having low and high job experience respectively. With the increase of experience, SAAOs become more equipped with job related information and as a result they pine less training as well as faces less problem in their job.

3. Extent of using Cell phone

The observed extent of using Cell phone for work scores of the respondents ranged from 7 to 16 hours per week. The average extent of Cell phone use for work was 11.32 and the standard deviation was 3.25. The respondents were classified into three categories based on their extent of Cell phone use for work as shown in Table 4.4.

Table 4.4 Distribution of respondents according to their use of Cell phone

Categories	Basis of categorization (years)	Respondents	
		Number	Percent
Low	≤ 8	25	31.6
Medium	9 – 14	37	46.9
High	Above 14	17	21.5
Total		79	100

Data in Table 4.4 reveals that Cell phone use is medium by most of the respondents (46.9%) while 21.5% of the respondents used cell phone highly for various purposes. Around 31.6% of the respondent had low use of Cell phone. It is argued that SAAOs possessing cell phone for a long time have better skills of various operations i.e. making calls, SMS and internet-based cell phone and hence increases the cell phone adoption and use for agricultural purposes. In this regard, respondents' cell phone use related attributes like possession duration and aptitude of its use were initially assessed.

4. Farmers coverage by SAAO

The farmers' coverage by SAAO score of the respondents ranged from 8.50 to 16. The mean score was 11.66 with the standard deviation 2.51. On the basis of farmers' coverage by SAAO, the respondents were classified into three categories (Mean \pm Standard Deviation) namely, 'less coverage', 'medium coverage' and 'high coverage' as shown in Table 4.5.

Table 4.5 Distribution of respondents according to their farmers' coverage

Categories	Basis of categorization (Farmers number)	Respondents	
		Number	Percent
Less	≤ 9	13	16.5
Medium	9.01 – 14	49	62.00
High	Above 14	17	21.5
Total		79	100

Data contained in the Table 4.5 revealed that the majority (62%) of the respondents had medium farmers' coverage as compared to 16.5% and 21.5% having low and high farmers coverage by SAAOs respectively. The SAAOs' perceptions regarding the benefits of cell phone use were a number of various benefits of cell phone use in accessing farm related information. More use of cell phone by SAAOs, enhance opportunity to communicate a huge number of vendors with short time with minimal effort especially pandemic or adverse situation.

5. Training received on ICT and Agriculture

Training received score of the SAAOs ranged from 6 to 15 with a mean and standard deviation of 10.96 and 5.62, respectively. Based on the training received score, the respondents were classified into three categories (Mean \pm Standard Deviation) namely 'no training', 'low', 'medium' and 'high' training exposure. The distribution of the SAAOs according to their training received is presented in Table 4.6.

Table 4.6 Distribution of the farmers according to their training received

Categories	Basis of categorization (days)	Respondents	
		Number	Percent
Low training	≤ 7	7	8.9
Medium training	8 – 12	62	78.5
High training	Above 12	10	12.6
Total		79	100

Table 4.8 indicates that the highest proportion (78.5%) of the respondents had medium training received compared to 12.6% in high training received and 8.9% in low training received category, respectively. Training makes the SAAOs skilled and helps them to acquire deep knowledge about the respected aspects. Trained respondents can face any kind of challenges about the adverse situation in their daily activities with appropriately.

6. Complexity of using Cell phone

Complexity of using Cell phone score of the respondents ranged from 1 to 8 against the possible range 0-9. The mean score was 4.47 with the standard deviation 2.41. On the basis of complexity faced in using Cell phone, the respondents were classified into three categories (Mean \pm Standard Deviation) namely ‘low complexity’, ‘medium complexity’ and ‘high complexity’, as shown in Table 4.7.

Table 4.7 Distribution of the respondents according to their complexity in using of Cell phone

Categories	Basis of categorization (score)	Respondents	
		Number	Percent
Low complexity	≤ 2	27	34.2
Medium complexity	3 – 6	28	35.4
High complexity	Above 6	24	30.4
Total		79	100

Data contained in the Table 4.7 revealed that the majority (35.4%) of the respondents faced medium complexity in using Cell phone as compared to 30.4% and 34.2% high and low complexity in using Cell phone respectively. Respondents reported two major constraints to attain the successful utilization of cell phone for agricultural purposes. These constraints included problems in understanding the information during network failure and high internet pack price in the study area.

7. Income beyond Job

The income beyond job of the respondents ranged from 0.00-150 thousand taka with a mean of 47.81 and standard deviation of 46.11. On the basis of income beyond job the respondents were classified into three categories as shown in Table 4.8

Table 4.8 Distribution of the respondents according to their income beyond job

Categories	Basis of categorization ('000' BDT)	Respondents	
		Number	Percent
Low income	≤ 25.00	37	46.8
Medium income	25.01 – 70.5	33	41.8
High income	Above 70.5	9	11.4
Total		79	100

Data presented in Table 4.8 indicates that highest proportion (46.8%) of the SAAOs had low annual income beyond job compared to 41.8% had medium and 11.4% had high annual income beyond job. If an individual's annual expenditure is less than his income, then he/she can devote himself/herself to his/her duties and responsibilities, otherwise he/she have to make room for extra job-related activities to meet up his/her extra expenditure.

4.2 Effectiveness of Cell phone

The observed effectiveness of Cell phone scores of the respondents ranged from 15 to 25 against the possible range 0-30. The average perceived effectiveness of Cell phone was 19.66 and the standard deviation was 2.68. The respondents were classified into three categories based on their perceived effectiveness of Cell phone (Mean \pm Standard Deviation) shown in Table 4.9.

Table 4.9 Distribution of the respondents according to their perceived effectiveness of Cell phone

Categories	Basis of categorization (score)	Respondents	
		Number	Percent
Less effective	≤ 17	18	22.8
Medium effective	17 – 22	48	60.8
High effective	Above 22	13	16.4
Total		79	100

Data in Table 4.9 reveals that majority (60.8%) of the respondents reported 'Cell phone' was medium effective while 16.4% and 22.8% of them respectively perceived it as high and less effective as a medium for disseminating agricultural information.

4.3 The Contribution of the selected characteristics of the respondents to their perceived Effectiveness of Cell phone for Disseminating of Agricultural Information

In order to estimate the contribution of the selected characteristics of the SAAOs to their perception on the effectiveness of Cell phone for disseminating of agricultural information, the multiple regression analysis was used as shown in the Table 4.10.

Table 4.10 Multiple regression coefficients of the contributing variables related to effectiveness of Cell phone for disseminating of agricultural information

Dependent variable	Independent Variable	β	P	R^2	Adj. R^2	F
Effectiveness of cell phone for Disseminating of Agricultural Information as perceived by the SAAOs	Age	.015	0.905	0.783	0.761	36.564
	Length of job experience	-0.096	0.428			
	Extent of using Cell phone	0.360	0.010*			
	Farmers coverage by SAAO	0.240	0.023*			
	Training received on ICT and Agriculture	-0.043	0.598			
	Complexity of using Cell phone	-0.319	0.017*			
	Income beyond Job	0.000	0.994			

*Significant at $p < 0.05$

Among the seven hypothesized variables, three (3) variables namely extent of Cell phone use, farmers coverage by SAAO and Complexity of using Cell phone had significant contribution to effectiveness of Cell phone for disseminating of agricultural information (Table 4.10) while rest of the variables had no significant contribution. All the factors jointly contribute 78.3% of the variance of the adoption ($R^2 = 0.783$). Each predictor may explain some of the variance in respondents' perceived effectiveness of Cell phone for disseminating of agricultural information simply by chance. The adjusted R^2 value (0.761) penalizes the addition of extraneous predictors in the model, but values of 0.761 still show that the variance in respondents' perceived effectiveness of Cell phone for disseminating of agricultural information can be attributed to the predictor variables rather than by chance, and that both are suitable model (Table 4.10). In

summary, the model suggests that the respective authority should consider the respondents extent of Cell phone use, farmers coverage by SAAO and complexity of using Cell phone.

4.3.1 Contribution of extent of using Cell phone for disseminating of agricultural information

The contribution of Extent of using Cell phone of the SAAOs to their perceived effectiveness of Cell phone for disseminating of agricultural information was determined by testing the following null hypothesis “There is no contribution of extent of using Cell phone for work to their effectiveness of Cell phone for disseminating of agricultural information”.

The following observations were made on the basis of the value of ‘b’ the concerned variable of the study under consideration:

- a. The contribution of extent of using Cell phone ($b=0.360$) was significance at 5% level.
- b. So, the null hypothesis could be rejected.
- c. So, it can be stated that if the use of Cell phone to there is increased by 0.360 unit, use of effectiveness of Cell phone for disseminating of agricultural information increased by one (1) unit, considering the effects of all other predictors are held constant.

Based on the above finding, it can be said that more use of Cell phone increased the effectiveness of Cell phone for disseminating of agricultural information.

4.3.2 Contribution of Farmers coverage by SAAO for disseminating of agricultural information

The contribution of farmers coverage by SAAO to their perceived effectiveness of Cell phone for disseminating of agricultural information was determined by testing the following null hypothesis “There is no contribution of Farmers coverage by SAAO to their effectiveness of Cell phone for disseminating of agricultural information”.

The following observations were made on the basis of the value of ‘b’ the concerned variable of the study under consideration:

- a. The contribution of farmers coverage by SAAO ($b=.240$) was significance at 5% level.
- b. So, the null hypothesis could be rejected.

c. So, it can be stated that if the use of Cell phone to there is increased for farmers coverage by 0.240 unit, use of effectiveness of Cell phone for disseminating of agricultural information increased by one (1) unit, considering the effects of all other predictors are held constant.

Based on the above finding, it can be said that more use of Cell phone increased the farmers' coverage with effective disseminating of agricultural information.

4.3.3 Contribution of complexity of using Cell phone for disseminating of agricultural information

The contribution of complexity of using Cell phone of the SAAOs to their perceived effectiveness of Cell phone for disseminating of agricultural information was determined by testing the following null hypothesis "There is no contribution of complexity of using Cell phone for work to their effectiveness of Cell phone for disseminating of agricultural information".

The following observations were made on the basis of the value of 'b' the concerned variable of the study under consideration:

a. The contribution of complexity of using Cell phone use ($b = -0.319$) was significance at 5% level.

b. So, the null hypothesis could be rejected.

c. So, it can be stated that if the complexity of using Cell phone to there is decreased by -0.319 unit, use of effectiveness of Cell phone for disseminating of agricultural information increased by one (1) unit, considering the effects of all other predictors are held constant.

Based on the above finding, it can be said that less complexity of using Cell phone increased the effectiveness of Cell phone for disseminating of agricultural information.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Major findings

5.1.1 Characteristics of the respondents

Age: Highest proportion (81%) of the respondents was under middle aged category compared to 15.2% young and 3.8% old aged.

Length of job experience: The highest proportion (74.6%) of the SAAOs' had medium experience compared to 12.7% had low experience and 12.7% had high experience in extension work.

Extent of using Cell phone: The observed use of Cell phone scores of the respondents ranged from 7 to 16. The average use of Cell phone was 11.32 and the standard deviation was 3.25. The majority of the respondents fell into medium (46.9%) category while 31.6% of the respondents had low use of Cell phone where as 21.5% of the respondent had high use of Cell phone.

Farmers' coverage by SAAO: The highest proportion (62%) of the SAAOs' had medium farmers' coverage compared to 16.5% had low farmers' coverage and 21.5% had high farmers' coverage.

Training received on ICT and Agriculture: Training received score of the SAAOs ranged from 6 to 15 with a mean and standard deviation of 11.66 and 2.51 respectively. The majority of the respondents fell into medium (78.5%) category while 12.6% and 8.9% of the respondents had high and low received of training on ICT and agriculture.

Complexity of using cell phone: The majority (35.4%) of the respondents had medium complexity of using Cell phone as compared to (30.4%) and (34.2%) had high and low complexity of using Cell phone respectively.

Income beyond Job: Annual family income from agriculture, livestock, poultry, fishery, business and others score except services of the respondents ranged from 0.00 to 150 thousand taka with the average of taka 47.81. The highest proportion (46.8%) of the respondents had low income beyond job while 41.8% had medium income and 11.4% had high income beyond job.

5.1.2 Effectiveness of Cell phone for Disseminating of Agricultural Information

The observed effectiveness of Cell phone scores of the respondents ranged from 15 to 25. The average perceived effectiveness of Cell phone was 19.66 and the standard deviation was 2.68. The majority (60.8%) of the respondents reported 'Cell phone' was medium effective while 16.4 percent and 22.8 percent of them respectively found it as highly and less effective as a medium for disseminating agricultural information.

5.1.3 Contribution of the selected characteristics of the respondents to their perceived effectiveness of Cell phone for disseminating of agricultural information

Extent of using Cell phone, farmers coverage by SAAOs and complexity of using Cell phone had significant contribution to effectiveness of Cell phone for disseminating of agricultural information, while rest of the variables showed no significant contribution.

5.2 Conclusions

Conclusions drawn on the basis of the findings of this study and their logical interpretation in the light of the other relevant factors are furnished below: (60.8 %) of the respondents reported 'Cell phone' was moderately effective, while 16.4 percent and 22.8 percent of them respectively found it as highly and less effective as a medium for disseminating agricultural information. Therefore, it may be concluded that effectiveness of Cell phone for disseminating agricultural information was moderate in this area.

- i. Majority (78.5%) of the respondents belonged low to medium level of use of Cell phone. So there have scope to take initiative for increasing the use of cell phone by the SAAOs in disseminating agricultural information.
- ii. There was a positive significant contribution of the use of Cell phone to the effectiveness of Cell phone for disseminating agricultural information. Therefore, it may be concluded

that, SAAOs having more use of Cell phone perceived more effectiveness of Cell phone for disseminating more agricultural information.

- iii. Majority (78.5%) of the SAAOs belonged to low to medium farmers' coverage. Farmers' coverage of the SAAOs had significant positive contribution with their effectiveness of Cell phone for disseminating of agricultural information. Therefore, it may be concluded that, SAAOs having more use of Cell phone perceived more coverage of farmers within short times for disseminating more agricultural information appropriately and efficiently.
- iv. Overwhelming majority (65.8%) of the SAAOs belonged to medium to high complexity in using Cell phone. Complexity of using Cell phone of the SAAOs had significant negative contribution with their effectiveness of Cell phone for disseminating of agricultural information. Therefore, it may be concluded that if SAAOs faced less complexity in using Cell phone, ensure more coverage of farmers within short times for disseminating more agricultural information appropriately and efficiently.

5.3 Recommendations

5.3.1 Recommendations for policy implications

Based on the major findings of this study, the following recommendations are put forwarded.

- i. Most of the respondents perceived moderate effectiveness of Cell phone for disseminating agricultural information. Therefore, attempts should be made by the concerned authorities to increase the effectiveness of Cell phone for disseminating of agricultural information by increasing its quality and use.
- ii. The extent of using Cell phone had a significant contribution on perceived effectiveness of Cell phone for disseminating of agricultural information. Therefore, it may be recommended that steps should be taken by the concerned authorities to increase the use of ICT as well as Cell phone by extending motivational campaigns and trainings.
- iii. The complexity of using Cell phone had a significant negative contribution on perceived effectiveness of Cell phone for disseminating of agricultural information. Therefore, it may be recommended that attempts should be taken by the concerned authorities to reduce complexities of Cell phone through developing network system and ensure low cost for internet pack. However, cell phone with GPRS should be supplied.

- iv. In the study, length of job experience and training received on ICT and agriculture have great influence on agricultural information dissemination. Within farm society. It may be recommended that agricultural extension agencies especially the DAE and relevant NGOs should critically review their training programs and make sound provisions so that the SAAOs understand the benefits of multifarious use of ICTs. The DAE and other non-governmental organizations should strengthen their extension programs with serve job incentives.

5.3.2 Recommendations for further study

This study investigated perceived effectiveness of Cell phone for disseminating of agricultural information. A small and limited research has been conducted in the present study cannot provide much information related to this aspect. Further studies should be undertaken to cover more information in the relevant matters. So, the following recommendations were put forward for further research:

- i. It is difficult to perceived effectiveness of Cell phone for disseminating of agricultural information. Measurement of effectiveness of Cell phone for disseminating of agricultural information was measured by the perception of the SAAOs in this study. More reliable measurement of concerned variables may be used for further study.
- ii. The present study was conducted only in three upazilas of kushtia district. Findings of the study need further verification through similar research in other parts of the country.
- iii. The study investigated the contribution of seven characteristics of the SAAOs to their perceived effectiveness of Cell phone for disseminating of agricultural information. So, it is recommended that further study would be conducted with other characteristics of the SAAOs.
- iv. Research should be undertaken to measure the effectiveness of Cell phone for disseminating of agricultural information by using the perception of farmers.

REFERENCES

- Aker, J. C., & Mbiti, I. M. 2010. Mobile phones and economic development in Africa. *Journal of Economic Perspectives*, 24(3), 207–232.
- Aker, J. C. 2010. Information from markets near and far: Mobile phones and agricultural markets in Niger. *American Economic Journal: Applied Economics*, 2(3), 46–59.
- Aker, J. C. 2010. “Dial ‘A’ for Agriculture: Using Information and Communication Technologies for Agricultural Extension in Developing Countries.” Tuft University, Economics Department and Fletcher School, Medford MA02155.
- Aker, J.C. 2011. Dial ‘A’ for Agriculture: Using Information and Communication Technologies for Agricultural Extension in Developing Countries, Washington D.C. Centre for Global Development.
- Aker, J. C., & Fafchamps, M. 2015. Mobile phone coverage and producer markets: Evidence from West Africa. *World Bank Economic Review*, 29(2), 262–292.
- Anderson, J. R., & Feder, G. 2004. Agricultural extension: Good intentions and hard realities. *World Bank Research Observer*, 19(1), 41–60.
- Ashenfelter, O. and Card, D. 1985. Using the longitudinal structure of earnings to estimate the effect of training programs. *Review of Economics and Statistics*, 67: 648-660
- Aydemir, 2005. Addressing the information needs of farmers and the extension services: the Malaysia Experiment *Quarterly Bulletin of IAALD*. 36(1-2):36- 39.
- Balaji, V., Meera, S. N. and Dixit, X. 2007. ICT-enabled knowledge sharing in support of extension: Addressing the agrarian challenges of the developing world threatened by climate change, with a case study of India. *SAT eJournal4* (1):18.

- Bayes, A., J. Von Braun, and R. Akhter, 1999. Village pay phones and poverty reduction: Insight from a Grameen Bank Initiative in Bangladesh, Bonn: Center for Development Research, University of Bonn.
- Baye, et. al., 2007. "Information, Search and Price Dispersion." Handbook on Economics and Information Systems.
- Bertolini. R. 2004. Making ICTs work for food security. 2020 Africa Conference Brief 11. International Food Policy Research Institute. Churi et.al; 2012 discovered that Majority of farmers possess mobile phones which are cheap and easy to use; as a result they are able to make calls to input suppliers, extension workers and other agricultural stakeholders.
- Birkhaeuser, D., Evenson, R. E., and Feder, G. 1991. The economic impact of agricultural extension: A review. *Economic Development and Cultural Change*, 39: 607-650
- Bokor R.K (2005). Agricultural Extension: It's Role in National Development. Feature article in *Modern Ghana*". Retrieved from www.modernghana.com/news/118522/1/a on. 17 November, 2015
- Bonger, E. Gabre-Madhin, & S. Babu (Eds.), *Agriculture technology diffusion and price policy* (pp. 3–33). Washington, DC: Ethiopian Development Research Institute and the International Food Policy Research Institute.
- BTRC. (2020). The Bangladesh Telecommunication Regulatory Commission, Statistic Division, Ministry of Post and Telecommunication, Government of the People's Republic of Bangladesh, Dhaka.
- Cash, D. W. 2001. In order to aid in diffusing useful and practical information: Agricultural extension and boundary organizations. *Science Technology and Human Values*, 26, 431-453

- Churi, A.J., Mlozi, M.R.S., Tumbo, S.D. and Casmir, R. 2012. Understanding farmers information communication strategies for managing climate risks in rural semi-arid areas, Tanzania. *International Journal of Information and Communication Technology Research* 2 (11):842.
- Courtois, P., &Subervie, J. 2015. Farmer bargaining power and market information services. *American Journal of Agricultural Economics*, 97(3), 953–977.
- Cullen, 2003. Effectiveness of TV and its Combination in Transferring Technologies. *Indian Journal of Extension Education*. 15 (L&2): Pp 9-18.
- Davenport, T. and L. Prusak, 1998. *Working Knowledge: How Organizations Manage What They Know*. Cambridge, MA: Harvard Business School Press.
- Davis, K. (1948). *The Human Society*. New York: Macmillan. Dercon, S. 2002. Income risk, coping strategies and safety nets. *World Bank Research Observer*, 17 (2), 141–166.
- De Janvry, A., Fafchamps, M., &Sadoulet, E. 1991. Peasant household behaviour with missing markets: Some paradoxes explained. *Economic Journal*, 101(409), 1400–1417.
- De Silva and Zainuddin, 2007. *Sub-Saharan Africa*. In R. Saravanan, Ed. *ICTs for agricultural extension: Global experiments, innovations and experiences*. New Delhi: New India Publishing Agency.
- Demiryurek, K., Erdem, H., Ceyhan, V., Atasever, S., and Uysal, O. 2008. Agricultural Information Systems and Communication networks: The case of dairy farmers in the Samsun Province of Turkey. *Information Research*, 13(2).
- Duflo, E., Kremer, M., & Robinson, J. 2008. How high are rates of return to fertilizer? Evidence from field experiments in Kenya. *American Economic Review*, 98(2), 482–488.

- Ekbia, H. R. and Evans, T. P. 2009. Regimes of information: Land use, management, and policy. *The Information Society*, 25(5) 328-343
- Fafchamps, M., & Hill, R. V. 2008. Price transmission and trader entry in domestic commodity markets. *Economic Development and Cultural Change*, 56(4), 729–766.
- Fafchamps, M., & Minten, B. 2012. Impact of SMS-based agricultural information on Indian farmers. *World Bank Economic Review*, 26(3), 383–414.
- Foster, A. D., & Rosenzweig, M. R. 2010. Microeconomics of technology adoption. *Annual Review of Economics*, 2, 395–424.
- Futch, M. D., & McIntosh, C. T. 2009. Tracking the introduction of the village phone product in Rwanda. *Information Technology and International Development*, 5(3), 54–81.
- Furuholt, B. and E. Matotay, 2011. The Developmental Contribution from Mobile Phones Across the Agricultural Value Chain in Rural Africa. *The Electronic Journal on Information Systems in Developing Countries*, 48(7): 1–16.
- Gakuru, M., K. Winters, and F. Stepman, 2009. Inventory of Innovative Farmer Advisory Services using ICTs. *The Forum for Agricultural Research in Africa (FARA)*.
- Goodman, J., 2005. Linking mobile phone ownership and use to social capital in rural South Africa and Tanzania. In *Africa: The Impact of Mobile Phones*. The Vodafone Policy Paper Series No.3. Berkshire: Vodafone Group, Pp 53–66.
- Gabre-Madhin, E., Barrett, C. B., & Dorosh, P. 2002. Technological change and price effects in agriculture: conceptual and comparative perspectives.

- Galloway, L. and Mochrie, R. 2005. The use of ICT in rural firms: A policy orientated literature review. *The Journal of Policy, Regulation and Strategy for Telecommunications*, (7): 33-46
- Goyal, A. 2010. Information, direct access to farmers, and rural market performance in Central India. *American Economic Journal: Applied Economics*, 2, 22–45.
- Heeks, 1999. Gender, ICTs and Agriculture. A Situation Analysis for the Consultative Expert Meeting of CTA's ICT Observatory meeting on Gender and Agriculture in the Information Society.
- Herman, J. B. 1973. "Are Situational Contingencies Limiting Job Attitude-Job Performance Relationship?" *Organizational Behavior and Human Performance*. 10: 208-224.
- Herselman, M. E. 2003. ICT in rural areas in South Africa: Various case studies. In *Proceedings of Informing Science + Information Technology Education Joint Conference*, 945-955
- International Rice Research Institute (IRRI). 2011. "Higher Rice Production a Phone Call away for Filipino Farmers".
- Islam, F. 2010. Institutionalization of agricultural knowledge Management system for Digital Marginalized Rural Farming Community, ISDA. Montpellier, France. ITU. 2010. *World Telecommunication/ICT Development Report. Monitoring The WSIS Targets. A mid-term review*. International Telecommunication Union (ITU), Geneva, Switzerland.
- Islam, A. and Islam, M. 2008. Community information services in Bangladesh: A case study on community information Centre (CIC). *Library Herald, Journal of the Delhi Library Association*, 46(4): 225-280

- Jensen, R., 2007. The Digital Divide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector. *The Quarterly Journal of Economics*, 122(3):879 –924.
- Kaini B.R. 2007. Roles of information and Communication Technologies (ICTs) to Alleviate Poverty through Agricultural Development: ICTs Initiatives in Agricultural Research and Extension System. *ICT for Agricultural Research and Development*. Pp 67-77.
- Katalyst. 2011. Media Behavior of the poor. Katalyst, Dhaka.
- Kiplang'at, J. 1999. An analysis of the opportunities for information technology in improving access, transfer and the use of agricultural information in the rural areas in Kenya, *Library Management*, 20(2):115-127
- Kirlidog, 2005. Relative Value of Mass Media in Extension (4ba). Master Report (M. Ed. In Ext. Ed.). Colorado State University.
- Lanham, E. (1955). *Job Evaluation*. New York: McGraw-Hill Book Inc. Lawler, E.E. and L.W. Porter. (1968). The Effect of Performance on Job Satisfaction, *Industrial Relations*, 7:20-28.
- Lio, M. and Liu, M. (2006). "ICT and Agricultural Productivity: Evidence from Cross-Country Data", *Agricultural Economics*, Vol. 34, Pp. 221-228
- Lucky, A.T. 2012. Department of Library and Information Science, Ahmadu Bello University, Zaria, Kaduna State, Nigeria.
- Mahboob, S.G., G.Rasul, M.S.Alam and M.M.Islam.(1978). A Study of Union Assistants in Bangladesh, Dept.of Agricultural Extension & Teachers' Training, BAU, Mymensingh.

- Mannan, S. M. and Bose, M. L. 1998. Resource sharing and information networking of libraries in Bangladesh: a study on user satisfaction. *Malaysian Journal of Library & Information Science*, 3(2): 67-86
- Martiz, J. 2011. How mobile phones are transforming African Agriculture. *Agri4Africa*. Meera, et. al., 2004. *Information and Communication Technology in Agricultural Development: A Comparative Analysis of Three Projects from India*. Agricultural Research & Extension Network.
- Mgbada, J.U., (2006). Effectiveness of information sources on improved farming practices to Women farmers in Enugu State, Nigeria. *Global Approaches to Extension Practice*, 2(1).
- Mutula, 2005. 'I Don't Trust the Phone; It Always Lies': Trust and Information and Communication Technologies in Tanzanian Micro and Small Enterprises. *Information Technologies and International Development*, 3(4): 67–83.
- Nakasone, E., Torero, M., & Minten, B. 2014. The power of information: The ICT revolution in agricultural development. *Annual Review of Resource Economics*, 6, 533–550.
- Nikam et. al., 2004. Sustainable development starts with agriculture, In: *Sustainable solutions. The action report of the sustainable agriculture initiative*. Novello Press Ltd., London. UK. Pp 8-11.
- Ommani, A. R. and Chizari, M. 2008. Information dissemination system (IDS) based elearning in agricultural of Iran (perception of Iranian extension agents). *World Academy of Science, Engineering and Technology*, 38:468-472.
- Opara, U. N. 2008. Agricultural Information sources used by farmers in Imo State, Nigeria. *Information Development*, 24(4): 289-295

- Overa, R. 2006. Networks, distance and trust: telecommunications development and changing trading practices in Ghana, *World Development*, 34(7):1301-1315.
- Parvyn-Wamahiu, ETTA F (eds.). 2003. Information and communication technologies for development in Africa: The experience with community telecentres. Vol. 2. Payne, J., and S. McCarthy, 2010. African Agriculture and ICT: An Overview. Briefing Paper. USAID.
- Quizon, J., Feder, G., &Murgai, R. 2001. Fiscal sustainability of agricultural extension: The case of the farmer field school approach. *Journal of International Agricultural and Extension Information*, 8(1), 13–24.
- Rao, N. H. 2007. A framework for implementing information and communication technologies in agricultural development in India. *Technological Forecasting and Social Change*, 74(4): 491-518
- Rashid A. T And Elder, L. (2009). Mobile Phones and Development: An Analysis of IDARC-Supported Projects. *The Electronic Journal on Information Systems in Developing Countries (EJISDC)* 36: 2, 1-16
- Rizvi, R.S. 1967. Job Analysis, Job Performance and Suitability of Pre-service Training of Gram- Sevikas in Three Selected States. An M. Sc.Thesis. IARI:New Delhi.
- Rothwell, D.J. 2004. *In the company of others: An Introduction to communication*. New York: McGraw Hill. Samanta, 1986. A Comparative Study of Adoption of UYV Program by the Farmers' of TV and non-TV Villages, *Indian Journal of Extension Education*. 9 (3&4):92-101. Schultz, T. W. 1964. *Transforming traditional agriculture* (p. 212). New Haven, CT: Yale University Press.
- Roy, A. K., Srinivasacharylu, A and SamdrupRigyal. 2003. Proceedings of the Regional Workshop on Role of Information and communication Technologies (ICT) for Poverty

Alleviation in SAARC Countries, Dhaka, Bangladesh. 22-23 October 2003.SAARC Agricultural Information Centre (SAIC), New Airport Road, Farm gate, Dhaka. ISBN: 984-32-1026-3

Salau E. S. and Saingbe N.D (2011) Access and Utilization of Information and Communication Technologies (ICTs) Among Agricultural Researchers and Extension Workers in Selected Institutions in Nasarawa State of Nigeria. *Production Agriculture Technology* 4 (1) retrieved on 15th May, 2015 from www.patnsukjournal.com/currentissue.

Samuel Gebre-selassie, (2001) *The Development of Integrated Management Information System for Agricultural Extension institutions of Developing Countries, The case of Oromia Agricultural Development Bureau of Ethiopia*, Shaker Verlag. Germany.

Sife, A.S.2010.Contribution of mobile telephone, radio and television to rural livelihoods and poverty reduction in Morogoro Region, Tanzania. PhD thesis, University of Dares Salaam, Tanzania.

Singh, I. J., Squire, L., & Strauss, J. (Eds.).1986. *Agricultural household models: Extension, application and policy* (p. 335). Baltimore, MD: Johns Hopkins University Press.

Souter et. al., 2005.*The Economic Impact of Telecommunication on Rural Livelihood and Poverty Reduction: A study of rural communities in India (Gujrat), Mozambique and Tanzania.*

Ssewanyana, J. K. 2007a. *ICT Access and Poverty in Uganda. International Journal of Computing and ICT Research*, Vol. 1, No. 2.10-19.

Svensson, J., &Yanagizawa, D. (2009). Getting prices right: The impact of the market information service in Uganda. *Journal of the European Economic Association*, 7(2–3), 435–445.

- Taragola, N. M. and Van Lierde, D. F. 2010. Factors affecting the internet behavior of horticultural growers in Flanders, Belgium. *Computers and Electronics in Agriculture*, 70: 369-379
- Vinake, W.E. 1962. Motivation as Complex Problem. In Jones M.R. (ed.) *Nebraska Symposium on Motivation*. Lincoln: University of Nebraska, Press.
- Warren, M. F. 2002. Adoption of ICT in agricultural management in the United Kingdom: The Intra-Rural Digital Divide. *Agricultural Economics*, 48(1): 1-8.
- Wate, F.N. and W.M. Rivera. 1991. *New Technology for Transferring Agricultural Information*. School of Mass Communications. University of Yaounda, Yaounda, Cameroon. World Bank, 2011. *Sparks of a Revolution in the Trade in African Farm Products now Visible in Ethiopia*.
- Yekini, O. T. and I. A. Hussein, 2007. "An Assessment of the of Relevance of Information Communication Technologies (ICTs) to Agriculture and Rural Development by Research and Extension Personals in South-Western Nigerian *Journal of Rural Sociology* Vol S No 1 Pp 79-88.
- Yukl, G., & Van Fleet, D. D. 1992. Theory and research on leadership in organizations. In M. D. Dunnette & L. M. Hough (Eds.), *Handbook of industrial and organizational psychology* (Vol. 3, pp. 147-197). Palo Alto, CA: Consulting Psychologists Press

APPENDIX

(English Version of the Interview Schedule)

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An Interview schedule of the study on

“EFFECTIVENESS OF CELL PHONE IN DISSEMINATING AGRICULTURAL INFORMATION AS PERCEIVED BY THE SAAOs”

Serial No:

Name of the respondent:

Phone Number:

Place of posting: Village/Mohallah Block.....

Ward NoThana..... District.....

(Please answer the following questions)

1. Age

How old are you?

Ans: years

2. Length of job experience

How many years you are engaged with the job?

Ans: years

3. Extent of using cell phone

Please mention your extent of using cell phone

Ans: ----- (hours/week)

4. Farmers coverage by SAAO

How many Farmers exist in your block?

Ans: farmers/farm-family

5. Training received on ICT and Agriculture

Arrange chronologically the particulars of in-service training attended during the tenure of your service life.

SL No.	Name of Training	Duration
1		
2		
3		

6. Complexity of using cell phone

SI No	Items	Not complex	Less complex	Moderate complex	High complex
1	Voice call				
2	SMS or MMS				
3	Video call				

7. Income beyond Job

SL No.	Source of income	Amount
1		
2		
3		

8. Effectiveness of Cell Phone

Please mention the effectiveness of Cell Phone for dissemination of Agricultural information to the farmers

Statements	Extent of effectiveness			
	Most effective	Effective	Less effective	Not effective at all
Cell phone is useful to disseminate message on following items/issues				
a) Market information				
b) Agricultural Training information				
c) Credit information				
d) Weather information				
e) Improved technology information				
f) Farm mechanization information				
g) Agricultural input (seed, irrigation, fertilizer and pesticide) information				
h) Agricultural subsidy information				
i) Field day/meeting information				
j) Pest control information				

Thanks for your co-operation

Signature of the interviewer

Date: