



THE ROLE OF ICT IN AGRICULTURAL KNOWLEDGE COMMUNICATION IN ATA:

THE CASE OF AGRICULTURAL INFORMATION SERVICE HOTLINE (8028) OR THE IVR/SMS SYSTEM

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This is to certify that the thesis prepared by Sosena Obesie, entitled The role of ICT in agricultural Knowledge Communication in ATA: The case of Agricultural Information Service Hotline (8028) or the IVR/SMS system and submitted in partial fulfillment of the requirements for the Degree of Master of Arts in Journalism and Communication complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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ABSTRACT

Sosena Obesie: The role of ICT in agricultural Knowledge Communication in ATA: The case of Agricultural Information Service Hotline (8028) or the IVR/SMS system.

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Information and Communication Technology is believed to play a vital role in disseminating knowledge and information and benefits farmers to have access to up to date knowledge and information. This paper explores the opportunities that ICT brings to agricultural knowledge communication in Ethiopia, with special focus on the Agricultural Information Service Hotline in terms of disseminating relevant and timely information to the target beneficiaries. The study was guided by three basic research questions and, Roger's Diffusion of innovation theory as a theoretical framework. Both qualitative and quantitative approaches were employed in the study. Quantitative data was collected from 50 purposely selected smallholder farmers using questionnaires, while qualitative data were gathered from ATA Agricultural and ICT experts and MoA agricultural expert. The collected data was analyzed by using descriptive statistics such as frequencies and Percentages. Tables and charts were used to present the findings.

The findings of the study showed that in the study area Agricultural extension workers or DAs served as the main source of agricultural information (82%), followed by radio. Radio was mentioned as the main sources of information by 40% of the respondents; they reached the stage of confirmation by continuing to use the technology to get agricultural advices.

The study found out that, the Ethiopian Agriculture Transformation Agency implemented an IVR/SMS system that disseminates agronomic advice to the farmers/ development agents (DA) for free but the practice is still in an infant stage.

The findings of the study also showed that due to lack awareness and exposure, the Hotline is not fully utilized by the farmers but they reflected their interest to use the system in the future. The study recommended that all concerned stake holders in the agricultural sector should be involved in the whole process of knowledge management including awareness creation in order to get benefit out of it.

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LIST OF ABBREVIATIONS

ATA-Agricultural Transformation Agency

ADLI- Agriculture Development Led Industrialization

CSA- Central Statistical Agency

DA-Development Agents

ECX- Ethiopian Commodity Exchange

EIAR-Ethiopian Institute of Agricultural Research

GOE-Government of Ethiopia

ICT-Information and Communication Technology

IK-Indigenous Knowledge

ITU-International Telecommunication Union

IVR-Interactive Voice Response

KC-Knowledge Communication

KM-Knowledge Management

MoA-Ministry of Agriculture

SMS-Short Message Service

OIDA-Oromia Irrigation Development Authority

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CHAPTER ONE

INTRODUCTION

1.1. Background of the study

In developing countries, rural development is the function of agriculture. Agriculture is not only the major source of employment; it also produces livestock and crops for livelihoods, raw materials for processing industries and export.

In countries like Ethiopia where a large portion of population lives in rural areas , emphasis should be given to the development of agriculture sector to improve supply of modern agricultural inputs, expansion of extension services, arrangement of better market services and the overall improvement of the productivity of the sector.

Agriculture is the main economic sector in Ethiopia on which the majority of the rural population depends on .The sector continuous to be the most dominant aspect which accounts for 46% of GDP, 73% of employment, and nearly 80% of foreign export earnings. Furthermore, the majority of the agriculture sector is made up of smallholder farmers who live off of less than 2 hectares of land. However, the sector faces major challenges in enhancing production in a situation of lacking knowledge necessary for production (ATA overview document, 2014).

The government of Ethiopia has recognized the importance of the sectors transformation for stability and growth. Over two decades ago, Ethiopia put agriculture at the heart of its economic development by launching its Agriculture Development Led Industrialization (ADLI) strategy. This strategy puts agriculture at the forefront of Ethiopia's development

process. It also provides an overarching plan for economic development on the basis of agricultural transformation for increased productivity, production and product quality. This would then lead to increased employment, incomes, and investable surplus for the development of other sectors of the economy.

The Ethiopian Agricultural Transformation Agency (ATA) was established in December 2010 by the government of Ethiopia as a medium for positive, transformational, and sustainable change. “The primary aim of the Agency is to promote agricultural sector transformation by supporting existing structures of government, private sector and other non-governmental partners to address systemic bottlenecks in delivering priority national agenda for achieving growth and food security.” (ATA, 2014)

ATA targets to build progress and drive the transformation of the agriculture sector to realize the interconnected goals of food security, poverty reduction, and human and economic development. “The agency’s target focus is on enhancing the productivity and production of smallholder farmers and pastoralists, strengthening marketing systems, improving participation and engagement of the private sector, expanding the amount of land under irrigation, and reducing the number of chronically food insecure households.” (ATA, 2014)

ATA focuses on a set of high priority program areas. These program areas are sub-divided into systems, value chains, and initiatives. Across these, the ATA engages public, private and non-governmental stakeholders to support strategic planning, manage and strengthen implementation capacity, and test innovative models. Its structure and function is focused on innovative and results-oriented support to partners in the agricultural sector. It is financed by GOE and a range of development partners (ATA, 2014).

The Ethiopian Agricultural Transformation Agency in collaboration with Ministry of Agriculture (MoA), and Ethiopian Institute of Agricultural Research (EIAR) and also together with other stakeholders' implemented the Agricultural Information Service Hotline (8028) or the IVR/SMS System for smallholder farmers as a strategy for an innovative information and communication technology approach. On September 17, 2014, ATA hosted a press briefing to announce the starting of the IVR/SMS system/8028 agricultural hotline for smallholder farmers. During the briefing ATA announced "In approximately three months of operation, the system has handled 1.5 million phone calls from 300,000 registered callers, and provided them with information on high value crops and agricultural activities." (ATA, 2014)

The attainment of effective knowledge management in the agriculture sector requires the continuous and systematic interaction of stakeholders including farmers, farmer organizations, research scientists, policy makers, extension agents and the private sector among others. Therefore, in order to implement an effective knowledge management in agricultural sector the following four issues must be done: an overview and a comprehensive knowledge of what needs to be done to solve the sector's problem or to exploit its potentials ,identification of problem solving mechanism and exploitation of opportunities ,identification of the sources of knowledge required for success; and determination of responsible organs for taking the actions needed to solve the problem or exploit the identified opportunities (ASARECA, 2010).

AFAAS (as cited in UNDP, 2012, p.16) mentioned that"Knowledge is considered as the fourth production factor after labor, land and capital" and is particularly critical in the agricultural sector. Making relevant knowledge accessible to the farming community helps improve

production, productivity and brings higher returns. If the agricultural practice of smallholders farmers is not supported with modern agricultural knowledge and information, agricultural households are likely to remain trapped in low productivity, food insecurity and poverty. “In the context of Ethiopia, generating new agricultural knowledge and information and making it available for use by smallholder farmers is important in promoting sustainable livelihoods and reducing rural poverty.” (UNDP, 2012)

The value of knowledge is more when made available to the right people i.e. for intended users at the right time. Thus, managing knowledge in terms of the capturing, storing, accessing, disseminating and sharing of knowledge is facilitated through information and communication technologies including computers, telephones, e-mail, databases and the like.

ICT plays a crucial role in benefiting the resource-strapped farmers to have access to up to date knowledge and information on agricultural technologies, best practices, markets, price trends, and weather conditions. The experiences of most countries indicate that rapid development of ICT, which facilitates the flow of data and information, has tremendously enhanced the knowledge management practice in agriculture (UNDP, 2012).

According to UNDP report published in 2012 the application of ICT in Ethiopia remains low in comparison with several African countries. For instance, in a number of Sub-Saharan African countries, smallholder farmers get technology-related advice as well as location-specific market information on inputs and outputs through ICT kiosks. Furthermore, mobile telephone service is being used to deliver agricultural information to users (UNDP, 2012).

The new IVR/SMS or 8028 hotline initiative of ATA is an encouraging one. Therefore, it is important to assess whether the Agricultural Information Service hotline (8028) or the IVR/SMS is an effective communication channel for the intended users.

1.2. Statement of the problem

Information and Communication Technology (ICT) is believed to play a vital role in disseminating knowledge and information and benefits farmers to have access to up to date knowledge and information on agricultural technologies, best practices, markets, price trends, and weather conditions. Making relevant knowledge accessible to the farming community helps improve production, productivity and brings higher returns. Even if both ICT and non-ICT (traditional media) based methods are used in disseminating knowledge and information, ICT plays an important role in capturing, processing, and disseminating information. This ranges from modern ICTs such as the Internet, email, telephones, to traditional media such as radio, television and video.

In Ethiopia, even if progress is being made in using ICT to provide a wide range of knowledge and information, it is comparatively low from other sub-Saharan countries (UNDP, 2012). In rural parts of Ethiopia, where access to information on individual basis is costly and also unavailable, arrangements of innovative approaches like the IVR/ SMS implemented by ATA are believed to have the potential to disseminate the required information to the rural community in the most cost effective way.

According to a study (Bayissa, 2014:4) conducted to assess small-holder farmers' use ICTs to get agriculture and market related information in Limu Kosa Woreda, the study found out that the majority of the respondents do not have access to modern ICT devices and applications such as computer, they are not exposed to those ICT technologies and its application. The same study has also identified that modern ICT such as mobile phone are not properly used by farmers to get access to agricultural and market information.

In implementing any agricultural knowledge management initiatives an effective media and communication channels for disseminating knowledge and information should be considered. Therefore, assessing the role of ICT as an enabling means of Knowledge communication and how it is applied for less educated farmers in Ethiopian context is important. Thus, assessing whether it is desirable and is timely to understand the full potential of using ICT based agricultural Knowledge communication approach and the challenges in larger scale intervention.

Despite the difference in their focus and area of study, the studies have identified modern ICT is not well practiced, for various reasons such as lack of technological infrastructure, lack of basic operation and usage skills; and language barriers. With regard to mobile based communication Lack of infrastructure such as electricity and network connections have become a problem.

However, the studies paid attention to ICTs and its application in agriculture in general but they have not paid attention to mobile based communication in particular. As far as the knowledge of the current research is concerned, no prior study conducted to assess the role of ICT's in Knowledge Communication in Agricultural Information Service Hotline was found since the system is in its infant stage. The innovativeness of this study is that it tries to understand and document how effectively ATA uses ICTs specifically for the Agricultural Information Service hotline (8028) or the IVR/SMS in communicating with its intended users in the country's infrastructure context.

1.3. Objective of the Study

1.3.1. General Objective

This research aimed to investigate the potential roles of ICT for agricultural based Knowledge Communication in terms of accessing and disseminating relevant and timely information to the target beneficiaries by specifically looking at Agricultural Information Service Hotline /8028. It is also aimed to assess the challenges and opportunities in developing ICT-based agricultural KC by undertaking a study of ATA's experiences. The study was conducted in ATA and its target beneficiaries.

1.3.2. Specific Objectives

To achieve the above general objectives, the study considered the following specific objectives:

- To identify the role of ICT in processing, managing, and disseminating of knowledge in ATA.
- To find out the farmers awareness and use of the agricultural information service hotline
- To find out the major challenges that hinders the farmers from not using the Agricultural Information Service Hotline (8028) or the IVR/SMS system.
- To get lessons from experience of ATA that could inform a valid strategy for employing ICT-based Knowledge Communication efforts in other areas and sectors.

1.4. Research Questions

The research answered the following basic questions:

1. What is the role of ICT in processing, managing, and disseminating of agricultural knowledge in ATA?
2. To what extent do the farmers know, and use the Agricultural Information Service hotline (8028)?
3. What are the major challenges that hinder farmers' use of the Agricultural Information Service Hotline (8028)?

1.5. Limitation of the study

Even if the IVR/SMS system gives services to farmers, model farmers, extension workers, government officers and others found in twelve regions of the country. Due to time constraint, the study was limited to farmers found in Oromia regional state of Burayu special Zone in Nono Kebele.

1.6. Scope of the Study

This study was conducted to assess the important role of ICT for an effective agricultural KC system and its beneficiaries'. The Agricultural Information Service hotline (8028) or the IVR/SMS system was the case at point.

1.7. Significance of the study

This study attempts to capture leading practices in agricultural KC that may be identified during the study process. The findings of this study will have the following significances:

- Answer questions related with ICT based knowledge Management and Communication approach; it can be helpful for program planners in other areas and sectors to construct a strategy that can be comprehensive and effectively applicable.
- Serve as an input for future researchers looking into broader questions of Knowledge Management and communication. For example, what is the impact of KC on the livelihood of framers who are using the IVR/SMS system and 8028 agricultural hotline?
- Provide evidence-based and methodological assessment of the role of ICT on agricultural KC and to inform policy makers in making relevant decisions in this sector.

1.8. Organization of the Study

This thesis consists of five chapters. The first chapter deals with the background, statement of the problem, the research objectives, the research question and limitations of the study. The second chapter reviews the literature related to the study. The third chapter is where the methodology of the study is discussed in detail. The fourth chapter includes the findings and discussions of results and finally, the fifth chapter concludes the thesis and makes recommendations.

CHAPTER TWO

REVIEW OF RELATED LITRATURE

This thesis is intended to study the potential roles of ICT for agricultural based Knowledge Communication (KC) in terms of accessing and disseminating relevant and timely information to the target beneficiaries. Specifically—it is designed to investigate how ICT contributed in the application of the Agricultural Information Service Hotline (8028) or the IVR/SMS system and also document how ATA uses ICT in processing, managing and sharing of knowledge. By using fieldwork, the study will explore the farmer's awareness or knowledge and attitudes of the Agricultural Information Service Hotline (8028) or the IVR/SMS system to access information.

This part is, therefore, designed to review literature related to the conceptual framework of the study and, on the other hand, embodies the specific direction by which the study was undertaken. In the literature review the theoretical frame work of the study was also discussed. The literature includes these main concepts ICT and its application in Ethiopia, Agricultural Knowledge Management and Communication and how it is applied in the country, Interactive Voice Response (IVR), Short Message System (SMS) and other topics which are related to the study. These topics are discussed as follows.

2.1. Knowledge management concept and definitions

The concept of knowledge management is broad and comprises different concepts from different disciplines', but the scope of this study is only limited to knowledge dissemination which is one of the components of knowledge management but for the sake of understanding some basic concepts and terms are included from the field(KM) in the review of literature.

2.1.1. What is knowledge?

Dictionary definition of knowledge is “the facts, feelings or experiences known by a person or group of people” (Collins English Dictionary).

Knowledge is a more subjective or justified personal belief or way knowing which is processed in the minds of individual and is typically based on internalized information related to facts, concepts, ideas, observations, experiential or individual values, perceptions and experience (Nonaka, 1994;Dalkir, 2005;King, 2009).

“Knowledge can be equated to information but it is richer and more meaningful than information. It includes familiarity, awareness and understanding gained through experience or study, and results from making comparisons, identifying consequences, and making connections,” (Servin, 2005:3) Quinn also analyzed knowledge as the result of further refining of information and further placing in context in to a form that readers, listeners and viewers find even more useful that saves them time and money (Quinn, 2002).

2.1.2. Types of Knowledge

Within the field of knowledge management there exist two quite distinct and widely accepted types of knowledge: tacit and explicit. Tacit knowledge is the knowledge that people carry in their heads or that is stored in their brain which comes from inherited practices, passing knowledge via apprenticeship through observation and guidance of a master. It is much less concrete than explicit knowledge. It is more of an “unspoken understanding” about something, knowledge that is more difficult to write down in a document or a database (Nonaka and Takeuchi, 1995;Servin, 2005;Uriarte, 2008;Liikkanen, 2010 &Averweg, 2011).

“Tacit knowledge is highly subjective and personal, making it difficult to formalize and encode and susceptible to change. Indigenous Knowledge (IK), as an example of tacit

knowledge, is generally stored in people's minds and passed on through generations by word-of-mouth rather than in written form; it is vulnerable to rapid change.” (Sithole, 2006)

The term “indigenous knowledge” refers to knowledge that an indigenous (local) community accumulates over time. This description of IK encompasses all forms of local knowledge acquired experientially – arts, languages, understanding, practices, technologies and beliefs – that enables a community to achieve stable livelihoods in its geographical residence.” (Averweg, 2001).

Explicit knowledge is that contained in documents or other forms of storage other than the human brain. Explicit knowledge is knowledge that can be captured and written down in documents or databases or can be articulated, codified and communicated in symbolic form and/or natural language or which can be stored or imbedded in facilities, products, processes, services and systems. This is particularly referred to books, instruction manuals, written and printed procedures and guides, best practices, lessons learned and research findings that express information clearly through language, images, sounds, or other means of communication (Nonaka& Takeuchi, 1995; Servin, 2005; Uriarte, 2008&Liikkanen, 2010).

Explicit knowledge can be categorized as either structured or unstructured documents, databases and spreadsheets are examples of structured knowledge, because of the data or information in them is organized in a particular way for future retrieval. In contrast, e-mails, images, training courses, and audio and video selections are examples of unstructured knowledge because the information they contain is not referenced for retrieval. (Servin, 2005:6)

Both types of knowledge can be produced, developed and disseminated as a result of interactions or innovations.

In like manner Agricultural knowledge is created from modern and indigenous sources. The modern knowledge is created through scientific research by universities and research institutes (and therefore it is explicit knowledge). Indigenous knowledge or tacit knowledge,

on the other hand, refers to traditional knowledge, innovations and practices of local communities and is developed outside the formal education system (UNDP, 2012).

2.1.3. What is Knowledge management?

Knowledge management (KM) is the process of capturing, developing, sharing, and effectively using organizational knowledge. It refers to a multi-disciplined approach to achieving organizational objectives by making the best use of knowledge.

Knowledge management was initially defined as the process of applying a systematic approach to the capture, structuring, management, and dissemination of knowledge an organization to work faster, reuse best practices, and reduce costly rework from project to project (Nonaka and Takeuchi,1995;Pasternack and Viscio ,1998; Pfeiffer and Sutton, 1999; Ruggles and Holtshouse, 1999).

2.1.4. Knowledge management process

The processes that can characterize the KM discipline are numerous and several authors have suggested a number of activities and processes tied to KM. Most of the referenced authors agree that the processes of KM are three but Alavi and Leidner (2001), in (Cassivi et al, 2009) added the application or use of knowledge as a last step. These tools leading to the development of KM are: (1) creation (also called construction) or capturing), (2) storage and retrieval, (3) transfer or dissemination of knowledge (Malhotra, 2002; Cassivi et al, 2009). To capture, store or share knowledge, practical Knowledge Management Tools are necessary to enable the process, the tools, through which data, information, and knowledge are transferred and transformed from one state to another are categorized into three KM processes. (Fanos, Ermias and Hoekstra, 2012); the scope of this study is on knowledge sharing or dissemination.

2.2. Knowledge Sharing/Communication

2.2.1. What is knowledge sharing?

Knowledge sharing /dissemination: refers to activities associated with the flow of knowledge from one party to another. This includes communication, translation, and conversion, filtering and rendering (Fanos, Ermias, and Hoekstra, 2012).

For organizations with a strong base either in research or in practical on the ground experience a next step is to make the knowledge as widely available, accessible and used as possible. Generally, it is generating knowledge and making knowledge as widely accessible or known to the external world.

Agricultural information and knowledge created from different sources is stored in various forms before it is disseminated for use. The main repositories of such knowledge include publications, audio visuals, and websites. The stored knowledge and information is then disseminated to users, such as rural farmers, through intermediaries notably during trainings, field visits, exhibitions, publications, and using traditional forms of ICT (TV and radio), modern forms of ICT (internet, mobile phone, etc.), and others (UNDP, 2012).

2.2.2. Agricultural Knowledge sharing practices or Extension systems

Extension service has meant different things to different people. Moris (1991) defined extension as the mechanism for information and technology delivery to farmers.

Accordingly Purcell and Anderson (1997), in Berhanu, Hoekstra, Azage, (2006:55) has given a more comprehensive definition of extension service as: “A process that helps farmers become aware of improved technologies and adopts them in order to improve their efficiency, income and welfare”

“Extension service is defined as a service of information, knowledge and skill development to enhance adoption of improved agricultural technologies and facilitation of linkages with other institutional support services (input supply, output marketing and credit).” Broadly extension service facilitates linkages of farmers with other institutional support services such as input supply, credit and agricultural product marketing. (Berhanu, Hoekstra and Azage, 2006)

“Agricultural experts acquire knowledge which is generated in formal educational settings (schools, universities, research institutes) and circulated through the global network of professionals, institutions and publications. We call it therefore global, formal knowledge system.” (Islam, 2010:2) Farmers mostly acquire knowledge informally from their social groups through customary practice or experience and hence they have less formal education.

The transfer of knowledge from one knowledge system to other knowledge system is very difficult since the knowledge which is transmitted from one knowledge source do not give sense to receiver found in another knowledge system but knowledge which is transferred within the same knowledge group be it formal or local is relatively easy. For example, farmers may listen attentively to agricultural advisors without changing their practices. (Islam, 2010)

Among the many institutional support services that need to catalyze/support the transformation of agricultural process, the agricultural extension service plays a critical role, since it contributes to the development of the skill and knowledge of farmers to adopt new and improved technologies (seed varieties and animal breeds, implements, chemicals and practices), and the approaches and processes with which the skill development and access to information are realized. (Berhanu, Hoekstra and Azage, 2006)

2.2.3. Sources of Agricultural Knowledge

Agricultural knowledge is very important in achieving productive, profitable and sustainable agricultural development in Ethiopia.

Research by Bachelors or Masters Students; field days, study tours, technology exhibitions; CDs, DVDs, internet and books found in knowledge centers make the largest share for most of agricultural knowledge sources (Fanos, Ermias and Hoekstra, 2012).

Study tours, and farmers field days are age old tools of KM, which are used for knowledge capturing and sharing practices, by helping farmers or other participants to learn new practices, technologies and others experiences and giving opportunities for them to evaluate their own journey, create new ideas and benefit from experiences. Farmer Training Centers (FTC) and Agricultural Knowledge Centers (AKC) are other means used to capture knowledge and also to store and share knowledge (Fanos, Ermias and Hoekstra, 2012).

2.3. ICT and Agriculture

Access to information and communication technologies (ICTs) has brought new opportunities in every aspect of the economy including agriculture and in every part of the society- including farmers.

2.3.1. The ICT contribution to KM and KC

It is undeniable that IT is one of the main facilitators to the implementation of a KM strategy. Indeed, IT can support the KM processes in different ways. Nonetheless, IT is only a tool and not a final solution. Key factors to consider in the development of a KM system include the simplicity of the technology, its ease of use, the alignment to users' needs, the pertinence of the knowledge and the standardization of the knowledge structure or ontology. (Cassivi et al, 2009)

Advances in ICTs have helped create an entirely new discipline, termed knowledge management. Effective knowledge management means that an organization or network of partners gets the right information to the right person at the right time in a user-friendly and accessible manner so that they can perform their jobs efficiently (Islam, 2010).

The application of information and communication technologies for managing knowledge is not without problems. The challenge started from collection of information from diverse sources, it is laborious, time-consuming and costly. Capturing the collected knowledge by ICTs and setting up databases and making the knowledge available to the people who need them or sharing the knowledge captured using ICTs is another challenge. (Lishan, 2005)

2.3.2. ICTs and its application in agriculture

Any ‘ICT for development’ strategy is driven by certain technological determinism: ICT-based community development initiatives are a case of technology transfer and usually the emphasis is on the potential of the technology, mainly computer networks, to provide information and communication opportunities to the rural poor. For decades, “traditional” forms of ICTs have been used in advisory service provision. Radio and TV programs regularly feature weather and agricultural information have become more prevalent in advisory service provision in developing countries, and rural tele-centers have provided information on price and quality (FARA, 2008; Goyal, 2010)

According to Aker, (2011) and FARA, (2008), some of the most common ICT based agricultural information delivery services are presented as follows:

Voice Information Delivery Services:

Voice-based information delivery services primarily include telephone-based information delivery services that provide advice on farming methods and market access. Some of these services use call-in centers or hotlines for agricultural extension support. The mechanisms

range from the use of a simple telephone—such as landlines or mobile phones—to more complicated technology and computing applications (FARA, 2009).

Radio: dial-up (agricultural information on demand) and regular radio broadcasts

Regular radio broadcasts that provide market prices or other agricultural information, as well as dial-up radio that feature a series of short segment audio programs (FARA, 2009). The radio system often features a regularly updated menu of pre-recorded agricultural content. In some cases, the systems allow farmers to ask questions via SMS and the responses are disseminated via the radio (FARA, 2009).

Extension services based on mobile phone

SMS-based extension services essentially use message based platforms to collect and disseminate information. This includes sending an SMS-based code to request information (on market prices or agricultural production) and receiving the response via SMS; and receiving mass SMS on agricultural topics (FARA, 2009). This category also includes services which allow farmers to ask questions through SMS, or broadcasting information gathered through question and answer vouchers or other innovative means.

E-learning for basic skills, agricultural education

E-learning programs typically include tele-centers and internet kiosks that allow farmers to access computers and the internet for agriculture-related information. The information provided via these different mechanisms includes market prices, weather, technical advice, and suppliers and buyers in local markets. (Cassivi et al, 2009)

2.3.3. ICTs impact on agricultural information, extension, and adoption

In the developing countries, the advancement of mobile technology and the rapid growth of mobile phone coverage, moved many of ICT based initiatives from “traditional” ICTs to mobile telephony, including voice, SMS, and internet-based services. (Aker, 2011) This new

technology offers several advantages over other alternatives in terms of cost, geographic coverage and ease of use besides it also offers different advantages like improved access to market information and coordination among agents; increased job creation; improved communication among social networks; and the development of new services, such as mobile banking services among others. (Aker, 2011; Aker and Mbiti, 2010)

More than 55% of sub-Saharan households listen to the Radio weekly, but it generally provides a limited range of information and offer only one-way communication. Radios are becoming common in poor rural areas and new private commercial broadcasters and local community radios are emerging. In the case for print media use in general, Africa is a communication poor continent, the medium is expensive and less accessible to illiterate populations even with a much smaller share in rural areas than urban areas. According to Aker, Less than 19% of individuals in Sub-Saharan Africa read a newspaper at least once per week. Television is largely an urban medium, even though this is now changing in many countries on the continent access to Fax machines, e-mail, and internet, are similarly low. Cost of transportation and the cost of individual's time make personal travel the least preferred way of obtaining information. (Aker 2011; Orgeret & Ronning, 2009(11))

2.3.4. ICT based agricultural extension initiatives in some countries

The role of ICT in enhancing food security and supporting rural livelihoods is increasingly being recognized and was officially endorsed at the World Summit on the Information Society (2003-2005). ICTs are being used by Several Africa and Asia countries for the dissemination of agricultural knowledge and information and a number of success stories have been registered that can be exemplified and scaled up in Ethiopia (UNDP, 2012).

A few of the ICT-based initiatives are presented below to illustrate the extent of the progress that has been made in the agricultural sector in selected countries

In Philippines the “Nutrient Manager for Rice Mobile program” provides information for rice farmers via their mobile phone on the optimal timing, amount, and type of fertilizer to apply to their rice crop to maximize production and profit, and reduce waste. The farmers and extension workers are able to dial a toll-free number and hear a voice instruction in their preferred local language, which will prompt them to use their keypad to answer 12 to 15 questions about their rice crop (UNDP, 2012). This initiative is similar with the IVR under this study.

Esoko is a rural communication platform that seeks to improve incomes by building healthy markets. In Ghana, “Esoko”, a local company, implemented Cocolink, a pilot program that provides cocoa farmers with useful information about improving farming practices, farm safety, crop disease prevention, post-harvest production, and crop marketing. In this program farmers receive information and specific answers to questions at no charge through voice SMS messages and online profiling and marketing in their local language or English (FARA, 2008; UNDP, 2012). This initiative is similar with the SMS under this study.

In India, “Reuters Market Light (RML)” sends four SMS messages a day to its subscribers. Farmers who subscribe to the system receive information about the weather, crops, and current and projected commodity prices at different markets.(UNDP, 2012) In Uganda, where messages about what prices different products have can be fetched and is being texted to farmers and sellers. The experiment in Senegal, with a service called ‘XamMarse’, which means ‘Know your market’ in Wolof, the basis for this service is that market information on prices for different agricultural products is being distributed to the farmers that participate in the scheme by SMS. The service contributed to agricultural sales rising by up to 50% in the trial Zone (Orgeret & Ronning, 2009:9).

2.3.5. ICT based agricultural extension services in Ethiopia

However, in Ethiopia the use of ICT for the accumulation and dissemination of knowledge and information is still low. Currently, among the various ICT related initiatives, radio is widely used to share and inform users on agricultural issues, including new and upgraded farming techniques, production management, market information, and other issues. Due to its strategic importance in reaching the majority of the smallholders, attempts are being made to strengthen the delivery of knowledge and information through radio programs (UNDP, 2012). Some of the most common ICT based initiatives are presented as follows:

The initiative of Farm Radio International (FRI): is one best case in the use of ICT for agriculture. FRI, a Canadian based not-for-profit organization, started its operation in Ethiopia in June 2011. Supports some local radio broadcasters in capacity building activities, prepares and collects agriculture related knowledge and information and produce radio script that is used by the partner broadcasters, produces a weekly publication called Farm Radio Weekly that is delivered to e-mail inboxes every week with free subscription. (UNDP, 2012) Apart from such traditional ICT tools (i.e., radio and TV), the use of modern ICT (computer, internet, mobile telephony, etc.) remains very low in the country. According to the survey made by FARA, 2008 and based on UNDP report, in Ethiopia ICT-based agricultural extension programs is low compared with other sub-Saharan countries. However, some activities that make use of ICT tools in agricultural knowledge and information management are underway and are worth mentioning.

Livestock Information Network and Knowledge System (LINKS)

LINKS is active since 2003 and run in three east African countries; Kenya, Ethiopia, and Tanzania. It is an ongoing and expanding regional linked livestock marketing information system that is geared towards addressing the needs for timely and reliable livestock

marketing information for producers, traders and policy makers in the livestock sub-sector. The information provides livestock & livestock products prices by volume and can be downloaded from the web using the individual country URLs for e.g. in Ethiopia www.lmiset.net ; the service covers 18 markets in Kenya, 32 in Ethiopia and 30 in Tanzania (FARA, 2008; UNDP, 2012).

Improving Agricultural Productivity and Market Success of Ethiopian Farmers (IMPS)

A project on Improving Productivity and Market Success (IPMS) of Ethiopian Farmers was implemented with the objective of assisting the Ministry of Agriculture to develop knowledge Management system. It is a project funded by the Canadian International Development Agency and implemented by International Livestock Research Institute on behalf of the Ethiopian Ministry of Agriculture. IPMS aim to contribute to improved agricultural productivity and production through market-oriented agricultural development – focusing on the smallholder rural population of Ethiopia. This IPMS project has developed web-based portal that can be accessed by <http://www.eap.gov.et> and also established knowledge centers. The Ethiopian Agriculture Portal aggregates information from diverse national and international sources. It contains technology, market related as well as extension packages for a wide range of crops, forest products, and livestock. In addition, it deploys agricultural research outputs drawn from national and international research institutes, and higher education institutions (UNDP, 2012; FARA, 2008; Fanos et al, 2009).

The Ethiopian Commodity Exchange (ECX): is another notable organization having some modern types of ICT-based information management system. It carries out trading of the agricultural commodities on its trading floor located in Addis Ababa and disseminates price information in real time to producers, consumers, and traders using electronic price tickers as well as its website. In addition, ECX has developed a prototype for data dissemination using short message services (SMS) and interactive voice response (IVR). (UNDP, 2012)

2.3.7. ICT challenges and opportunities

Challenges:

Even if, ICTs has brought an immense opportunity in the development of communication in Africa there are also challenges since the majority of the rural farmers do not have access to modern ICTs so there is a communication gap between the vast majority of the rural people and few urban elite who are using modern ICTs.

According to Orgeret & Ronning, (2009),

The challenge for development of communication in Africa lies in two factors. The first is to develop media and communication systems which contribute to growth and development. ICTs are important for all sectors of the economy and administrations. The second challenge lies in overcoming the domestic communication gaps. The gaps exist between the vast majority of rural people and small urban elite. The majority of the rural people have access to Radio and the simplest versions of mobile telephony. (P: 13)

Generally, the challenges of access to ICT can be divided into two: these are access to ICT infrastructure and access to ICT services. The access to ICT infrastructure in Ethiopia is still very low despite some noticeable improvements registered in recent years(Lishan, 2010).

Thus, despite the fact that ICT has immense potential in disseminating agricultural knowledge and information, the low level of ICT infrastructure in Ethiopia is believed to have hindered the sector from realizing its potential and it is also believed to have slowed the sharing and exchange of knowledge and information generated from research centers at national and regional levels. In spite of being a necessary condition, access to ICT infrastructure by itself is not sufficient for the dissemination of knowledge and information to occur through it. Access to ICT infrastructure must be accompanied by access to ICT services. The low level of electricity coverage has in turn inhibited the expansion of ICT services to rural areas. In this respect, the other challenge is how to make ICT services both

affordable and available in venues or modes that are convenient to smallholder farmers (UNDP, 2012).

Opportunities:

Ethiopia has some ICT related opportunities that can be utilized in the dissemination of agricultural knowledge and information to the users. Thus, the presence of such modern ICT initiatives can be considered to be a good opportunity to enhance the flow of agricultural knowledge and information in the country. It is also an important medium to expand and effectively provide a wide range of other extension services including health and nutrition extension services and conducting civic education programs.

2.4. Mobile Communication and its role as Agricultural extension tool

The rapid spread of information and communication technologies (ICT) in developing countries offers a unique opportunity to transfer knowledge via private and public information systems.

“It is striking how quickly the new ICTs (mobile phones and the internet) have spread across Africa and are being regarded as vital for social and economic development and political democratization, Ethiopia is one of the few remaining countries where mobile telecoms remains a government –run monopoly.” (Orgeret & Ronning, 2009:8)

In the 21st century, the greatest development in communication technology in Africa has been the area of mobile telephony. There are great discrepancies between areas in Africa when it comes to mobile use and penetration. Mobile telephony is still very much an urban phenomenon (ibid).

By end of 2014, from the six world regions, Africa, Asia and the Pacific are the regions with the strongest mobile-cellular growth, and the lowest penetration rates, which reach 69 % and 89%, respectively (ITU, 2014). Nevertheless, in mobile-broadband penetration all regions

continue to show double-digit growth rates but Africa stands out with a growth rate of over 40% – twice as high as the global average. By end of 2014, mobile-broadband penetration in Africa has climbed to almost 20%, up from less than 2 % four years earlier, by end 2013. In Africa, the region with the lowest Internet penetration rate (19%), Internet usage is growing strongly at 13%, and almost twice as many people will be online by the end of this year compared with only four years earlier (ITU, 2014).

In recent years, in some of the world's poorest countries, mobile phones have been adopted by rural and urban populations while its initial adoption is concentrated to wealthier, urban, and more educated residents (Aker and Mbiti, 2010).

Mobile phones significantly reduce communication and information costs for the rural poor. This not only provides new opportunities for rural farmers to obtain access to information on agricultural technologies, but also to use ICTs in agricultural extension services. Since 2007, there has been a proliferation of mobile phone-based applications and services in the agricultural sector, providing information on market prices, weather, transport, and agricultural techniques via voice, short message service (SMS), radio, and internet. While such programs are innovative, they are not without challenges, and it is not yet clear that they will substitute for existing agricultural extension systems. Furthermore, empirical evidence on their impact remains limited. In order to measure the impact of such services on farmers' knowledge, adoption, and welfare, as well as their cost effectiveness, rigorous impact evaluations are needed. (Aker, 2011)

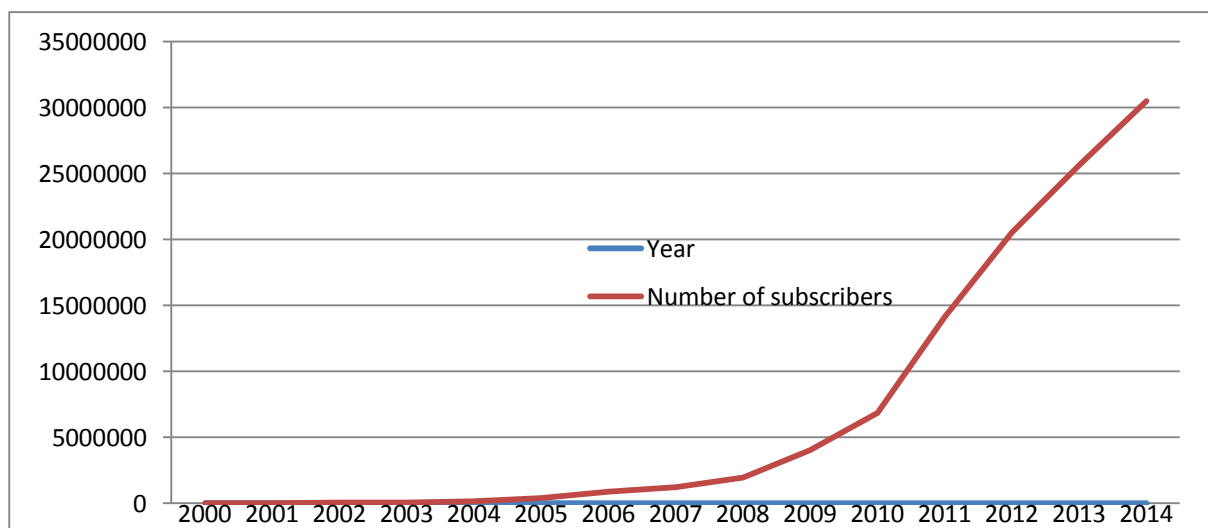
According to Aker and Mbiti, (2010) and Aker, (2011), mobile based agricultural extension systems coverage, adoption and the advantages which offer are listed below:

Mobile phone coverage and adoption in the developing world

Agricultural extension systems were conceived of and developed in response to information asymmetries for poor farmers, particularly those with limited access to other sources of

information(landlines, newspapers, and radios).While infrastructure investments still remain low in many developing countries, one of the most dramatic changes over the past decade has been an increase in mobile phone coverage and adoption. In Africa, since 2002, the number of mobile phone subscribers has increased from less than 10% to approximately 50% and penetration has grown from under 10% to around 40% in 2009. In sub-Saharan Africa, for example, less than 10% of the population had mobile phone coverage in 1999, increasing to over 60% of the population in 2008 (Aker and Mbiti, 2010; Aker, 2011; Orgeret & Ronning, 2009(p.8)). According to ITU report, 2014Mobile phone penetration in Ethiopia is increasing in the past 15 years (ITU, 2014).

Figure 1 Mobile phone penetration in Ethiopia.



Mobile phones can improve access to private information

As of now, Mobile phones and Radios are the most important communication medias in Africa. Both are cheap and flexible. They don't need permanent electricity and (still substantial) illiterate sections of the population can use them. (Orgeret & Ronning, 2009(11)) Mobile phones can improve access to and use of information about agricultural technologies, potentially improving farmers' learning (Aker, 2011). Farmers require information on a variety of topics at each stage of the agricultural production process. In many developing

countries, such information has traditionally been provided via personal exchanges, radio and perhaps landlines and newspapers. Compared with these mechanisms, mobile phones can significantly reduce the costs of obtaining agricultural information. Mobile phones are significantly less expensive than the equivalent per search cost of personal travel or a newspaper, and radio only provides price information for specific products and markets on a weekly basis. The reduction in search costs associated with mobile phones could increase farmers' access to information via their private sources, such as members of their social network (Aker and Mbiti, 2010; Aker, 2011).

2.4.1 Interactive Voice Response concept and definitions

IVR (Interactive Voice Response): is one of mobile based technology which is used worldwide. IVR technologies are now widely used to handle everything from customer service to billing inquiries to the administration of automated surveys.

“Generally refers to automated telephone call-handling systems where the user interacts through the use of a touch-tone telephone or through speech recognition with a computer based voice signal (either recorded real speech or computer-generated speech).” (Rutenbeck, 2006)

Speech is the most desirable medium of communication between humans. The goal of speech processing is to provide natural interfaces to human–computer interaction through speech input and speech output capabilities in any regional languages. Speech being a natural mode of communication among human beings has the potential of being primary as well as convenient mode of interaction with computers. The Interactive Voice response system is well known application of speech processing. (Gaikwad, Gawali and Mehrotra, 2014)

The purpose of IVRs is mostly to make the initial process of answering and routing a call more efficient. Instead of talking to a live person, the caller is greeted by a pre-recorded voice

coupled with technology that is capable of Understanding words the caller speaks or selections he/she makes using the phone keypad. When implemented correctly, an IVR can help people perform transactions or get answers over the phone faster than they would by speaking to a live representative. (ibid)

Agro Interactive Voice Response System:

Agriculture has been the primary occupation of human being. Generally farmers do not have the scientific information about diseases of crops and their solutions, in this case, IVR is advantageous in providing information especially when farmers don't wish to go to the Agro information Centre or visit the agro web site for their queries related to the crops usually they don't have understanding on the language and typing.

This model will be advantageous in following conditions: People with disabilities that prevent them from typing.

- Illiteracy of farmer that keep them away from the automatics systems.
- Lack of source to get the information.
- To save the time to find the information.
- For visually impaired users when it is not possible or convenient to use Braille keyboard.(Gaikwad, Gawali and Mehrotra, 2014)

2.4.2. Short Message System (SMS) concept and definitions

SMS (Short Message Service):SMS is a form of mobile-phone based text messaging allowing messages of up to160 characters to be sent and received via the network operator's message center to a mobile phone, or from the Internet (using a so-called "SMS gateway"). If the phone is powered off or out of range, messages are stored in the network and are delivered at the next opportunity (Rutenbeck, 2006).

With the widespread use of mobile phones, voice and SMS solutions should find more use as they offer easy accessibility. However, they also face the following challenges: the SMS carries only a limited amount of information and requires a basic level of literacy. Voice-based solutions are complicated to develop for they require machines to produce natural speech, or in technical terms, good speech synthesis. They also do not offer detailed information such as pictorial illustrations as in web solutions. Nonetheless, the voice solution is still by far be the most attractive platform for the farmer as it can be customized for language, is readily accessible and very natural, as it entails using the mobile phone as it is normally used(FARA,2008).

2.5. Theoretical Framework

Diffusions of Inventions theory is a theory which was used in this study. As the adoptions and diffusions of communication technologies changes our communication methods also changed at large level and the Agricultural Information Service hotline (8028) or the IVR/SMS system is one of the indication point.

2.5.1. Diffusion of Innovations Theory

Diffusion is the process by which an innovation makes its way over time to members of a social system. An innovation is the introduction of something new—a project, practice, or idea. The theory of diffusion of innovations also focused on technologies and their adoption as markers of modernity, although this theory also included interpersonal and community level communication as important determinants of a society's move toward modernization.

Broadcasting's technological features—especially its ability to reach less educated audiences across wide distances—made it a logical candidate for experiments in technological innovation for modernization. A leading development scholar was Everett Rogers. His model

of diffusion of innovations includes stages of social change ranging from knowledge, acquisition, persuasions or reaching a decision, implementation of a new innovation, and confirmation of use (Littlejohn and Foss, 2009).

Stages of Technological adoption:

Rogers's (1983) stages of technological adoption or decision making process are five. These are presented as follows (p: 165-174)

Knowledge: It is an exposure or awareness of the Innovation. During this stage of the process the individual has not been inspired to find more information about the innovation.

Acquisitions: Positive or negative attitude people have towards the innovations. In this stage the individual is interested in the innovation and actively seeks information/detail about the innovation.

Persuasions: It involves People's decision to adopt the innovation. In this stage the individual takes the concept of the change and weighs the advantages/disadvantages of using the innovation and decides whether to adopt or reject the innovation.

Implementation of a new innovation: It is regular or standard practice. In this stage the individual employs the innovation to a varying degree depending on the situation. During this stage the individual determines the usefulness of the innovation and may search for further information about it.

Confirmation of use: Comparing and evaluating the Innovation. In this stage the individual finalizes his/her decision to continue using the innovation. This stage is both intrapersonal (may cause cognitive dissonance) and interpersonal, confirmation the group has made the right decision.

Elements in Diffusion of Innovation

Diffusion of innovation is a theory that seeks to explain how, why, and at what rate new ideas and technology spread through cultures. According to Rogers (1995) “Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system.” Rogers argues diffusion depends on four elements. These are the innovation itself, communication channels, time, and a social system in which diffusion takes place.

Innovation: “An innovation is an idea, practice, or a project perceived as new by an individual or other unit of adoption” (Rogers,1995:11). The nature of the innovation or the new technology as perceived by the potential users affects its rate of adoption.

Communication channel: Communication channels are a means by which messages get /transmitted/ from one individual to another or an instrument to transmit an information from one end to the other.

In diffusion of innovation, the two mediums that are taken commonly as predominant in the diffusion are the mass media and interpersonal communication.

Time: Time is the period from coming towards knowledge of a new innovation to developing a habit of using it and sharing it to others. It is a core aspect of any communication process and it is an important element in the diffusion process.

The innovation-decision period is the length of time required to pass through the innovation-decision process. An innovation-decision process is a process by which an individual passes from first knowledge of an innovation through its adoption or rejection.

Rate of adoption is the relative speed with which an innovation is adopted by members of a social system. It is usually measured as the number of members of the system that adopt the innovation in a given time period.

In the innovativeness of an individual or other unit of adoption—that is, the relative earliness/lateness with which an innovation is adopted—compared with other members of a system.

Social System: "A social system is defined as a set of interrelated units that are engaged in joint problem solving to accomplish a common goal"(Rogers, 1995: 25). It is stated in 'Diffusion of innovation' that "A social system is a set of interrelated units that are engaged in joint problem solving to accomplish a common goal.

In the social system, the aspects given distinct emphasis that influence the dissemination of innovation are issues like language, culture and norms, special identities like religion, dressing, flag, beliefs and colors that specify the society and related aspects that identify the society. These aspects are taken in to consideration, if the new communication channels have to get acceptance and distributed in the target people with ease. And other aspects like opinion leaders and the place of acceptance they are given in their specific society the communication address are also taken in to consideration.

CHAPTER THREE

RESEARCH METHODOLOGY

This study is intended to investigate the role of ICT on agricultural KC as implemented by ATA ICT-based initiatives in the Agricultural Information Service hotline (8028) or the IVR/SMS system. The study analyzes the role of ICT for an effective KC practices. It used mixed methods; both qualitative and quantitative research methods.

3.1. Research Design

This study mainly focuses on studying the ICT contribution for agricultural knowledge communication by taking the case of Agricultural Information Service Hotline, since knowledge is powerful for the attainment of any development. Hence, communicating and exposing the knowledge that is gained through education, research, and experience is vital. The study focuses on the diffusion/communication of the innovation (Hotline) to the farmers. Consequently, it uses diffusion of innovations theory as a theoretical framework, it traces the process by which a new idea or practice is communicated through certain channels over time among members of a social system. The model describes the factors that influence people's thoughts and actions and the process of adopting a new technology or idea (Rogers, 1962 & 1983). Since the Hotline is new in its kind, the study focuses on how this new idea or practice is communicated and practiced within the community since the start. What influences them to adopt or not, what challenges them and what opportunities they get from the innovation was included in the study.

The theory of diffusion of innovations also focused on technologies and their adoption as markers of modernity, although this theory also included interpersonal and community level communication as important determinants of a society's move toward modernization.

The new innovation (Hotline) is an important indication of the society moved towards modernizations. Since Broadcasting's technological features—especially its ability to reach less educated audiences across wide distances—made it a logical candidate for experiments in technological innovation for modernization.

3.2. Research Method

As mentioned above this research used mixed approach of research that means both qualitative and quantitative methods.

Qualitative research method is used when it is not known what to expect, how to define the issues, or lack an understanding of why and how populations are impacted. It is characterized by its methods which (in general) generate words, rather than numbers, as data for analysis. Qualitative data like quantitative data is based on empirical investigation and evidence. It can be addressed through qualitative methods such as participant observation, in-depth interviews, and focus groups. (Kothari, 1990; Patton and Cochran, 2002; Mack et al, 2005)

Qualitative approach is a subjective assessment of attitudes, opinions and behavior and generates results either in non-quantitative form or in the form which are not subjected to rigorous quantitative analysis, Kothari, (1990). When used along with quantitative methods, qualitative research can help us interpret and better understand the complex reality of a given situation and the implications of quantitative data. (Mack et al, 2005)

The second method used in this research was Quantitative Method. Quantitative research is based on the measurement of quantity or amount. It is applicable to phenomena that can be

expressed in terms of quantity. Quantitative research methods are characterized by the collection of information which can be analyzed numerically, the results of which are typically presented using statistics, tables and graphs. (ACAPS, 2012)

In this study, in-depth interview, questionnaire and document analysis was employed to gather information. Each one of these tools explained in detail under the section of data collection method.

The quantitative data for this particular research was summarized by Microsoft Excel because it is an easy way to categorize and to enumerate quantitative data. Descriptive statistics, tables and charts was also be used. Qualitative data was systematically categorized, summarized and discussed one by one.

3.3. Data Source

The study was focused on identifying the potential roles of ICT specifically the Agricultural Information Service Hotline for agricultural based Knowledge Communication (KC) in terms of accessing and disseminating relevant and timely information to the target beneficiaries and the data was collected from Burayu special zone Nono Kebele. Burayu special Zone is located in Oromia National Regional State, surrounding Finfine at a distance of 15 km from Addis Ababa. According to the population and Housing census conducted in 2007, the zone has a total population of 63,889 of whom 31,516 were men and 32,373 were women; 48,876 or 76.5% of its population were urban dwellers, (CSA, 2007). Burayu is one of the reform towns in the region and has a city administration, municipality and six kebles out of which three of them are rural kebles namely Guji, Nono and Kersa Burayu. Out of other pilot woredas' Burayou was selected because it is nearby to the capital and the majority of the society is urban dwellers by assuming that it has exposure to new technologies.

The data for this particular study come from primary and secondary sources. The primary data is a data gathered directly from the concerned body through field work. Primary data is often collected through face to face interviews or discussions, but can also be gathered through phone interviews, radio communication, email exchange, and direct observation (ACAPS, 2012). The primary data for the research was collected by interviewing ATA ICT and Value chain experts and MoA agricultural expert who participated in the process and implementation of the system; Interview guide was prepared to maintain the coherence of the ideas to be raised. A well prepared and coherent questioner was also used in order to explore the awareness, acceptance and the experiences of the farmers in using the Hotline.

Secondary data means data that are already available, which has typically been collected and analyzed by researchers, but directly not researched. Secondary data may either be published data or unpublished data. It comprises internet materials, and media reports, such as academic research or an agency or sector specific monitoring reports (ACAPS, 2012, Kothari, 1990).The secondary data for this study was collected from documents stating about the organization and the Hotline.

3.4. Data Collection Methods

Primarily, the data collection tools of the research were in-depth interview, questionnaire, and analysis of documents having relevant information about the organization and the system. Each of these tools explained below.

3.4.1. In-depth Interviews

One of the techniques used in this study is in-depth interview. The interview was semi-structured so as to let the interviewees express their thoughts and views using the few prelisted questions as elements to guide the course of interview to only relevant points.

“In-depth interviews are one of the most common qualitative methods. One reason for their popularity is that they are very effective in giving a human face to research problems” (Mack et al, 2005)

Qualitative research usually employs Semi structured interviews, which is designed to provide vital information on individual perspectives and experiences through direct discussion and conducted on the basis of a loose structure. It is made up of open-ended questions which define the area to be explored and the interviewer would like to cover, with some useful prompts to encourage the interviewee to talk about specific issues and also it provides an opportunity for both the interviewer and interviewee to discuss in more detail (Patton and Cochran, 2002; Hancock, Ockleford & Windridge, 2009).

This research used in-depth interview as a primarily data gathering tool as it enables to get information from one ICT and one Value Chain expert of ATA and an expert from MoA who were participated in the process and implementation of the system by using semi structured interview guides.

In order to make the interviews and the data consistent and complete the interview questions designed to be open ended so that it created a way of discussion between the interviewer and the interviewees. The researcher took note on every answer in addition to that the interview was recorded in audio to preserve time of the discussions.

3.4.2. Questionnaire

Survey questionnaire is a collection of questions designed to elicit valid information from respondents about research topic. A questionnaire usually includes questions on attitudes, beliefs, opinions, behavior, demographics life styles, psychographics, and social groups (Poindexter & McCombs, 2000).

In this study, questionnaire was used as a data gathering tool to obtain information directly from users of the system (farmers): to find out their awareness /knowledge and attitudes about the system and also to find out what challenged in using the hotline and opportunities' they got from the Hotline if any. The questionnaire have both open ended and close-ended questions so that the some of the close-ended questions assist to collect factual data from the options given in 'Likert scales' whereas the open ended questions help to find the respondent's opinions. The questionnaires were translated into Amharic for clarity and distributed to a total of **50** farmers. All the distributed questionnaires were properly filled out.

3.4.3. Document Analysis

In this study document analysis was used as a data collection tool in order to discover all written documents which stated about the organizations, containing information related to the Hotline.

Documentation includes a wide range of written materials that can produce qualitative information. These can be particularly useful in trying to understand the philosophy of an organization. They can include policy documents, mission statements, annual reports, minutes of meetings, codes of conduct, web sites, series of letters or emails, case notes, promotion materials, etc(Hancock, Ockleford&Windridge,2009).

These documents were ATA's Organizational Overview/Transformation agenda, ATA's 2013/2014 annual report, IVR/SMS Project overview, ATA IVR/SMS System Overview, Fact sheet about the IVR and IVR Briefing (Media Release by ATA).

3.5. Sampling technique

Sampling is defined as the selection of a small group of people from a larger population to represent that population on the basis of a judgment or inference made about the aggregate or totality (Kothari, 1990).

This study employs purposive sampling and random purposive sampling as a sampling method. The study focused on farmers found in Burayou Woreda of Oromia region. The sampling units for quantitative data were farmers in Nono kebele. Out of 3 rural kebeles in the woreda, one village namely Nono was purposely selected, using purposive sampling based on the proximity to the city. The participants of the study were selected on a farmers' field day which was conducted in Nono kebele, since it is a good opportunity to get potential respondent model farmers in one place by assuming that they have exposure to new innovations. Also within the participants individual farmers were selected using random purposive sampling, 50 farmers were selected randomly from the total farmers who were participated on the farmer's field day. The respondents were selected randomly because the farmers are many to include all in study. Random purposive sampling is employed with a small sample sizes, selecting participants by random means who were purposively selected and are too numerous to include all in the study.

Purposive sampling method was also employed to collect qualitative data and to select respondents who can provide in-depth and relevant information about overall functionality of the Hotline. Hence the researcher selected one ATA agricultural expert, one ATA ICT expert and one MoA agricultural expert and conducted in-depth interview. In qualitative work, sample sizes are typically small and samples are usually **purposive** since participants are

selected because they are likely to generate useful data for the project (Patton and Cochran, 2002).

3.6. Data Analysis

The data collected from the participants was analyzed according to their nature. Data analysis is the crucial stage where researchers begin to understand their findings in light of their research aims (Basit, 2003).

The quantitative data, the questionnaire was properly counted and coded in to an excel sheet in order to describe results and inferences were made about the overall content and analyzed using descriptive statistics such as frequencies and percentage. Tables and charts were used to present the findings.

The qualitative data collected via interview and document analysis was categorized into five major parts based on the relevance to the main point of the research questions, and was summarized and discussed one by one. The qualitative data generated from the interview was transcribed and translated into English and analyzed to answer the research questions. The qualitative data triangulate and supplemented the findings obtained using the quantitative data. “Through qualitative research we can analyze the various factors which motivate people to behave in a particular manner or which make people like or dislike a particular thing” (Kothari, 1990: p3).

3.7. Research Difficulties and challenges

- Initially the researcher assumed that the telephone numbers of the registered users (farmers) of the Hotline will be provided by ATA, but due to the agreement made between the Ethio-telecom and the agency not to expose personal information to another party even if for research purpose, it was not possible to get the telephone numbers of the registered users. Instead of a telephone interview the researcher was forced to undertake the research onsite on the pilot areas in which the system was started at the beginning assuming that it is possible to get large volume of callers.
- By assuming that the telephone number of the Hotline users will be provided by ATA, the research was planned to employ systematic random sampling to select telephone numbers of the Hotline users but since it was not possible to get the telephone numbers the study area was purposefully selected from the pilot areas by assuming potential Hotline users will be found and the farmers were selected by Random purposive sampling method from the total population
- Since the system is new and unique in its type, the researcher has encountered a problem in getting farmers who know about the system even in the pilot areas in which the system was started at the beginning. So the researcher was forced to change the study area from one pilot Woreda in which the research was planned to be undertaken to another pilot Woreda.
- My initial assumption was, there will be an experienced users of the system and the questioner was prepared for them but at the middle , I came to know that the majority of the farmers have not even heard about the system so the questioners was revised include naive users who hear or used the system for one day.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS AND DISCUSSION OF THE FINDINGS

The major objective of this study was to investigate the potential roles of ICT specifically the IVR/SMS system for agricultural based Knowledge Communication (KC) in terms of accessing and disseminating relevant and timely information to the target beneficiaries. The research was also assessed the opportunities and challenges in developing ICT-based agricultural Knowledge Communication(the Agricultural Information Service Hotline) by undertaking a study of ATA's experiences. Therefore, this chapter deals with the findings that the researcher got during the study from documents and respondents responses collected from ATA and MoA during interview and from farmers via questionnaire. These responses were carefully and systematically reviewed and analyzed.

4.1. Discussion of results from documents and Interview:

As indicated above, one of the objectives of the study was to assess the challenges and opportunities in developing ICT-based agricultural knowledge communication specifically the Agricultural Information Service Hotline and studied by undertaking a study of ATA's experiences.

4.1.1. Overview of the IVR/SMS System (System Details)

The Ethiopian Agriculture Transformation Agency implemented an IVR/SMS system that disseminates agronomic advice to the farmers/ development agents (DA) throughout Ethiopia. Based on the information from ATA officials and the documents:

This intervention planned to leverage IVR to transfer information to segments that do not regularly get information in timely manner. This intervention also planned to distribute agronomic best practices that can improve the flow of information (1) between stakeholders implementing farmer-targeted interventions (different research institutes, Universities and the like) and (2) towards the farmers that these interventions are intended to benefit.

In the past, there has been significant time lost as new information on agronomic practices trickles down from research institutions and government bodies to the smallholder farmers. The ATA identified the use of an ICT platform to streamline the provision of tailored, real-time information directly to smallholder farmers in one to three weeks.

This system provides agronomic information to farmers in two ways: (1) a call-in automated helpline and (2) a push-based alert system using IVR/SMS. Using the Interactive Voice Response/Short Message Service (IVR/ SMS) system, smallholder farmers can call into the 8028 automated hotline for free and receive information on high-value crops and a wide range of agriculture activities. Whereas, a push-based voice and SMS alert system is used to notify farmers of relevant and timely agriculture issues, drawing on the specific characteristics of farmers collected when they initially registered on the system.

The intervention pilot project was launched in February 2014 in four regions, (Amhara, Oromia, Tigray and SNNP), focusing on horticultural crops like potato, onion, and carrot. The pilot was successful with an average of 500 calls per day, 7,700 unique callers, and a total of 57,400 calls into the system. In July 2014, the project content was expanded to address the needs of farmers during the pre-planting, planting, and post-harvesting seasons. The system now runs on 90 phone lines and includes best practices advice on growing the important cereal crops of maize, teff, wheat, barley and sorghum. Its content is available in three languages (Amharic, Oromiffa, and Tigrigna) and can be updated periodically to cover additional areas.

Features of the IVR/SMS Information System:

The Hotline has these basic features which makes it unique from other ICT based agricultural communication methods, a web based portal and knowledge centers developed by ILRI and electronic price tickers and websites developed by ECX, which were previously implemented in Ethiopia:

- Unlike a web based portal and a website which were developed by ILRI and ECX the Hotline is accessed through telephone. No Internet connection or computer is required; so the farmers can easily access it through their mobile phone.
- Auto-attendant – The ATA IVR Information System acts as a human operator. It can completely replace human operator and can provide callers with the required information;
- The system is equipped with voice menu prompts that guide the user throughout connection time; this menu prompt makes the farmers to easily understand and operate each menu.
- Standard Telephone Set - No specialized telephone set is required. Any standard telephone set can work with the system (except rotary type of telephones);
- The SMS system has the capability of sending bulk SMS from a web interface; when needed the system has a capability of sending bulk SMS.

IVR/SMS system administration menu

The IVR/SMS system has a dashboard that will provide administrators with real-time statistics of the users calling into the system:

- The IVR dashboard provides a running tally of calls placed on a daily, weekly, and monthly period which helps the agency to know when there is a large volume of call, how many unique calls were attended and how many registered callers use the system.

- Number of simultaneous calls coming into the system which helps the agency to make a priority on the call.
- Detailed information on calls per region and users registered per language this helps the agency to know in which region and language there are large volume of callers are found, which in turn makes them to decide what to do.
- Detailed figures on how often certain type of agronomic content for a particular crop is requested. This helps the agency to identify the content which is more requested which in turn make them to modify the content based on the request

The IVR/SMS System also has a push-based voice and SMS alert system, to notify extension workers and smallholder farmers of any pertinent agricultural related issues:

- The system can send an unlimited number of IVR or SMS messages through the ‘Push with Filter’ feature. This functionality makes the administrators to send a specific message to a certain users than sending all the messages to registered users. For e.g. climate related message to users found in a certain climate.
- The push alert mechanism can provide administrators with detailed logs of message statuses. This functionality makes them to know which messages are sent and which of them are delivered.
- The IVR/SMS system allows users to record and upload voice recordings directly from the system.

Knowledge Management Cycles involved in implementing the IVR/SMS system:

ATA used ICT tools in storing, accessing, disseminating and sharing of knowledge. The existing IVR/SMS system is not fully integrated the whole knowledge management cycles. The system lacks the tool to capture knowledge. The knowledge is captured from the documents, manuals and the experts from ATA, EIAR and MoA. Mysql was used to store the audio and text files, telephone (8028) was used to disseminate the knowledge to end users, the web applications and reporting tools (jaspersoft) was used to share the aggregated report across offices in ATA and to stakeholder offices.

Regarding the ICT tools which was used in documentation and/or preservation of indigenous knowledge .One of the interviewed expert stated that (Code 2):

“As of my knowledge, ICT tools are not effectively being used so far to preserve indigenous knowledge in Ethiopia.” He further explained, although there are efforts here and there to do that, mainly using the traditional Medias like tape recorders, Video cameras and televisions, but these medias are not effective to capture and disseminate knowledge at large.

4.1.2. The IVR/SMS Content

From the points to be considered to ensure the effectiveness of KM is fulfilling the knowledge needs of the beneficiaries’ is one and the main.

Agricultural knowledge is created from modern and indigenous sources. The modern knowledge is created through scientific research by universities and research institutes. Indigenous knowledge or tacit knowledge, on the other hand, refers to traditional knowledge, innovations and practices of local communities and is developed outside the formal education system. (UNDP, 2012)

According to the information we get from ATA’s agricultural expert, ATA tries to involve different stakeholders in extracting and to assuring the quality of knowledge. The content of

the IVR/SMS was originally developed by the ATA value chain (specific crop experts like maize, wheat...etc) and sent to EIAR and MoA experts to some extent OIDA (Oromia Irrigation Development Authority) for their checkup and approval before being stored at the backend of the IVR system. Even if ATA involves different stakeholders and used expertise knowledge to develop the content during evaluation they came to know that there were some mistakes on the content and evaluated and refined the content by the feedback from farmers by using focus group discussion, key informant interview. (Code 1)

4.1.3. Justification of selecting the IVR/SMS system over other Medias

ATA has selected Telephone (IVR/SMS system) over traditional media such as radio, television and video and modern ICT tools such as Internet, email, in disseminating knowledge and information because of its accessibility and timeliness.

“Traditional way of knowledge dissemination is not an effective way in disseminating knowledge especially when there is information which has to be transferred within a short period of time for example: Radio and Television programs are time bounded. They are transmitted at specific time and people have to tune their radio or television at that time to get that agricultural advice. Once they missed that program they would definitely miss it or they have to wait until that program is repeated. Video based approach is not cost effective compared to the IVR system.”(Code 2)

The Hotline can be used by smallholder farmers regardless of their educational level compared with modern ICT tools. It does not need high level of literacy as expected to use modern ICT tools such as internet, email and others it only needs knowing how to operate a mobile phone. In short, the advantage of ATA’s IVR/SMS system is explained in terms of accessibility, availability, scalability and ease of use each of which is explained below:

Accessibility: ATA IVR/SMS Information System is a system that can be accessed from practically anywhere. Anyone who can have access to telephone can get connected to the system and get agronomic information via the telephone.

Availability: Since the system does not require human interaction from ATA side, it is available 24 hours a day, 7 days a week, and 365 days a year. (Note: This is subject to availability of ethio-telecom services)

Easy to use: The system can be accessed just by dialing a specific phone number called "The Agricultural Information Service" Unlike computers everybody knows how to use a telephone. Hence, the user does not need to have technical skills so anyone who knows how to use a telephone can use the system.

Scalability: It is very easy to expand or upgrade the system to accommodate more lines and users. This makes ATA to easily upgrade and add lines.

4.1.4. Briefing about the system

According to ATA officials the following were the awareness creation activities undertaken by ATA about the Hotline:

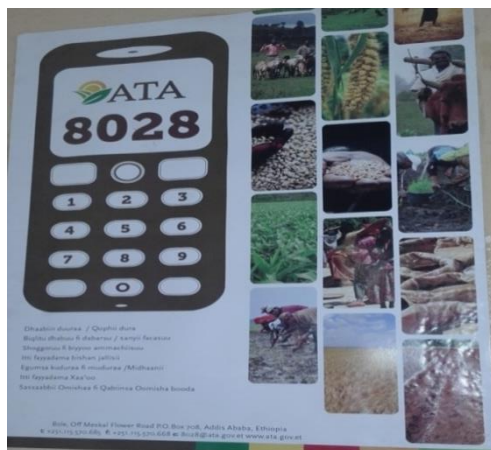
- The primary means which was used in creating awareness for intended users about the Hotline was Promotion campaigns through six local radio stations, being aired 2-3 times per day for 3 months
- Creation of marketing materials: 300,000 posters and 400,000 calendars with information on what the system offers

- Live activation events in 65 local market places, Advocacy work or live demonstration to the users has the second positive relation with creating recognition and dissemination of new innovations.

“Promotional campaigns through local radio stations and Fana FM 98.1 in 90 & 120 dekika program is still ongoing” (Code 2).

During the process of data collection, the researcher requested Woreda level agricultural experts and agricultural extension officers (DAs) on their awareness about the Agricultural Information Service Hotline, because ATA officials claimed that , besides the campaigns which were made in large marketing areas overview about the Hotline was given to Woreda level agricultural experts and extension officers and it was also witnessed that Posters were hanged in the office wall of Ambo and Adea Woreda farmers’ association office but they don’t even practice it themselves. The information above shows that, awareness creation mechanisms in which ATA used before is not enough for, DAs and woreda level experts in order to adopt and make use of a technology let alone farmers.

Figure 4:- IVR/SMS system Poster



4.1.5. Challenges faced during system implementation

It is not possible to develop a system without any challenge: Below are the major challenges faced in developing and implementing the system and the actions taken to solve the problem encountered:

- ✓ Developing and maintaining the IVR/SMS infrastructure was a big challenge, it was handled by a huge support from Ethio-telcom.
- ✓ Managing the expectations of the system users in regards to the content and was also another challenge; it was handled by a huge assistance from EIAR and MoA to re develop the content.
- ✓ At the beginning ATA used expertise knowledge to develop the content but during evaluation they came to know that there were some mistakes on the content and they used the feedback from farmers and Woreda level experts using focus group discussion, key informant interviews to evaluate and to refine the content.

4.2. Discussion of results from Questionnaire

As indicated in the introductory chapter, the major objective of this study was to investigate the potential roles of ICT specifically the IVR/SMS system for agricultural based Knowledge Communication (KC) in terms of accessing and disseminating relevant and timely information to the target beneficiaries. Responses from farmers were analyzed below.

4. 2. 1. Demographic Profile of Respondents

The following table shows demographic profile of respondents who took part in the study. Their age, sex, education and marital status will be discussed below.

Table 1: Age, Marital and Educational Status of the Respondents

Demographic Profile	Responses of the respondents				
	1. Below 20	2. Between 21-40	3. Between 41-60	4. Between 61-80	Total
1. Age?					
Frequency	2	27	15	6	50
2. What is your level of education?	1. No formal education	2. From grade 1-5	3. From grade 6-12	4. Certificate or above	
Frequency	2	16	32	-	50
3. Marital Status?	1. Not married	2. Married	3. Widowed	4. Divorced	
Frequency	5	42	3	-	50

Among the total of 50 respondents that took part on the study 88% were men while women make only 12%. Only 4% of the respondents are found below the age of 20 but more than half of the respondents 54%, are found between the age of 21-40, while 30% of the

respondents are found between the age of 41-60 years and the rest (12%) are found between the age of 61 and 80.

With regard to their educational status, 14% of the respondents has never been in school, while 32% claim to study until grade 6 or even less. Moreover, 64% of the respondents reported to reach high school level education.

In the above table, the respondents' marital status shows that 84% of the respondents are married whereas 10% of them are unmarried. Moreover, 6% respondents are widowed. The information above shows that, for 86 % of the respondents it is not difficult to make use of the hotline because it doesn't need any sophisticated knowledge it only needs calling to 8028 and follow the steps.

4.2.2. Total Land, Main Agricultural Activity & Main Crops grown in the Area

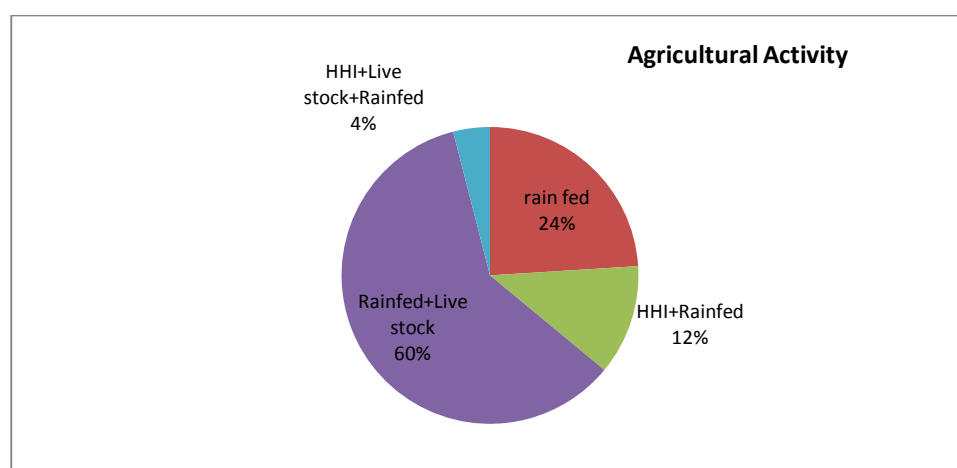
The data gathered showed that out of total respondents 62 % of them owned less than one hectare of land while 38% them owned more than one hectare. Household Irrigation is practiced by 16 % of the respondents. The total land holding of the farmers, the main agricultural activity practiced and main crops grown is presented in the following table.

Table 2:- Total Land holding, Main Agricultural Activity & Main Crops Grown in the Area

Total Land, Main Agricultural Activity & Main Crops grown	Responses of the respondents			
1. Total Land Holding you have?	1.< ¼ H	2. Between ¼ and ½ H	3.Between ½ and 1 H	> 1 H
Frequency	-	7	24	19
2. What type of agricultural activities do you practice? (Multiple answers is possible)	1.Irrigation based agriculture	2.Rainfed agriculture	3.Livestock production	4.all
Frequency	8	50	30	2
3. What type of crops do you produce? (Multiple answers is possible)	1.Cereal	2. Pulses	3. Oil seeds	4. Vegetable
Frequency	46	38	-	20

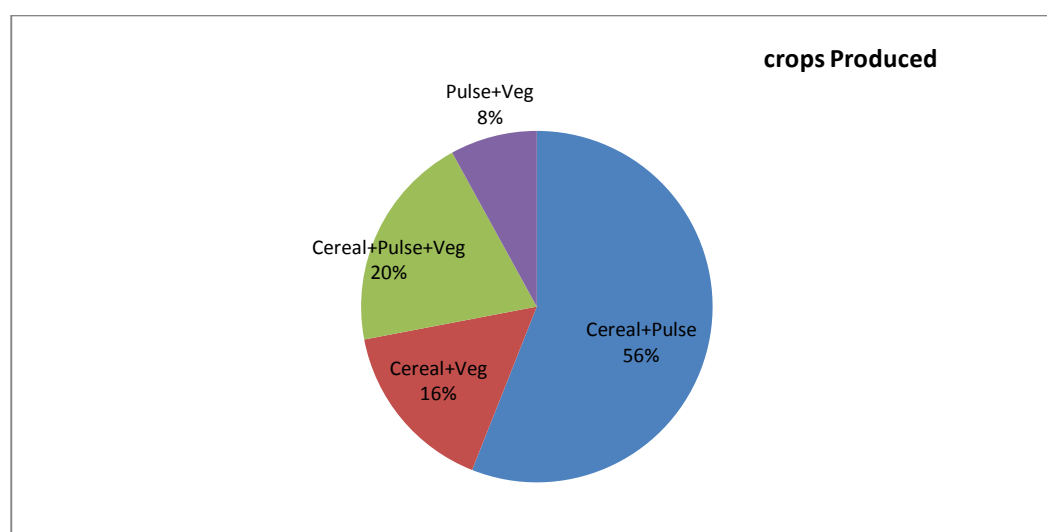
Rain fed agriculture is the main agricultural activity practiced in the area it is practiced by all of the respondents; 24% of them use Rain fed agriculture alone,12% of them use household irrigation together with rain fed agriculture ,60% of them use rain fed agriculture and livestock production altogether but the rest uses all the activities.

Graph 1:- Main Agricultural Activity practiced in the area



Cereals are the main crops produced in the area it is grown by more than three quarter (92%) of the respondents the rest produces pulses and vegetables. Out of the total cereal producers 56% of them produce pulses in addition to the cereals. 16% of them produce cereals and vegetables but the rest (20%) produces vegetables in addition to cereal and pulses. Pulses are grown by three quarter of the respondents (76%) and Vegetables are grown by 40% of the respondents who participated in the survey. The data above shows that, the information which is provided by the agricultural information service hotline about rain fed agriculture would be very relevant to farmers found in the study area since all of the farmers practice rain fed agriculture. Moreover, information concerning specific crops for e.g. barely, teff and season based agricultural activities like planting, fertilizer application and the like for those specific crops would also be accessed by the hotline.

Graph 2:-Main Crops Grown in the Area



4.2.3. Access to Agricultural Information

To undertake their day to day agricultural activities all of the interviewed farmers confirmed that, they do not usually need any information. They do their activities by themselves without consulting others. But when some catastrophe /unusual thing happened on their crop (disease or pests) or at the time when they need some seasonal agricultural information (usually fertilizer application) they consult the agricultural extension workers. Extension Workers are rated as the main information sources by 82%of the respondents. They preferred them as the main agricultural information source because they are reliable. Radio selected as an information source by 40% of the respondents. With regard to traditional ICT such as radio, the respondents reached the stage of confirmation by continuing to use the technology to get agricultural advices.

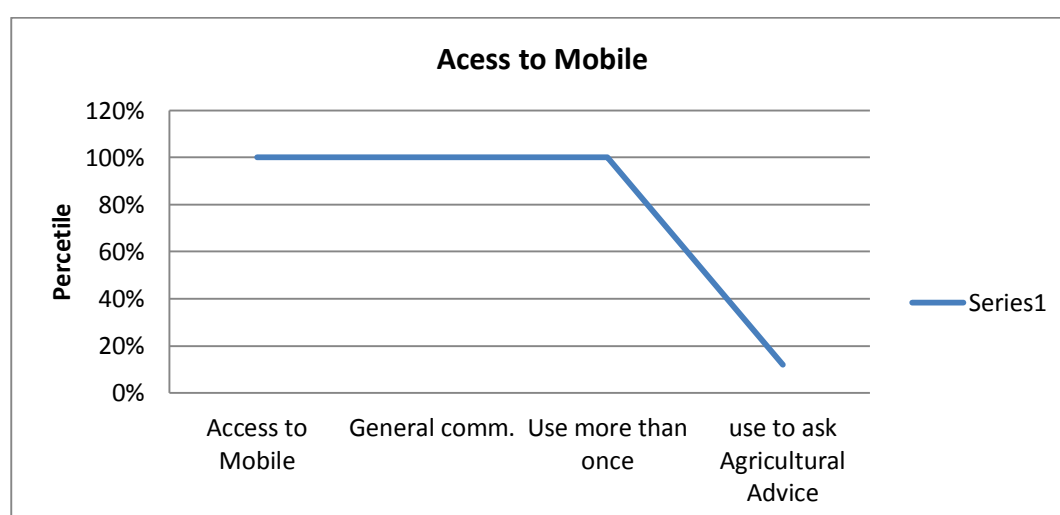
It is known that providing access to information to farmers helps them to increase their agricultural productivity and puts them in a favorable marketing position. Those farmers that have access to accurate, timely and appropriate information are believed to make better

decisions about what to produce, when to produce and how to produce than those who do not have such information.

4.2.4. Access to Mobile Phone

Mobile phone is among different channels which is used to access and share information. All of the respondents have mobile access and use it at least once per day for general communication purpose/personal use rather than asking agricultural advice from experts or from friends. But only 12% of the respondents use mobile phone to ask agricultural information and advices when need arises. If mobile phone is used as a communication method, it would be good to access agricultural and market information on a timely basis and also less expensive than the equivalent per search cost of personal travel to find agricultural extension workers and radio only provides agricultural information on a weekly basis.

Graph 3:- Access to Mobile



4.2.5. Knowledge, Access and Use of the Hotline

Even if the study focused on the knowledge, access and use of the agricultural information service (Hotline) it was not possible to get sufficient data on the use of the hotline. All of the

respondents have never called to the hotline or have never received voice message from the Hotline.

Table 3:- Knowledge, Access and Use of the Hotline

Access to Mobile	Responses of the respondents			
	1. Yes	2.No		Total
1. Do you know about the Agricultural Information Service Hotline?				
Frequency	13	37		50
2. When did you hear about the Hotline	1.before 6 months	2.before 1 year	3.before 1 & half year	
Frequency	6	5	2	13
3. How did you hear about the Hotline?	1.FromMedia(Radio)	2. From marketing materials (posters and calendars)	3.From live activation	
Frequency	8	3	2	13

Out of fifty respondents, nearly three quarter (74%) of them don't ever hear or know about the Hotline, but only 26 % of the respondents have known about its existence. From the total farmers (26%) who were aware about the Hotline, 16% of them hear from Radio, 6 % from posters but the rest from live demonstration undertaken in market areas. From the above data

we can see that the majority of the farmers hear about the hotline from radio. As Rogers stressed that "Mass media channels are relatively more important than interpersonal channels for earlier adopters than for later adopters." This generalization seems logical, since at the time that innovators adopt a new idea there is almost no one else in the system that has experience with the innovation.

Time is an important element in which an innovation depends on and it is a core aspect of any communication process. Time is the period from which an innovation coming towards knowledge to developing a habit of using it and sharing it to others.

From the total farmers (26%) who were aware about the Hotline, 12% of them know about the hotline 6 months ago, 10 % of them know it 1 year ago and the rest (4%) known about its existence 1 and half year ago.

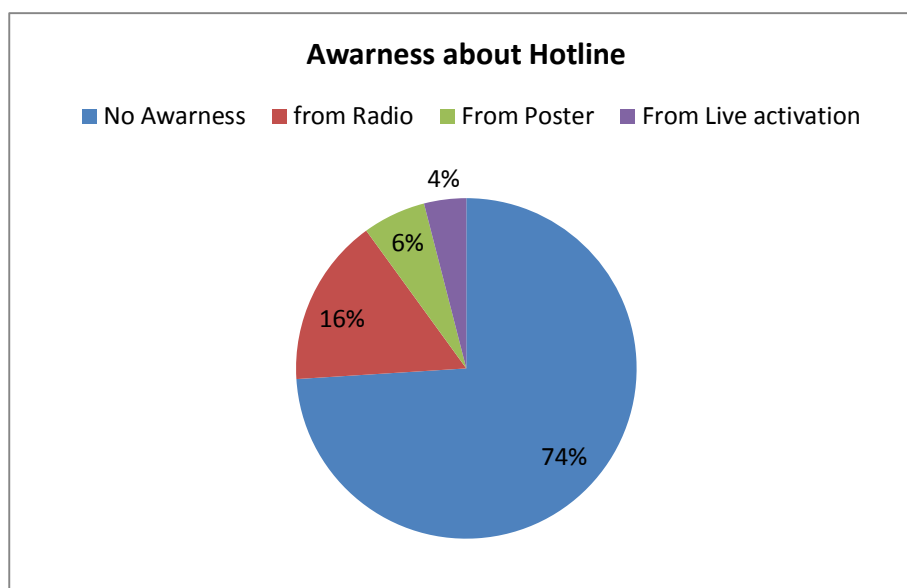
In diffusion of innovation the two mediums that are taken commonly as predominant in the diffusion of new ideas are the mass media and interpersonal communication. Interpersonal communication is taken as a first key means in facilitating or impeding the distribution of the innovation to users. Rogers stressed it as "Mass-media channels are more effective in creating knowledge of innovations, whereas interpersonal channels are more effective in forming and changing attitudes toward the new idea, and thus in influencing the decision to adopt or reject a new idea. Mostly an innovation is evaluated, not on the basis of scientific research by experts, but through the subjective evaluations of near-peers who have adopted the innovation" similarly, if there were farmers who adopted and make use of the Hotline before their counterparts will follow their footsteps since they will talk about its advantage.

The majority of the respondents (74%) do not have awareness or prior knowledge about the Hotline. Hence they have not even reached the stage of knowledge, according to Rogers' stages of adoption process. Many innovations require a lengthy period, often of some years, from the time when they become available to the time when they are widely adopted.

The "newness" aspect of an innovation is expressed in terms of knowledge, persuasion, or a decision to adopt. Out of the total population 26% of them are on the first stage of technological adoption, because at this stage people are exposed or being aware about the innovation but they lack full information so we can conclude that, they have reached the stages of knowledge,

An innovation-decision process is a process by which an individual passes from first knowledge of an innovation through its adoption or rejection therefore those farmers who were aware about the Hotline before, plenty of them have good intension towards it and they are interested in knowing about it at this stage the individual are interested in the innovation and actively seeks information/detail about the innovation.

Graph 4:- Knowledge, Access and Use of the Hotline



4.2.6. Factors affecting / hindering the Hotline use

Among the different factors that hinder the use of the hotline which was repeatedly mentioned by most respondents was Lack of Awareness. Most of the respondents do not know/ever heard about the hotline. The study came up /found out the following factors that adversely affect farmers' use of the Hotline or the technology adoption. The commonly identified factors are mentioned in the below table:

Table 4:- Factors affecting the Hotline adoption

Factors that affect the use of the Hotline	Responses of the respondents		
	Yes	No	Total
Illiteracy	2	48	50
Techno Phobia	11	39	50
Lack of awareness(Do not know the benefit of the Hotline)	37	13	50

More than 95% of the respondents mentioned that lack of awareness as a determining factor that hinders the farmers not to use the system. some of them even if they are aware about its existence not understanding the benefit put them back not to adopt it since awareness is not enough in order to adopt a technology/an innovation not understanding the use or not being convinced about its use is also a determining factor.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

The study aimed at assessing and examining how ICTs contribute in agricultural knowledge communication particularly in the agricultural information service hotline. It mainly focused on identifying farmers' use of the agricultural information service Hotline, and challenges that hinders them from adopting the Hotline.

Based on the findings of the study the following conclusions were drawn.

Knowledge is important to farmers to undertake their day to day agricultural activity and benefits them to have up-to-date information in all aspects and makes them to be competent and productive and ICTs contribution in this regard is very high.

Out of the key factors to be considered in the development of knowledge Management in agriculture, ATAs' Agricultural information Service Hotline fulfills all the key factors, since the system uses simple technology, it is easy to use; any farmer, who has a simple form of telephone can use it, contains standardized and relevant information from pre-planting up to harvesting.

Agricultural Transformation Agency of Ethiopia implemented an IVR/SMS system that disseminates agronomic advice to the farmers/ development agents (DA) for free; the practice is still in an infant stage. The main reason for this is Farmers have no awareness about the

existence and benefit of the Hotline even if ATA officials claimed, promotional event were undertaken on different market places on the pilot areas.

Because of not involving all stake holders including smallholder farmers and their indigenous knowledge at the beginning of the content formation, ATA forced to refine the content of the IVR by the feedback from farmers by using focus group discussion, key informant interview because there were some mistakes on the content was detected.

The evidence above shows that, Agricultural extension workers or DAs were served as the main agriculture information source by 82% of the respondents followed by radio, 40% and Mobile 12%. This indicates that the practice of using traditional ICTs such as radio is not that much practiced let alone modern ICTs such as mobile.

Out of fifty respondents, nearly three quarter (74%) of the respondents don't ever heard or know about the Hotline but they showed their interest to use the system and in relation to its Woreda level experts and agricultural extension workers who knew about the agricultural information service hotline have not tried it. It is only in the wall of their office the posters are hanged. So we can conclude that awareness creating mechanism which ATA used before is not enough in order to adopt and make use of a technology, convincing them about the use should be inline of this.

5.2. Recommendations

Based on the conclusion of the findings, the following recommendations are suggested.

- The above study shows that, in the study area the practice of using traditional ICTs such as radio is not that much practiced let alone modern ICTs such as mobile . ICTs contribution in disseminating knowledge and information is vital so the government should give a very good emphasis in developing the sector.
- Besides hiring advertising consultant, awareness creation activity about the Hotline for the intended purpose should involve Woreda level experts and agricultural extension workers so that they too know the system and can transfer the knowledge since they are near and trusted by the farmers.
- In an intervention like this, which is done with high capital and consultants from abroad care should be taken in involving all stakeholders including the small holder farmers and their indigenous knowledge from the beginning instead of correcting the mistakes encountered on the contents at the middle of service delivery. So consideration to users' needs should be there from the beginning
- There should be a coordinated way of handling this huge intervention so that all the concerned stakeholders should be in line for success in regards to content development, awareness creation and handling of the system so that farmer/intended users can adopt and get benefit out of it. Here Ministry of agriculture should take the lead because it has acceptance from the farmers and even have employees at regional, zonal and Woreda level.
- An impact of the intervention should be assessed from time to time in order to ensure its effectiveness and measure the intended outcome.

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APPENDICES

Appendix A

Interview Guide for In-Depth Interview

I. Interview Guide for ATA ICT Technical Expert:

Background Information of Respondents:

- I. Name -----
- II. Gender-----
- III. Position-----
- IV. Education level-----
- V. Experience-----
- a. For how many years have you been in your current job?-----

IVR/SMS Related questions:

1. What is Agricultural Information Service Hotline (8028) or the IVR/SMS system?
2. What was your role in the establishment of the IVR/SMS system? How do you express your current contribution to the process?
3. Explain the role of ICT in the implementation and running of the system?
4. What ICT tools did you use, in proper management of knowledge, in capturing, storing, accessing, disseminating and sharing of knowledge?
5. What is your justification in selecting Telephone (IVR/SMS system) over traditional media such as radio, television and video or modern ICT tools such as Internet, email, electronic Medias in disseminating knowledge and information?
6. Did ICT tools play roles in facilitating the documentation and/or preservation of indigenous knowledge? (You can consider computers, video cameras, tape recorders, TV, etc as part of ICT tools)
7. What major technical challenges were faced in the establishment of the system? What actions were taken to overcome such challenges?
8. What are your strategies to expand and develop the functions of the IVR/SMS system further?
9. Explain about the mechanisms of updating the already existing content or addition of new content to the system when demand arises to provide up to date and timely information?
10. Do you have any suggestions related to ICT infrastructure or use of Information Communication Technology? If yes, please specify
11. What else can you comment, advice or pass on a message about the IVR/SMS system or about this research?

II. Interview Guide for ATA Value chain expert:

Background Information of Respondents:

- VI. Name -----
- VII. Gender-----
- VIII. Position-----
- IX. Education level-----
- X. Experience-----
- a. For how many years have you been in your current job?-----

IVR/SMS System related questions:

1. Do you think your organization is the responsible organ in determining and taking actions needed to solve agricultural problem? How do you explain the IVR/SMS system in accomplishing your organizational objective?
2. How do you explain the IVR/SMS system in solving agricultural production problem or in fully exploiting its production potential?
3. What was your role in the establishment of the IVR/SMS system? How do you express your contribution to the process?
4. Was the establishment of an IVR/SMS system request first initiated by ATA or was it the plan of EIAR or MoA? How long did it take to implement the IVR/SMS system from planning to implementation?
5. How did you extract the necessary knowledge for the system and who were involved in the process?
6. Were there any formal or informal mechanisms to document and/or preserve indigenous agricultural knowledge of farmers during knowledge capturing?
7. Did ICT tools play roles in facilitating the documentation and/or preservation of indigenous knowledge? (You can consider computers, video cameras, tape recorders, TV, etc as part of ICT tools)
8. What is your justification in selecting telephone technology over traditional media such as radio, television and video or modern Medias such as Internet, email, electronic Medias in disseminating knowledge and information?
9. What is the role of this modern ICT tool (telephone) in substituting the role of extension workers in disseminating knowledge and information?
10. How do you explain the country's status in comparison with other Sub-Saharan African countries in terms of accessing technology-related advice as well as location-specific market information on inputs and outputs?
11. What are the basic components of the IVR? Do you think these components are enough? What efforts are you making to include other components (Livestock, forest, cash crops) other than the existing ones?
12. Do you think the information provided is up to date and timely?
13. How did users of the system especially farmers came to know about the system? (If there was any briefing before implementation?)
14. How do you explain the easiness of the IVR for less educated farmers? Is that a desirable approach to follow in large scale interventions since most of our farmers don't have formal education?
15. In your opinion does the IVR serve in its full capacity? If not what are the reasons?

16. Do you think that the service provided by the IVR can cover the current demand? If not what has to be done?
17. Is there any link with other organizations that have previously adopted IVR system regarding
 - a) Sharing experience and information
 - b) Solving problems encountered
18. What else can you comment, advice or pass on a message about the IVR/SMS system or about this research?

III. Interview Guide for MoA Agricultural Expert

Background Information of Respondents:

- I. Name -----
- II. Gender-----
- III. Position-----
- IV. Education level-----
- V. Experience-----
- a. For how many years have you been in your current job?-----

IVR/SMS Related questions:

1. Do you think your organization is the responsible organ in determining and taking actions needed to solve agricultural problem or exploit the identified opportunities? How do you explain the IVR/SMS system in accomplishing your organizational objective?
2. How do you explain the IVR/SMS system in solving agricultural production problem or in fully exploiting its production potential?
3. What was your role in the establishment of the IVR/SMS system? How do you express your contribution to the process?
4. How did you extract the necessary knowledge for the system and who were involved in the process?
5. What were the major sources of information/knowledge?
 - a) From research institutes
 - b) Ministry of Agriculture
 - c) Search on the Internet, DVD/CD, or other ICT-supported sources
 - d) From books or publications
 - e) Other
6. Were there any formal or informal mechanisms to document and/or preserve indigenous agricultural knowledge of farmers during knowledge capturing?
7. Did ICT tools play roles in facilitating the documentation and/or preservation of indigenous knowledge? (You can consider computers, video cameras, tape recorders, TV, etc as part of ICT tools)
8. Do you think the information provided in the hotline is up to date and timely?How and why?
9. What else can you comment, advice or pass on a message about the IVR/SMS system or about this research?

Questionnaire

IV. English Questionnaire

Questionnaire on Farmers' use of the Agricultural Service Hotline

I. Record keeping Information

Kebele.....

II. Introduction to the survey:

My name is Sosena Obesie I am Addis Ababa University School of Journalism and Communication Student. I am conducting a Master's thesis on the topic of "The Role of ICT in Agricultural Knowledge communication: The case of Agricultural Information Service Hotline (8028" Your opinions are important to the accuracy of the survey and I would appreciate your help. Thank you in advance for being part of the research.

III. Questions:

Section1. Background Information of the Respondents

1. Sex

Male ☐ Female ☐

2. Which of the following categories best describes your age?

a) Below 20 b) 21- 40 c) 41- 60 d) 61 -80 e) Above 80

3. What is your level of education?

a) No formal education b) From Grade 1-5 c) From Grade 6-12 d) Certificate
e) Diploma f) Degree g) other

4. Marital status

a) Not married b) Married c) Divorced d) Widowed

5. Which category best describes you?

a) Farmer b) Model Farmer

6. Total Land holdings of your own (household and farm) (Hectare)

a) < 1/4 hectare b) 1/4 - 1/2 hectare c) 1/2 h- 1 hectare d)> 1 hectare

7. What type of agricultural activities do you practice? (Multiple answers is possible)

- a) Rain fed agriculture b) Irrigation based agriculture c) Livestock production
- d) Other please specify _____

8. What are the major crops produced in your area? (Multiple answers is possible)

- a) Pulse: Chikpea, Common Bean....
- b) Horticultural Crops: Potato, carrot, onion, garlic, tomato, pepper
- c) Cereal: Barley, maize, sorghum, teff, wheat
- d) Oil Seeds: Sesame, Fava Bean, Cotton (Cash Crop (Coffee)

Section2. Questions related to access to ‘Agricultural Information’:

9. What type of information do you usually need for the day to day agricultural activities? (Multiple answers is possible)

- a) About Pre-Planting b) About Planting & Transplanting c) About Pre-Irrigation
- d) About Irrigating Crops e) About Crop Protection f) About Fertilizer Side Dressing
- g) About Harvesting and Post harvesting h) all

10. From where do you get that information? (Multiple answers is possible)

- a) From Friends b) From Model Farmers c) From agriculture extension workers
- d) From traditional medias (radio, TV) e) From modern ICT tools (Mobile, Internet)
- f) If from other source, please specify _____

11. Which one of these (mentioned above) is your preferred source of agricultural information? Why? _____

12. How often do you get the necessarily agricultural information?

- a) Not require (will do by my own) b) Every day c) Every other day
- d) Once in a week e) Once in a month f) When needed g) Others Specify _____

Section3. Questions related to access to Mobile

13. How long have you used mobile service?

- a) < one year b) 2-5 years c) 6-10 Years d) >10 years e) I never use mobile

14. What are the major tasks you do with your Mobile? (Multiple answers is possible)

- a) For general communication Purpose b) Browsing Internet, E-mail and Face book
- c) Listening Music and Radio d) all e) other specify _____

15. How often are you using mobile for general communication purpose a day?

- a) More than once a day b) once a day c) once a week d) Once a month
- e) Never used

16. Have you ever used Mobile to get agriculture information and advice?
(It can be from Colleague, from agricultural extension worker or any other person)

- a) Yes b) No

17. How frequent are you using Mobile for the above mentioned purpose (question 18)?

- a) More than once a day b) once a day c) once a week d) Once a month
d) Never used e) when needed

Section4. Questions related to Knowledge, Access and Use of the Hotline:

18. Do you know about Agricultural Information Service Hotline?

- a) Yes b) No

19. If the answer for the above question is yes, when did you hear about it?

- a) Before 3 months b) Before 6 months c) Before 9 months d) Before one year
e) At the launching (1&half year before)

20. How did you hear about the Hotline?

- a) From a friend b) From Model Farmers c) From Medias (radio, TV)
d) From live activation e) From agricultural extension workers (DAs)
f) From marketing materials (posters and calendars)
g) If from other source, please specify _____

21. How often do you call to 8028 Hotline?

- a) Not at all b) Every day c) Every other day d) Once in a week
e) Once in a month f) When needed g) I stopped calling

22. If you stopped calling to the Hotline, what is your reason? Please specify

23. Have you ever receive voice message from the Hotline?

- a) Yes b) No

24. If the answer for the above question is yes, how many times have you received?

- a) Once b) Two times c) More than two times
d) I have received but I don't remember how much I received

25. From advices related to the main agricultural practices on the Hotline, which type of advice have you used? (Multiple answers is possible)

- a) Rain fed agriculture b) Irrigation based agriculture c) Both d) I never used

26. From advices related to the main agricultural activities on the Hotline, what type of advice have you used? (Multiple answers is possible)

- a) About Pre-Planting b) About Planting & Transplanting c) About Pre-Irrigation
d) About Irrigating Crops e) About Crop Protection f) About Fertilizer Side Dressing
g) About Harvesting and Post Harvesting h) I never used

27. Which aspects of the information you get from the Hotline is interesting? Please specify:

Section 5. Questions related to Farmers' perception towards the Hotline:

28. What is your attitude towards the Hotline? Please describe based on the following criteria:

	a) strongly agree b) Agree c) Neutral d) Disagree e) Strongly disagree
Is the Hotline easily accessible any time you want?	
Is the registration process too long?	
Is the Hotline easy to use and operate?	
Is the Hotline facilitates access to new information?	
Is the Hotline offers valuable & useful information for your daily agricultural activity?	
Does the Hotline minimize costs which were incurred to get agricultural information?	
Is the Hotline offers timely, correct and updated information?	

29. Generally, How do you find the operation of the Hotline?

- a) Excellent b) Very good c) Good d) Poor

30. What aspects of services do you like to be improved in the Hotline?

Section6. Questions related to Factors that affects the use of the Hotline:

31. What are the major factors that hinder the use of the Hotline? Please select on the following criterion:

Factors		a) Yes b) No
Illiteracy		
Techno Phobia		
Not easy to operate, not user friendly		
The operation is complex and too long		
The information/the content is complex		
There is no new knowledge/information offered. We already know what is there		
The information is not reliable		
Do not provide location specific information(Topics are not specific to our area)		
It offers too much information which is not relevant		
Sometimes the System disrupts at the middle		
Disruption of telephone networks		
Lack of awareness (Do not understand the benefit of the Hotline)		
I have never heard about the Hotline		

32. Any other challenges encountered in regards to infrastructure, Operation and content of the Hotline? Please specify: _____

Section7. Future direction and concluding questions:

33. If the challenges faced and the problems encountered are solved, are you willing to use the Hotline for advices related to your daily agricultural activity?

a) Yes b) No

34. If the answer for question 34 is No, Please specify your reason

35. If other beginners of the Hotline user need your advice, what do you like to tell them from your experience?

a) To continue using b) To stop using c) Nothing to tell them d) other specify _____

36. What else can you comment, advice or pass on a message about the Hotline or about this research? _____

IV. Closing: thanks for participating in the research

V. Amharic Questionnaire:

መጠይቅ

መጠይቅ ስለ 8028 የግብርና መረጃ አገልግሎት

ስለተጠያቂው ጠቅላላ መረጃ

1. ፆታ

ወ

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ሴ

☐

2. እድሜ

ሀ. ከ 20 በታች ለ. 21-40 ሐ. 41-60 መ. 61-80 ሠ. ከ 80 በላይ

3. የትምህርት ደረጃ

ሀ. ያልተማረ ለ. 1-5 ሐ. 6-12 መ. ስርተፊኬት ሠ. ዲፕሎማ ረ. ዲግሪ ሰ. ሌላ

4. የትዳር ሁኔታ

ሀ. ያላገባ ለ. ያገባ ሐ. የተፋታ መ. ባል ወይ ሚስት የሞተበት

5. እርስዎ የቱ ይገልጽዎታል

ሀ. አርሶ አደር ለ. ሞዴል አርሶ አደር

6. በአጠቃላይ ያሉት የመሬት መጠን

ሀ. $\frac{1}{4}$ ሄክታር ለ. $\frac{1}{4}$ – $\frac{1}{2}$ ሄክታር ሐ. $\frac{1}{2}$ – 1 ሄክታር መ. ከ1 ሄክታር በላይ

7. ምን አይነት ግብርና ነው የምትጠቀሙት (ከአንድ በላይ መልስ መመለስ ይቻላል)

ሀ. የመስኖ እርሻ ለ. በዝናብ ላይ የተመሰረተ ተግብርና ሐ. ከብት ማርባት

መ. ሁሉም ሠ. ሌላ ግልጽ-----

8. ምን ምን ምርት ነው የምታመርቱት (ከአንድ በላይ መልስ መመለስ ይቻላል)

ሀ. የእህል ዘር ለ. ጥራጥሬ ሐ. የቅባት እህል መ. አትክልት (ድንች፣ ሽንኩርት..)

ሠ. ቡና ረ. ሁሉም

9. የቤት ውስጥ መስኖ ይጠቀማሉ

ሀ. አዎ ለ. አልጠቀምም

ስለ ግብርና መረጃ የተመለከተ

10. ወቅታዊም ሆነ የእለት የእለት የግብርና ስራዎችን ለማከናወን መረጃ ይፈልጋሉ?
 ሀ. አዎ ለ. አልፈልግም
11. የሚፈልጉ ከሆነ ምን ምን አይነት መረጃዎችን ነው የሚፈልጉት?
 ሀ. ስለ ቅድመ ዘር ለ. ስለ አዘራር ሐ. ስለ ቅድመ መስኖ መ. ስለ መስኖ አጠቃቀም
 ሠ. ስለ ተክል ጥበቃ ረ. ስለማዳበሪያ አዘገጃጀት ሰ. ስለ ምርት አሰባሰብ እና ድህረ ምርት አሰባሰብ
 ሸ. ሁሉንም
12. የግብርና ስራዎችን ለማከናወን የሚጠቀሙበትን መረጃ ከየት ነው የሚያገኙት?
 ሀ. ከጓደኛ ለ. ከሜዴል አርሶ አደሮች ሐ. ከልማት ሰራተኞች መ. ከፊደላት እና ቴሌቪዥን
 ሠ. በሞባይል ረ. ከሌላ ምንጭ -----
13. ከላይ ከተጠቀሱት ውስጥ የትኛውን ይመርጣሉ?

14. በየሰዓት ጊዜው ይሄን መረጃ ያገኛሉ?
 ሀ. አልፈልግም ለ. በየቀኑ ሐ. በ የሁለት ቀኑ መ. በሳምንት አንዴ
 ሠ. በወር አንዴ ረ. ስፈልግ ሰ. ሌላ ግለፅ-----

ስለሞባይልአጠቃቀም

15. በግም ሞባይል መቼ መጠቀም ጀመሩ ?
 ሀ. ከ 1 አመት በታች ለ. 2-5 አመት ይሆነኛል ሐ. 6-10 አመት ይሆነኛል
 መ. ከ10 አመት በላይ ይሆነኛል ሠ. ሞባይል አልጠቀምም
16. ሞባይሎችን ለምን ለምን አገልግሎት ይጠቀሙበታል?
 ሀ. ከሰው ጋር ለመገናኘት ለ. መዝናኛና ፊደላት ለማዳመጥ
 ሐ. ኢንተርኔት ለመጠቀም መ. ሁሉም ሠ. ሌላ ግለፅ.....
17. በቀን ስንት ጊዜ ሞባይሎችን ከሰዎች ጋር ለመገናኘት ይጠቀሙበታል?
 ሀ. ከአንድ ጊዜ በላይ ለ. በቀን አንዴ ሐ. በሳምንት አንዴ
 መ. በወር አንዴ ሠ. አልጠቀምም
18. በሞባይልዎት ደውለው የግብርና መረጃ ጠይቀው ያውቃሉ (ከባድ በሽታም ሆነ አንዳች አደጋ ሲከሰት)
 ሀ. አዎ ለ. አላውቅም

19. ተጠቀመው ካወቁ በየስንትጊዜ?

ሀ. ስፈልግ ለ. በቀን አንዴ ሐ. በሳምንት አንዴ መ. በወር አንዴ

8028 የተመለከተጥናት

20. 8028 ለመጠቀም ተመዝግበዋል?

ሀ. አዎ ለ. አልተመዘገቡም

21. መቼ እንደተመዘገቡ ያስታውሳሉ ? በግምት

ሀ. ከሶስት ወር በፊት ለ. ከ6 ወር በፊት ሐ. ከ 9 ወር በፊት መ. ከአንድ አመት በፊት

ሠ. ገና ሊሰመረት (ሲተዋወቅ)

22. ስለ 8028 ማንነገሮት (ከማንሰሙ?)

ሀ. ከጓደኛ ለ. ከሞዴልአርሶአደር ሐ. ከፌዴራልኤጀክቲቭ

መ. ሲስተዋወቅ ሠ. ከልማትጣቢያሰራተኛ ረ. ከበራሪወረቀቶች

ሰ. ከሌላግለፅ

23. በ የስንት ጊዜው ወደ 8028 ይደውላሉ?

ሀ. አልደውልም ለ. በየቀኑ ሐ. በየሁለት ቀኑ

መ. በሳምንት አንዴ ሠ. በወር አንዴ ረ. ስፈልግ ሰ. አሁን መደወል አቁሚያለሁ

24. አሁን መደወል ካቆሙ ምክንያቶ ምንድነው?

.....

25. የድምጽ መልእክት ከ 8028 ደርሶት ያውቃል

ሀ. አዎ ለ. አልደረሰኝም

26. ደርሶት የሚያውቅ ከሆነ ስንቴ ደርሶዎታል?

ሀ. አንዴ ለ. ሁለቴ ሐ. ከሁለቴ በላይ

መ. ደርሶኝ ያውቃል ግን ስንቴ እንደሆነ አላስታውስም

27. በ 8028 ከሚሰጡ መረጃዎች የትኛውን ይጠቀማሉ/ ተጠቅመው ያውቃሉ?

ሀ. በዝናብ ላይ የተመሰረተ ተግባርና መረጃ ለ. የመስኖ ግብርና መረጃ ሐ. ሁለቱንም

28. ከ8028 ካሉ ዋና ዋና የግብርና አሰራሮች ላይ ከሚሰጡ የምክር አገልግሎቶች የትኛውን ተጠቅመው ያውቃሉ (ከአንድ በላይ መልስ ይቻላል)

ሀ. ስለ ቅድመ ዘር ለ. ስለ አዘራር ሐ. ስለ ቅድመ መስኖ መ. ስለ መስኖ አጠቃቀም

ሠ. ስለ ተክል ጥበቃ ረ. ስለ ማዳበሪያ አዘገጃጀት

ሰ. ስለምርት አሰባሰብ እና ድህረምርት አሰባሰብ ሸ. ሁሉንም

29. ካገኙት መረጃ ውስጥ የትኛው መረጃ በጣም አስደስቶትዎታል? ግለጽ.....

ስለ 8028 ያሉትጠቅላላአስተያየት

30. ስለ 8028 ምንአስተያየትአሎት?

	ሀ. በደንብ እስማማለሁ ለ. እስማማለሁ ሐ. አስተያየት የለኝም መ. አልስማማም ሠ. በጣም አልስማማም
8028 በፈለኩኝ ጊዜ በቀላሉ መጠቀም ይችላለው ብለውያስባሉ?	
የምዝገባው ስነስርዓት ሂደቱ ረዥም ነውብለውያስባሉ?	
8028 ለመጠቀም ቀላል ነው ብለውያስባሉ?	
ወደ8028 በመደወሉ ወደ ሌላ ቦታ መረጃ ለማግኘት የሚያወጡትን ወጪቶች አሳውቅባሉ?	
ጊዜውን የጠበቀ መረጃ አገኛለሁ ብለውያስባሉ?	
ወቅታዊ ወይም አዲስ መረጃ ለማግኘት ይጠቅማል ብለው ያስባሉ?	
ጠቃሚ መረጃ አገኛለሁ ብለው ያስባሉ?	

31. ባጠቃላይ ስለ 8028 ምን አስተያየትአሎት

ሀ. እ.በ.ጥሩ ነው ለ. በጣም ጥሩ ነው ሐ.ጥሩ ነው መ. ጥሩ አይደለም

32. ምን መሻሻል አለበት ብለው ያስባሉ

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33. አገልግሎቱን ሲጠቀሙ ምን ምን ችግር ገጠሞታል ?

	ሀ. አዎ ለ. አይደለም
ያለመማር ችግር	
ቴክኖሎጂ ለመጠቀም መፍራት	
አጠቃቀሙ ቀላል አለመሆን	
አጠቃቀሙ ረጅም እና የተወሳሰበ መሆኑ	
መረጃው የተወሳሰበ መሆን (ግለጽ አለመሆን)	
ምንም አዲስ መረጃ አለማግኘት	
መረጃው ተአማኒ አለመሆን	
ለአካባቢው ምቹ እና ልዩ የሆነ መረጃ አለማግኘት	
ብዙ ግን ጠቃሚ መረጃ ስላልሆነ	
የሲስተም መቋረጥ	
የኔትወርክ ችግር	
ጥቅሙን አልመረዳት?	

34. ሌላየገጠመዎትችግርካለይግለጹ

.....

35. ከላይ ያጋጠሞት ችግሮችከተቀረፈሲስተሙንለመጠቀምፍቃደኛኖት?

ሀ. አዎ ለ. አይደለሁም

36. ፍቃደኛ ካልሆኑ ለምን?.....

37. አንድcአገልግሎቱንcተጠቅሞ የማያውቅ ሰው ስለ 8028 ቢጠይቅት ምን ምክር ይሰጡታል?

ሀ.መጠቀም እንዲቀጥል ለ. መጠቀም እንዲያቆም ሐ. ምንም አልለውም

መ. ሌላግለፅ.....

38. ባጠቃላይስለ 8028 ሆነስለዚህጥናትምንአስተያየትአሉት?

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Appendix B

I. Participant of the In-depth interview

Code	Name	Sex	Position
1	Ato Seyoum Getachew	M	Director-Household of Irrigation Program at ATA
2	Ato Temesgen Gebeyehu	M	ICT Technical Expert at ATA
3	Ato Elias Teshome	M	Irrigation program head at MoA