ACCESSIBILITY OF AGRICULTURAL KNOWLEDGE AND COMMUNICATION /ICT/ SERVICES TO SMALL FARM HOUSEHOLDS AND LEVEL OF UTILIZATION FOR AGRICULTURAL DEVELOPMENT: THE CASE OF DUGDA WOREDA OF EAST SHOWA ZONE, OROMIA REGION, ETHIOPIA

A THESIS

BY

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SUBMITED TO THE INSTITUTE OF AGRICULTURE AND DEVELOPMENT STUDIES, INDIRA GANDHI NATIONAL OPEN UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ART IN RURAL DEVELOPMENT

June, 2012

Addis Ababa, Ethiopia

DECLARATION

I hereby declare that the dissertation entitled Accessibility of agricultural knowledge and communication /ICT/ services to small farm households and level of utilization for agricultural development: The case of Dugda Woreda of East Showa Zone, Oromia Region, Ethiopia submitted by me for partial fulfillment of the requirements for the degree of master of art in rural development to Indira Gandhi National Open University (IGNOU), New Delhi is my own original work and has not been submitted earlier to IGNOU or to any other institution for the fulfillment of the requirement for any course of study. I also declare that no chapter of this manuscript in whole or in part is lifted and incorporated in this report from any earlier work done by me or others.

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ACKNOWLEDGEMENTS

I am deeply grateful and indebted to Dr. Mengistu Hulukka, my advisor, for his Scholarly guidance, supervision and suggestions. Successful accomplishment of this research would have been very difficult without his generous time devotion from the early design of the research to the final write up of the thesis by providing valuable constructive comments and thus I am indebted to him for his kind and tireless efforts that enabled me to finalize the study.

Similarly, I would like to express my sincere appreciation and gratitude to my friend Asayhegn Gezahegn for his heart full help and contribution to my study during data collection.

Finally, I would like to acknowledge the help received from all other collaborated individuals for their unforgettable cooperation to my work.

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ACRONYMS

CD- ROM Compact Disk Read-only Memory

CSA Central Statics Authority

CTA Technical Centre for Agricultural and Rural Cooperation

DAs Development Agents

FAO Food for Agriculture Organization

FHHs Female Head Households

GDP Gross Domestic Product

ICT Information Communication Technology

IICD International Institute for Communication and Development

IPMS Improving Productivity and Market Success

MFI Micro Finance Institute

NGOs Non Governmental Organizations

PAs Peasant Associations

REFILS Research - Extension – Farmers – Inputs - Linkage System

SMS Subject matter specialist

TV Television

VCD Variable- Capacitance Diode

ABSTRACT

Access to and utilization of agricultural knowledge and communication/ICTs is a key to agricultural development. Hence, the purpose of this study was to assess the level of farmers' awareness on the use of ICT, the barriers to access and utilization of ICT and the associated constraints by farmers in Dugda woreda of East Showa Zone of Oromia Region. A two stage random sampling procedure was used for the survey and the necessary data was obtained by face-to-face interview using a structured interview schedule and through focus group discussions. Data analysis was done through the use of simple descriptive statistics such as frequency counts, mean and percentages. The results of the study had revealed that, ICTs for imparting agricultural information was not accessible to farmers mainly due to their low educational level, large family size that had created pressure on farmers' lower income, non- participation of farmers in social institutions which had made them lost the opportunity they might gain in sharing vital agricultural knowledge and information, lower income generated from subsistence crop production, lack of awareness on the benefits of ICTs for agricultural production and productivity, poor infrastructural facilities in the area and long distance of ICT services from farmers residences. It was recommended that in the effort to provide ICT services to farmers more emphasis should be given to the provision of information relevant to their farming systems and compatible with the farmer's needs or expectations, literacy level, language, and social norms or cultural differences. Hence, ICT should be: affordable, scalable, sensible and appropriate to the farmers' real situations.

Chapter One: Introduction

1.1 Background of the study

Ethiopia is one of the largest countries in Africa. The total population of the country is estimated at 79,221,000 (CSA, 2008). Agriculture is the most important sector in Ethiopian economy with the majority of the rural population depend their livelihood on it. Ethiopia's total land area is about 1.1 million square kilometers of which about 73.6 million hectares (66%) is estimated to be potentially suitable for agricultural production (Tsehay, 2001). The study had indicated that out of the total land area suitable for agriculture, the cultivated land is estimated to be 16.5 million hectares (22%) and about 96% of the cultivated land area is under smallholder farming while the remaining is used for commercial farming (both state and privately owned). Hence, its agriculture is important for general economic development of the country. The significance of agriculture to the Ethiopia's economy arises from the fact that, in the fiscal year of 2007/08, it contributed to about 45.9% of GDP, to more than 88% of export trade and about 85% of employment (CSA, 2008). Importance of agriculture is also indicated by many other benefits such as, support for the transport system and domestic trade.

Increasing production is a major challenge facing present agriculture in Ethiopia. Smallholder farmers that account for more than 75 percent of the farming community in rural Ethiopia dominate the landscape of the country, and yet it continues to face significant problem in accessing production inputs and high value markets for their products (Chimdessa,1998). However, the growing demand for agricultural products offers opportunities for producers to sustain and improve their livelihoods.

There are a number of factors that contribute towards the success of attaining agricultural development, particularly to the small farm households. These factors include availability of capital, equipments, manpower, market, credit/loan, institutional mechanisms, ICT and so on. Even if all these factors are important, information and communication technologies (ICT) play an important role in addressing the aforementioned agricultural challenges and uplifting the livelihoods of the rural poor.

ICT services provide critical access to the knowledge and information and technology that farmers require to improve the productivity and thus improve the quality of their lives and livelihoods. It is, hence, crucial to provide farmers with the knowledge and information in a quality and timely way.

According to the study conducted by Bagetoft and Olesen(2004) the importance of farmers' to have access to information is known in reducing the transaction costs of exchange caused by information asymmetry between actors. Besides, similar study conducted by de Silva(2008)on the impact of ICT to the agricultural development revealed that the provision of ICT based market information services can improve farmers' access to market information and hence facilitate trade. At micro-level farmers/households benefit by using ICT technologies for exchange of information. On the other hand, the use of ICT reduces cost in finding and selecting a trading/exchange partner (i.e., search and screening costs), and the costs of negotiating and monitoring the terms of the transaction and the costs of adjusting the terms of exchange. Its use also reduces the price spread in the output market (Aker, 2008). The use of ICT technologies can also reduce the costs of acquiring credit and other inputs (e.g., seed, fertilizer, and technical advice) by lowering search, screening, negotiation and monitoring costs, thus,

increasing the margins and revenues assuming that there is constant output price. Reduction in input costs and hence increased margins, on the other hand, spur commercialization, thus foster agricultural development and improvement in household welfare. It can also retard the exclusion of the economically less endowed households by improving the earnings of such households (Chigona et al., 2009).

Theoretically, for the commodity-source market, the reduction in costs of doing business benefits traders by increasing the net price earned and hence margins. Assuming there is efficient transmission of price to the farmers, ICT-mediated access to information can raise the price earned by farmers and result in household asset/capital accumulation. In the medium to long-term, household capital accumulation can in turn stimulate investment in agriculture, commercialization and improved household welfare. For instance De Silva (2008) finds that access to market information through mobile phones improves the welfare of small export vegetable growers by increasing their linkage to better paying export market and also reducing the losses they incur as rejects and uncollected produce in Columbia. Anderson etal (1998) and Aker (2008), on the other hand, suggest that increased availability of information improve the process of price discovery (by reducing search, negotiation and policing costs) and thus improves marketing efficiency and hence farmers incomes.

The Government of Ethiopia has given due emphasis to agricultural development through expansion of ICT facilities to provide the important link between agricultural researches and farming communities, especially for technology transfer in support of agricultural and rural development. However, there is a strong criticism circulating in recent years. According to Qamar (2002), this criticism is due to its top-down approach, which has

been supply-driven, technically weak, catering only to large farmers (progressive farmers) and providing insufficient coverage of the small-scale farmers. This implies that proven agricultural technologies, which are needed to ensure higher productivity and food security, are not able to reach the millions of small-scale farmers scattered in the rural areas. Consequently, these farmers have managed to obtain information from other sources such as other farmers, input dealers, produce buyers and NGOs.

Even though a number of researches carried out were able to establish the enabling influence of ICT to foster agricultural development, yet the problems related to the level of utilization of the already available ICT and barriers to the utilization of ICT by the small farm holders is the one which has not been fully addressed. Thus, the current situation in the utilization of ICT by the small farm holders has aroused interest to analyze the level of utilization by farmers the already available ICT and examine the factors that impede their effective utilization in Dugda Woreda of Eastern Shoa Zone, Ethiopia.

1.2 Statement of the problem

Though agriculture is the most important sector in Ethiopian economy with the majority of the rural population depend for their livelihood on it and various extension efforts were exerted in the past, the performance of the sector has not much improved to the desired level. The agricultural sector and its problems have always dominated the Ethiopian economic scene. The present performance of the sector neither matches its potential nor does it meet the country's food demand. Therefore, the challenge in Ethiopia has been how to make advances in adopting and using technological packages in order to bring perceptible changes in the agricultural sector and eventually on the standard of living of the farmer (Chimdessa, 1998).

In Ethiopia, small farm holders who dominate the agriculture sector cultivate about 95% of the cultivated land area and are responsible for about 90% of the total food production (Chimdessa, 1998). According to Seme and Mulugeta(1998), crop yields were generally low, averaging 1.2 tons of grain per ha. This low productivity could be attributed to (1) unavailability of appropriate technologies (2) farmers' lack of awareness of recommended technologies that have been identified for their areas; (3) unavailability of inputs and supplies when needed by producers; and (4) policies that discourage technology adoption.

Developing effective and sustainable ICT services for the rural population, particularly to the resource-poor farmers within the context of broader rural development strategies also becomes a crucial challenge. Many authors concur that ICT facilities have failed to reach resource-poor farmers and few effective strategies for overcoming this failure have been developed.

As Munyua(2000) pointed out, when rural farmers lack access to knowledge and information that would help them achieve maximum agricultural yield, they are not only grope in the dark but are driven to the urban centers in search of formal employment, as the only option for survival.

Small farmers may not adopt innovations because they lack the resource needed to adopt them, or they may not be economical at a small level of production, or the technologies did not meet farmers' need or generally they may not have awareness about the technology itself (Franzal and van Houten, 1992). "Awareness" of the existence of innovation is the first and crucial element in the process of adoption or rejection of an idea to include or exclude into the exiting social system. Roling (1988) describes that larger farmers have more contact to Development Agents (DAs) and are more

cosmopolites to various sources of information than small farmers. The majority of small farmers obtain indirect and late information through the process of trickle down approach. This creates economic gap between them through the processes of windfall profit and windfall loss.

Various studies conducted on the role of ICTs in enhancing agricultural development indicate that, ICTs can provide critical access to the knowledge, information and technology that farmers require to improve productivity and thus improve the quality of their lives and livelihoods. Blait (1996) pointed out that the least expensive input for improved rural agricultural development is adequate access to knowledge and information in areas of new agricultural technologies, early warning systems (drought, pests, diseases, etc.), improved seedlings, fertilizer, credit, market prices, etc. Similarly, Aina (2007) raised an opinion that, farmers would benefit from global information, if information centres, cited in rural areas are complete with all information and communication gadgets. It is, hence, crucial to provide farmers with the knowledge and information in a quality and timely way. Although some ground-breaking tools like the telecenters can serve as major catalysts for information, knowledge and development opportunities, access to farmers in remote villages is restricted due to lack of infrastructure (UN, 2005).

The role of ICT to enhance food security and support rural livelihoods is increasingly recognized and was officially endorsed at the World Summit on the Information Society (WSIS, 2003-2005). This includes the use of computers, internet, geographical information systems, mobile phones, as well as working with folk media such as radio or TV for broadcast and listener participation, using video and multimedia for community expression and traditional community groups. Although it is a relatively new

phenomenon, evidence of the contribution of ICT to agricultural development and poverty alleviation is becoming increasingly available.

However, for rural farmers to benefit from such ICT services, first of all, they need to be aware of their presence and to use them. Undoubtedly, farmers will use ICT technologies that provide agricultural information if they find it convenient and profitable to do so.

Ethiopia, being a country with high degree of illiteracy and insufficient provision of ICT infrastructures, obviously faces the problem of accessing ICT services by the rural population in attaining the goal of agricultural development.

Rural farmers, especially small farm holders in Dugda Woreda of East Showa Zone, Oromia Region are not known to produce enough food, probably due to constraints that lead to lack of access to timely and up-to-date information which would have enabled them to achieve optimal yield from their farmlands. Over the years, these farmers heavily depend on indigenous or local knowledge for improved farming system/animal husbandry. Such knowledge (indigenous or local knowledge) refers to skill and experience gained through oral tradition and practice over many generations. Acquisition of such primitive skill by our rural farmers (e.g. rural farmers in the study area, Dugda Woreda) has not helped to improve agricultural yield, hence resulting in poor crop and livestock productivity.

It is witnessed that our agricultural system, being practiced by majority of the small farm holders, suffers from poor farm yield, emergence of new crop and animal diseases, weeds and pests that attack farm crops, backward farm implements, poor quality fertilizers, etc. These farmers, in their effort to access the required agricultural knowledge and

information/ICTs from available sources, for better farming system and improved agricultural yield, were confronted with certain constraints.

Even though a number of studies have been made on the adoption of new agricultural technologies in different parts of the country, nearly all of them were aimed at identifying factors affecting the adoption process of a particular technology. However, to the best of my knowledge, no study has been conducted to evaluate the level of coverage/access to farmers' awareness on the use of ICT, the barriers to access and effective utilization of ICT by the farmers, and the associated constraints by farmers in Dugda Woreda of Eastern Shoa Zone, Ethiopia**.**

This study was, therefore, designed to identify the constraints which hinder rural farmers in the study area from accessing agricultural knowledge and information/ICTs for improved crop production and better animal husbandry practices.

Research Questions

The research was conducted basically to answer the following questions:

1. What are the socio-economic characteristics of the farmers in the study area?
2. Do farmers in the study area use ICTs? If so, to what extent?
3. For what purpose do farmers in the study area use the already available ICT services?
4. What are the sources of knowledge and information, inputs and services (ICT sources) for the farmers in the study area?
5. What are the factors influencing the accessibility and utilization of knowledge and information (ICTs) by farmers in the study area?

1.3 Objectives of the Study

The overall objective of this study was to examine the farmers' knowledge and awareness on the presence and use of already available ICTs/agricultural knowledge and communication, as well as its accessibility amongst rural small farm holders in Dugda Woreda of East shwoa Zone, Ethiopia, and suggest mitigating solutions.

The specific objectives were to:

I. Describe the socio-economic characteristics of the farmers in the study area;
II. Identify the perceived behavior/awareness of the farmers in the study area on the use of already available ICT services;
III. Identify the factors influencing farmers' access to and utilization of ICTs in the study area;
IV. Identify farmers' possible sources of agricultural knowledge and Communication(ICT Sources) in the study area;
V. Assess the level of access to and utilization of ICTs by the farmers in the study area, and
VI. Recommend possible solutions on how to rectify the problem.

1.4 Scope of the Study

The scope of this research was limited to the assessment of accessibility and utilization of ICT services by the farmers in the study area. It did not cover the impact of ICT in enhancing agricultural development as it was largely studied by different researchers. Of course, as utilization of ICT services are influenced by a lot of factors, the study further tried to identify perceived behavior/awareness of the farmers in the study area on the purpose of ICT services, and the factors that hinder effective utilization of ICT services as

they are perceived to be critical issue to the rural population to enhance agricultural development.

The study had also limited its scope to assess the accessibility and utilization of ICT services by small farm households in the study area and not addressed commercial farms.

1.5 Significance of the study

This study contributes in understanding the level of awareness of farmers in the study area on using the ICT services, the effectiveness in the utilization of services, and the adequacy and accessibility of these services to farmers. It also assesses the reasons why small farmers in the study area are not using the currently available ICT services. Moreover, all farmers, extension agents, subject matter specialists, planners, researchers, policy makers, and other related government agencies, NGOs, and private sectors might use the result of this study to better understand the situation in the rural area and able to design and provide need based, and relevant ICT services that suit the different categories of farmers and address equity issues in the context of sustainable agricultural development. Finally, the result of this study will also serve as benchmark for further studies.

1.6 Limitation of the Study

It is common that every researcher faces certain constraints while conducting a research. Therefore, the major constraints faced by the researcher while conducting this study was associated to the shortage of financial resources (it was undertaken through researcher's personal means) and shortage of time due to different responsibility he bears and as a result, it was not possible to investigate the real situation of ICTs in all villages. Only perceived behavior/awareness of the farmers in the study area on the purpose of ICT

services and the factors that hinder effective utilization of ICT services were seriously investigated through sampling a few number of farmers in the study area. Illiteracy of some sampled farmers was also considered as constraint of this study. Some questionnaires distributed to these illiterate respondents were filled by the enumerators as they obtained the idea of respondents. However, questionnaires filled in such ways may lack the real intent or idea of the respondents fearing that the enumerators might write idea of the respondents with distortion. In addition, unavailability of sufficient relevant reading materials, other supporting data and unavailability of officials and some experts during data collection were some of the limitations the researcher was confronted during the study period.

1.7 Organization of the thesis

The rest of this thesis is organized in four chapters where the first chapter is already presented above. Chapter two presents both theoretical and empirical review of literature that includes concepts of small farm holders, concepts of knowledge and communication/information and its role in agricultural development, definitions of ICTs and its role in small farm holders agricultural production, sources and accessibility of agricultural knowledge and communication/ICTs by small farm holders, constraints to small farm holders accessibility and utilization of agricultural knowledge and communication/ICTs, empirical review of literature and conceptual frame work of the study. Chapter three presents a brief description of the study area and methodology of the research. Results obtained are presented and discussed in more detail in Chapter four. Chapter five presents summary, conclusions and recommendations.

Chapter Two: Literature Review

2.1 Meaning of ICTs and its application in agricultural development

Definitions of ICTs are as varied as they are diverse. Marcelle (2000) defines ICTs as a complex and heterogeneous set of goods, applications and services used for producing, distributing, processing and transforming information. Similarly, Ngenge (2003) perceives them as technologies that enable the handling of information and facilitate different forms of communication between human actors, human beings and electronic systems, and between electronic systems.

ICT is an acronym that stands for Information and Communication Technologies, which can be broadly interpreted as technologies that facilitate communication and the processing and transition of information by electronic means (CTA, 2003). This definition encompasses the full range of ICTs from Radio and Television to Telephones (fixed and mobile), computers and the internet. Likewise, FAO (1993) defined ICT as technologies involved in collecting, processing, storing, retrieving, disseminating and implementing data and information using microelectronics, optics and telecommunications and computers.

Overall, ICTs are grouped under two categories: 'traditional' and 'new'. Traditional (old) ICTs constitute no electronic media such as print and analogue technologies, i.e, radio, television, fixed line telephones, and facsimile machines. These technologies have been gradually ingrained in the daily lives of people and communities. On the other hand, 'New' ICTs consist of computers (in all their myriad manifestations) and data processing applications accessible through their use (email, internet, word processing, cellular

phones, wireless technologies and other data processing applications) (Gurumurthy, 2004:6; Marcelle, 2000: 8).

Agricultural Development, which depends largely on information exchange between and among farmers and a broad range of other actors, is an area in which ICT can have significant impact. Research Scientists can relate directly with the farmers through ICTs. Frontline extension workers, who are the direct link between farmers and other actors in the agricultural knowledge and information system, are well positioned to make use of ICT to access expert knowledge or other types of information that could be beneficial to the farmers. Accordingly, Arokoyo (2005) listed the potential applications of ICTs in agricultural development to include:

- Capacity to reach a large audience, e.g. the use of radio, TV and Internet
- Can be effectively used for training and demonstrations, e.g. T.V., Video, VCD, and CD-ROM.
- Can be used to make the extension systems and structures more efficient through better management of information and scarce resources, e.g. the use of Data bases for MIS and Networking soft wares
- For the search and packaging of information on demand and for exploring of alternative production options and technologies, e.g. the use of search engines, the web and data bases
- ICT may be used for normal weather forecasts and as a warning system for disease/pests outbreaks and other disasters before they occur and also for the provision of timely and sensitive market information. e.g. with the use of Radio, TV, and SMS.

- ICTs are important for networking among and between the key stakeholders in the Research-Extension-Farmers-Inputs-Linkage System (REFILS) e.g. with the use of Telephone, Video, SMS, and;
- ICTs can also be effectively used for community mobilization, learning and action, e.g. Radio, TV, public address systems and the Web.

2.2. The role of agricultural knowledge and communication /information/ in smallholder agricultural development

2.2.1. Concepts of smallholder/small farm householder

Small farms, also known as family farms, have been defined in a variety of ways. The most common measure is farm size: many sources define small farms as those with less than 2 hectares of crop land. Others describe small farms as those depending on household members for most of the labour or those with a subsistence orientation, where the primary aim of the farm is to produce the bulk of the household's consumption of staple foods (Hazell et al., 2007). Yet others define small farms as those with limited resources including land, capital, skills and labour. The World Bank's Rural Development Strategy defines smallholders as those with a low asset base, operating less than 2 hectares of cropland (World Bank, 2003). Moreover, a study by FAO defines smallholders as farmers with limited resource endowments, relative to other farmers in the sector (Dixon et al 2003).

2.2.2. Concepts of knowledge and communication/information and its role in agricultural development

According to Leeuwis (2004), knowledge is the one thing that accumulates among humans that can pass from one human to another almost intact, and that can be stored from generation to generation in some non-human form to be rediscovered by the infinity-plus one generation. Solomon and Engle (2000), explain knowledge as the set of concepts, meanings, skills and routines developed over time by individuals or groups as they process information. Moreover, as the primary cognitive content of cultures, knowledge includes all facts, concepts theories, and artifacts that are passed from one generation to another. Communication/Information is another term that has to be understood from the knowledge perspective. Information is clearly a broader term and includes all knowledge. The same authors explain information as explicit part of knowledge, which can be exchanged among people. It is a pattern imposed on carrier such as paper diskette, electronic cable and/or any sort of written or spoken message. Knowledge can be converted in to information through speeches, written language, expression graphic representation etc. However, information as a symbolic representation of knowledge is not the only form in which knowledge can be tangible because, in many ways human actions and practices as well as technologies and artifacts e.g. machines, seeds, varieties, roads and bridges can be seen as tangible expression of knowledge (Leeuwis, 2000). What actors know (believe) about social conditions, including conditions of their own action, but cannot express discursively/not expressed formally with strict structure/ no bar of repression, however, protects practical consciousness as is the case with unconsciousness (Giddens 1984, cited by Leeuwis,2004). In this regard,

when we equate consciousness with knowledge, we can see that discursive knowledge refers to knowledge we are aware of, have reflected up-on and can easily capture in language (i.e. can be converted to information). This type of knowledge is a type of knowledge that farmers are presented in a course on pest management, practical knowledge in a discursive form. Moreover, knowledge can be a "Tacit Knowledge" **(**as opposed to formal or explicit knowledge) when it cannot be transferred to another person as a result of it being written down or verbalized (Tesfaye *et al.,* 2010). Tacit knowledge is not easily shared and consists often of habits and culture that we do not recognize in ourselves. For example, for effective transfer of tacit knowledge generally requires extensive personal contact and trust. According to knowledge perspectives, actors generate, transform, integrate, exchange, disseminate and utilize knowledge while going about their daily businesses. Almost all knowledge has potential utility to someone, thus knowledge perspectives are inclined to require some sort of empirical test of utility as well as validity in other senses. Havelock (1986), strengthen this idea and said that a body of knowledge is, therefore, not made up of facts, but rather of the idea and values that govern the assignment of meaning. From these definitions, knowledge appears as the psychological state of an organism, which through processes such as learning, experience and the like has been acquainted to or has mastered some object of its environment. Moreover, based on scientific validation and utilization, knowledge can be classified according to characteristics like complexity, relative advantage (applicable mostly to instrumental knowledge use), diversity (technical communicability adaptable), communicability (adaptability to receiving cultures) and adaptability (Havelock, 1986).

In the context of agriculture, Umali (1994), classified knowledge and communication/information into two broad groups which include, i) pure agricultural knowledge and communication/information and ii) agricultural knowledge and communication/information inherently tied to new physical inventions. Pure agricultural knowledge and communication/information refers to any information which can be used without the acquisition of a specific physical technology. On the other hand, the new physical inventions are those technologies that come in the form of agricultural inputs, management, technologies facilitating farm management, marketing and processing equipment.

Agricultural knowledge and communication/information is definitely demand by agricultural stakeholders – especially researchers, educators, extensionists/development agents and producer groups in order to bring, communicate and share knowledge/ information and access resources to farming communities to enable them improve their production, incomes and standards of living.

2.3 The role of ICTs in smallholders' agricultural development

Today a new paradigm of agricultural development is fast emerging in both developing and developed countries. The overall development of rural areas is expanding in new directions; old ways of delivering important services to the farm society are being challenged; and traditional societies are being transformed into knowledge societies all over the world on account of the ICT provisions. The contribution of ICTs in fostering agricultural development cannot be over emphasized as a number of ICT projects carried out in many countries achieved this goal. The significance of ICTs is realized in many aspects such as improved access to relevant information by farmers (Kaino, 2007),

creation of conducive learning environment to the farmers (Kaino; 2004, 2006, 2007, and 2008), quality of knowledge delivery, provision of pre and post harvest information to the farmers, reduction of expenditure on marketing of their produce and many others (Kaino, 2008). This is the advantage of advances in Information Communication Technologies (ICTs) that have changed ways of farming and delivery of relevant knowledge to the farm society.

Increasing the efficiency, productivity and sustainability of small scale farms is an area where ICT can make a significant contribution. Farming involves risks and uncertainties, with farmers facing many threats from poor soils, drought, erosion and pests. Key improvements stem from information about pest and disease control, especially early warning systems, new varieties, new ways to optimize production and regulations for quality control supplied by ICTs.

Improving market access

Awareness of up-to-date market information on prices for commodities, inputs and consumer trends can improve farmers' livelihoods substantially and have a dramatic impact on their negotiating position. Such information is instrumental in making decisions about future crops and commodities and about the best time and place to sell and buy goods. In many countries, initiatives have appeared that seek to address this issue. Simple websites to match offer and demand of agricultural produce are a start of more complex agricultural trade systems. These sites tend to evolve from local selling/ buying websites and price-information systems, to systems offering marketing and trading functions. Typically, price information is collected at the main regional markets and stored in a central database. The information is published on a website, accessible to farmers via

information centers. To reach a wider audience, information is broadcast via rural radio, TV or mobile phone, thereby creating a 'level playing field' between producers and traders in a region. In Sri Lanka, the Govi Gnana project displays prices on light boards at major markets. The sustainability of these systems requires attention, with an important role for the private sector and organized producer groups. Web-based trading platforms offering one-stop shop facilities are emerging, especially for main commodities. In India the private sector led Agriwatch (www.agriwatch.com) and e Choupal programme (www.itcportal.com /ruraldevp philosophy/ echoupal.htm) support several million farmers with price information, tender and transaction facilities.

In recent years, short message and text services have taken up and effectively deliver prices and trading information via mobile phone to farmers. The set-up of price and market information systems has been piloted by IICD in Bolivia, Uganda, Tanzania and Ghana. Partner organisations are supported in adding ICT to core processes. In Ghana, IICD supports the Social Enterprise Foundation of West Africa (SEND) in linking rural soybean producers to mills, through the use of satellite, databases and mobile phones, thereby ensuring a fair income for producers and a steady supply of raw materials for the mills.

Capacity-building and empowerment

Communities and farmers' organizations can be helped through the use of ICTs to strengthen their own capacities and better represent their constituencies when negotiating input and output prices, land claims, resource rights and infrastructure projects.

ICT enables rural communities to interact with other stakeholders, thus reducing social isolation. It widens the perspective of local communities in terms of national or global developments, opens up new business opportunities and allows easier contact with friends and relatives. ICT can also play an important role in making processes more efficient and transparent. It helps in making laws and land titles more accessible (J. Stienen,W. Bruinsma, and F.Neuman,2007.IICD, International Institute for Communication and Development).

Global Positioning Systems (GPS) linked to Geographical Information Systems (GIS), digital cameras and internet, help rural communities to document and communicate their situation. Rural communities benefit from better access to credit and rural banking facilities. Recent mobile banking initiatives offer further scope to reduce costs and stimulate local trade. The Indian AMUL programme automates milk collection and payments for its 500,000 members, thereby enhancing transparency of the milk volume and quality collected and ensuring fair payments to farmers (J. Stienen, W. Bruinsma, and F.Neuman, 2007. IICD).

As so many studies indicate, agricultural extension services provide critical access to the knowledge, information and technology that farmers require to improve the productivity and thus improve the quality of their lives and livelihoods. It is, hence, crucial to provide farmers with the knowledge and information in a quality and timely way.

It is increasingly recognized that ICT is necessary for accessing required information and knowledge (Richardson 1997; Chapman et al. 2004; Anandajayasekeram et al. 2008; McNamara 2009; Aker 2010). ICT kiosks, ICT-equipped farmers with the necessary knowledge and expected to play an important role in strengthening the more complex and time-urgent pathways of information and knowledge-sharing on which agricultural innovations depend. According to Mera et al. (2004), ICT would enable farmers to gather, store, retrieve and disseminate a broad range of information needed by small producers such as information on best practices, new technology, better prices of inputs and outputs, better storage facilities, improved transportation links, collective negotiations with buyers, information on weather. Moreover, Heks and Molla (2009), find in their ICT evaluation study that ICT is not fully utilized in agriculture. Scaling up of delivery still remains at experimental stage. Although farmers have the real need to access to market information, land records and services, accounting and farm management information, management of pests and diseases, rural development programmes and ICT could help accessing these services, ICT projects dealing such services are extremely limited (Mera et al., 2004). Poor, marginalized and illiterate farmers and females are excluded, and marginal areas are excluded. Staffs for agricultural extension projects have inadequate training and farmers have very little faith in the ICT project personnel and their commitment to achieve the goals of the projects (Mera et al., 2004). However, research on how the excluded farmers could be reached is limited.

ICT can give a new impetus to the social organizations and productive activity of agriculture which, if nurtured effectively, could become transformational factors. The ‘knowledge’ itself will become a technology for overall agricultural development.

ICT, in the current scenario of a rapidly changing world, has been recognized as an essential mechanism for delivering knowledge (information) and advice as an input for modern farming (Jones, 1997). It can bring new information services to rural areas where farmers, as users, will have much greater control than before over current information channels. Access to such new information sources is a crucial requirement for the sustainable development of the farming systems.

2.4. Source and accessibility of agricultural knowledge and information /ICTs by small farm holders'

It is believed that agricultural knowledge and information/ ICTs can increase agricultural productivity and rural income by bridging the gap between new technological knowledge and farmers traditional own practice. In addition, effective agricultural knowledge and information/ ICTs systems elicit information about farmer's needs and concerns and convey them to research technology centers (Saito and Spurling, 2002).

As various literatures critically pronounced, farmers continuously need agricultural knowledge and information/ ICTs which provide them with prompt and reliable information /knowledge about what is happening in areas of improved seedlings, better methods of cultivation and fertilizer application, pest and weed control/eradication, new advances in livestock production and disease control, etc. Consequently, in Ethiopia, the task of providing farmers with improved agricultural knowledge/information and technologies that would enhance productivity and quality of crops, livestock, forestry and natural resources is primarily vested with the government agencies or the Public Extension System. Accordingly, the Ethiopia Institute Agricultural Research (EIAR), Regional research institutions and some universities spread across the country are

responsible for developing, refining and disseminating the latest technologies to farmers. In addition, extension activities are also carried out by state agriculture departments, private agri-business companies and NGOs. Whereas, Ministry of Agriculture and Rural Development (MOARD) through its various institutions, agencies and departments is the primary government body responsible for directing, structuring, regulating and developing the agricultural sector at federal level. Likewise, at the level of regional governments, Bureau of Agriculture and Rural Development, in each region, is responsible to direct and develop/ support the sector **(**Abebe Kirub, 2008).

As a study in the Indian Himalayan Region V.L.V. Kameswari: ICTs for Agricultural Extension: G. B. Pant University of Agriculture and Technology, India indicates Mass mediated broadcasts supported by trained agricultural extension personnel at the field level form the backbone of the agricultural extension system in India. All India Radio (AIR) – the state controlled radio network - started broadcasts for farmers in the late 1950s. These programs cater to the day to day seasonal needs of the farming community and provide information on the latest agricultural technologies. They broadcast for 60 to 100 minutes every day. Since 2004, AIR has also started broadcasting daily market rates and weather reports to farmers through 94 FM stations of AIR. In addition, non-formal educational programs known as "Farm School on Air" are also broadcasted by AIR. *Doordarshan* (the state controlled television network) started telecasting agricultural programs (*Krishi Darshan*) to farmers on an experimental basis in 1966. So, farmers can access and utilize agricultural knowledge/information broadcast through the above mentioned ICTs.

2.5. Factors affecting access and utilization of agricultural knowledge and communication/ICTs by small farm holders

A number of empirical studies have been conducted (Sintayehu *et al.*, 2008), (Haji, 2003), (Habtemariam, 2004) on the adoption of different agricultural technologies and improved practices within Ethiopia. However, there is limitation of empirical studies related to the factors influencing access to and utilization of agricultural knowledge and information. In this section, the literature review mainly based on different utilization (adoption) of agricultural technologies such as dairy, cereals, horticultural crops and fertilizers is presented.

Conceptually, the variables are categorized as household personal and demographic characteristics, socio-economic, psychological and institutional factors.

2.5.1. Personal-demographic characteristics

Household personal and demographic characteristics like age, education, family size, are among the most common characteristics expected to influence farmers' knowledge access and its utilization. Accordingly, from this category, variables such as, sex, age, education and family size are reviewed.

Sex: Gender is another factor that limits access to and utilization of Agricultural Knowledge and Information (AKI). According to Katungi, (2006), due to the prevailing socio-cultural values and norms males have freedom of mobility; participate in different meetings and trainings that consequently exposed them to have greater access to information. Moreover, male headed households appear to make more friendship in general and maintain more links with individuals in off-farm activities than female headed households. Female headed households may experience more barriers than their

counterparts to acquire social capital for communication. Various studies conducted (Mahlet, 2005; Daniel, 2008; Asres, 2009) indicate that Male- headed households to have more access to technologies and information.

Age of the Household Head: Age is one of the demographic factors that are helpful to illustrate households' personal situation. It is generally assumed that elder people have more farming experience which enables them to easily adopt new technologies and also because they have better involvement in different formal and informal groups, which helps them to easily access services and resources.

A study conducted about the knowledge of dairy woman farmers (Deribe, 2007) prove that age has a negative influence on agricultural information net work of farm women. The studies conducted reason out that negative relationship of age and farming might be due to the fact that older women do not seek many new ideas, since they try to conform to practices they followed for a long time in their life.

Education: Education increases the likelihood of participating in formal organizations and thus acquiring information from formal sources, and it can lower the likelihood of relying on informal mechanisms of information exchange and utilization of knowledge. Education is one of the factors which accelerate growth and development in agriculture. Study conducted by Kutangi (2006), on social capital and information exchange in rural Uganda had indicated that households headed by better educated individuals are more likely to join economically oriented organization when an individual is better educated. In addition, better educated individuals may also join agricultural organization because they are more targeted in rural interventions most of which use a group based approach. Moreover, another study conducted in Adami Tullu woreda (Ebrahim, 2006) about

adoption of dairy innovation, its income and gender implication found that adoption of dairy technology and formal education has significant and positive relationship. Habtemariam (2004) found that farmers education level and farm land size have positive and significant relationship with farmers adoption of maize and dairy production packages. Similarly, several authors reported significant and positive relationships that exist between formal education and literacy level and adoption of new technologies (Haji, 2003). Also,Wolday(1999), Mulugeta(2000) have reported that education has positive relation with adoption behavior. In addition, since farming is by in large a family business, all members of a family perform various farm related tasks and so is capable of affecting improvement in farming. Hence, educational level of all members of the family, therefore, is important for the acquisition, comprehension and acceptance of information about improved farming.

2.5.2. Socio-economic variables

Wealth status is expected to affect technology use for a number of reasons, including that wealthier farmers have greater access to resources and may be more able to assume risk. The form of tenure may also affect the adoption decisions, not only through the wealth effects, but also through the farmer's willingness to invest in the long-term quality of the land. A study conducted to identify effects of key factors and policies on Ethiopian dairy development had revealed that the past poor performances of the dairy sub-sector has been attributed to socio- economic, infrastructural, and technological constraints, inadequate research and extension(Sintayehu *et al.,* 2008).

Social participation: Social participation is a social asset which creates an opportunity to share experience and exchange information in innovation in the farming community. A

study by Ebrahim (2006) had indicated that the core of technology diffusion consists of interpersonal network of information exchange between those individuals who have already adopted innovation and those who are then influenced to do so. Reports indicate that membership and leadership in community organization assumes that farmers who have some position in peasantry associations and different cooperatives are more likely to be aware of new practices as they are easily exposed to information. The findings of Deribe (2007) had also indicated that a positive relationship between social participation and enhanced knowledge of dairy women farmers. Habtemariam (2004) and Asres (2005) have, however, reported that social participation was statistically insignificant in access to dairy technology and utilization of information by women.

2.5.3. Psychological variables

Psychological factors also play influential role in the access and utilization of agricultural information and technologies. In this study innovation proneness, production motivation and information seeking behavior were considered as important variable having influence on access to and utilization of agricultural knowledge and information.

Information seeking behavior: It is a broad concept encompassing the ways individuals articulate their information needs, seek, evaluate, select, and use information. In other words, information-seeking behavior is purposive in nature and is a consequence of a need to satisfy some goal. According to Pettigrew (1996), information-seeking behavior involves personal reasons for seeking information, the kinds of information which are being sought and the ways and sources with which needed information is being sought. On the other hand, barriers that prevent individuals from seeking and getting information

are also of great importance in understanding the information-seeking behavior of individuals and organizations. Gholamreza and Naser (2005) had investigated the factors influencing information-seeking behavior of Extension workers in Zanjan Province, Iran. Their research showed that there was a significant relationship between age, level of education, years of experience, and the worker's level of job-related information with information-seeking behavior.

Innovation proneness: It is the receptivity of the individual to new ideas related to different agricultural information. A study conducted in Dire Dawa administrative council, Eastern Ethiopia, (Asres, 2005) had shown that innovation proneness is a statistically significant relationship with access to productive role information and utilization of accessible development information by women. The household production orientation is also expected to influence participation in specific organization from incentives derived from production. Households engaged full time in agriculture might be driven by more incentives from agricultural innovations. They are also likely to be targeted by external agents promoting group based approaches, creating an upward bias in participation.

Achievement motivation: Human motivation is complex and distinguished by great variation behavior, goals and performance. According to Elizabeth (1998), achievement motivation is a capacity to drive the satisfaction by attaining some standard of excellence. Moreover, according to the author, human motives can be measured by using the Thematic Apperception Test (TAT), and the achievement motive or capacity to drive the satisfaction by attaining some standard of excellence, have been studied extensively in this manner. In this regard, high scorers tend to attribute failure or success to internal

factors while low scorers tend to attribute failure to lack of ability. Farmers have been trained to be achievement oriented and a variety of techniques including the encouragement of high achievement fantasies, appear to be effective. By concentrating on the study of the achievement motive, or the capacity to drive satisfaction some standard of excellence, we can see how these motives can be measured and analyzed and how knowledge gained from studying them might have practical benefit. Experts on behavioral science suggest that one of the main constraints to the development that many farmers face is isolation and a feeling that there is little they can do to change their lives. It is, therefore, equally important for extension agents to motivate and build self confidence in farmers by working with them, helping them to take the initiative and generally encouraging them to become involved in extension activities.

2.5.4 Mass media exposure

Mass media play greater role in creating awareness in shortest time possible over large area coverage. Mass media, viz, radio, newspaper, TV, etc could be effective in influencing symbolic adoption of rural women on agricultural technologies. A study conducted by Pathiraand and Ponusamy(2009) in Tamil Nadu, India, on the adoption of breeds, followed by feeding, housing, disease and rabbit management practices had indicated that mass media formats like Radio, TV, internet and print materials were effective enough in convincing the respondents to mentally adopt the technologies. The findings revealed that of the technologies, breeds have higher rate of adoption followed by feeding, housing, disease and rabbit management practices. Moreover, there existed significant differences in the effectiveness of the four channels at recommended technologies (breeding, feeding). The radio exposed one group differed significantly from

the other group in symbolic adoption. It was found that radios are the most effective and superior treatment. FAO (2009) suggests the potential of new information and communication technologies to reduce the educational disadvantages faced by older rural women through the development and dissemination of need-based information in appropriate formats and accessible mediums should be leveraged.

2.5.5. Institutional variables

Institutions include various formal and informal institutions, and organizations. Accordingly, factors facilitating and enhancing the access and utilization of agricultural information include services such as credit, and joint planning, development agent contact, visiting market place and contact with different formal and informal organizations.

Credit services: Access to credit can relax the financial constraints of women farmers. Accordingly, a study conducted by Sisay(2008), to determine smallholder farmers' access to formal credit found that small holder farmers' still have limited credit access, and the difference between the wealthy groups and the poor one in accessing credit from the formal sources was also statistically significant. Moreover, the study had revealed that farmers acknowledge group lending that solves the problems of collateral requirements by lending institutions, control misuse of borrowed funds and minimize the risk of default and they also recognize the provision of saving services by Micro Finance Institutions (MFI). Smaller loan size, earlier saving requirement which was not convenient to farmers and repayment period by MFI were among the critical problems. Similarly, a study conducted on the performance of micro finance in Ethiopia indicates that the overall share of women borrowers to be 41%, with five out of twelve MFIs having less than 50%

borrowers while all the relatively younger MFIs have greater than 50% women borrowers. Studies by Mulugeta(2000), and Mikinay (2008) have shown that access to credit plays a significant role in enhancing the use of improved technologies and significantly related with adoption. To this end, innovative credit schemes without isolation of poor women needs to be promoted.

Extension participation and extension contact: Access to extension services refers to the availability and existence of technical advices, trial and demonstrations to farmers. Extension service is one of the major sources of information about modern technologies. It is through extension service that farmers get trainings on technical practices and characteristics of all modern technologies.

Studies conducted by Deribe,(2007), Daniel,(2008), Ebrahim,(2006) had indicated that access to extension services has significant influence on adoption of agricultural technologies. On the contrary, findings of Bulale,(2000) had indicated that extension contact has no influence on adoption of all dairy production technologies. Therefore, the frequency of extension contact plays an important role in the access to and utilization of agricultural information.

Market access/Distance to the main road: Distance from market is a major factor that prohibited farmers from sale of whole fresh milk to urban consumers. Market distance and frequency of market visiting is also another factor in the dissemination of agricultural information and utilization. In addition, a study conducted by Katungi,(2006), in Uganda stated that market serve as forum for exchange of goods; and being organized weekly, biweekly or monthly constitute an important place where agricultural information is exchanged and men go to markets more often than women. Moreover, farmers located

near the market will have a chance to get better and faster information than other farmers. Therefore, rural roads need to be expanded for the improvement of marketing of agricultural inputs and out puts.

2.6 Empirical review of literature

Access and effective utilization of ICT services is important for the enhancement of the agriculture. This access and effective utilization of ICT services by people who are living in developing countries have great merit. Especially, for the rural population who are cultivating small size of land traditionally.

According to Oromia Bureau of Agriculture and Rural Development (OBoARD), considerable development efforts have been made to generate and disseminate appropriate technologies and information to farmers in the region. However, access to and utilization of recommended technologies and practices amongst the small farm holders has not been as widespread as it was anticipated. For example, as per the study conducted in Lome Woreda of East Showa Zone the potentialities for small farm holders, practicing dairy activities for improved income generation was poor on account of poor genetic merit of the local breeds of cattle, poor feed resources, poor traditional management and low adoption rate of the dairy technologies (Ahmed *et al.*,2003).

Again, a review of an empirical research indicates that the other problem of the small farm holders related to knowledge and information gain was their limited access to formal knowledge and information, sources and trainings in modern farming system. For example, according to Deribe (2007), majority of the farmers interviewed in Southern Nations, Nationalities and Peoples' Region (SNNPR), Dale woreda were having no involvement in any formal institutions and organizations. They mainly rely on informal

sources of knowledge and information of neighbors, associations and indigenous knowledge

While the benefits of ICTs have been acknowledged there have been some constraints in utilizing them effectively and efficiently, especially in developing countries. The constraints are many and include, access to computers (email and internet), affordability of computers and connectivity, telephone and electricity infrastructure, computer literacy, expertise, etc. (Davis & Danning, 2001; Oliver et al, 2001; Knowlton & Knowlton, 2001; Sibiya, 2003; Gumbo, 2003).

Other than mobile phones, other ICT tools suffers from the problem of feasibility to the poor in geographically disadvantaged areas because of lack of enabling environments such as infrastructure and capital. Internet enhanced technologies are not appropriate in the areas lacking electricity and network infrastructure. On the contrary, mobile phone technology has much less requirement on the infrastructure and hence wider applicability, especially in mountainous areas. Moreover, a lack of knowledge of best practices in IT usage as well as IT-related skill deficiencies by the farmers will also constrain the benefits from ICT, as argued by Kaushik and Singh (2004) based on case studies of two projects in North India.

The existence of farmer's knowledge networks, level of knowledge or awareness and information access and utilization and the factors influencing them can differ from area to area in context of agricultural production system.(Sintayehu *et al.*, 2008). Empirically, in the contexts of market oriented urban, peri-urban and rural agricultural production systems, knowledge on sources of information, inputs and services, as well as the extent to which the farmers access to and utilize improved farming technologies is scant. In

addition, personal, socio-economic, Psychological and institutional factors that influence farmers to access and utilize knowledge and information in relation to their farming system were not fully understood. Therefore, the availability of information on sources of knowledge and information, level of access to and utilization as well as factors influencing the same that would enhance the role of formal knowledge for improved productivity of the farmers are important issues to be addressed. Based on these premises, this study is expected to fill the gap in these aspects in order to formulate policy recommendations for development intervention.

2.7 Conceptual framework of the study

Due to external and internal factors, the output of the small farm households in the rural area of Ethiopia had not shown much in progress. This is mainly because of lack of knowledge and technological information by the small farm households to boost their production and productivity. Therefore, new ICT service delivery techniques will have to be devised if ICT is to serve the needs of the farmers effectively.

This study believes that the rural farming society in Ethiopia is embedded with a lot of responsibilities and roles in productive and reproductive aspects of their life that are highly attached to their agricultural capacity, but the chances to improve or modify them from the tradition bound styles which are carried over from earlier generations seem to be less. This is mainly due to the fact that the exposure to modernize and scientific information on these activities or roles remains to be limited to them with inherent limitations and imposed restrictions. Consequently, the livelihood of the entire family is constrained from progress.

What is the level of awareness of farmers, specially the small farm households to wards effective utilization of ICT services? What are the factors impeding the effective utilization of ICTs by the small farm holders? The easy accessibility of ICTs by the small farm holders were important issues that not yet been fully explored in rural areas in Ethiopia. To my knowledge, so far there is no large survey data-based evidence on these issues. Thus, the conceptual framework of this study is based on the assumption that access and utilization of ICT services in relation to all such aspects of life by the rural farming society are limited and interrelated. They are much influenced by different constraints_ a number of personal, social, economic, institutional and psychological factors of the rural farmers.

Chapter Three: Research Methodology

3.1. Description of the Study Area

This study was mainly concerned with determining the extent to which the farmers in the study are effectively utilizing the available ICT services to boost agricultural development. Hence, it was conducted in Dugda woreda, one of the district in Oromia Regional National state, East Showa zone, and located 134kms to the south of the capital city, Addis Ababa, and 89 km south west of Adama, the capital city of East Showa zone. The area lies with altitudes ranging from 1592-2937 meters above sea level with an average of 1896m and receives annual rainfall of 700-800 mm with an average of 719 mm (Dugda Woreda Agriculture office,2009).

There are 39 kebele administrations in Dugda woreda, out of which 36 of them are rural Village Kebeles and the remaining 3 are urban kebeles. According to the 1994 population and housing census of Ethiopia (CSA, 1994), the total population of the Woreda was estimated to be 164,209, out of which the rural population was 123,157 and the urban population was 41,052.

Dugda Woreda comprises diversified topographic features and agro ecological zones. 65% of which is identified as Kola agro ecological zone, and 45% is Weyina dega. The total land area of the woreda is 95,945 hectares. Out of these, the agricultural land constitutes 50,330 hectares, forest land 3,411 hectares, water body 12,032 hectares, grass land 13,476 hectares and hill constitutes 298 hectares.

Agriculture activities consisting of crop production such as maze and wheat were the major means of livelihood in the woreda. Moreover, livestock is an integral part of

production system in the study area. The Woreda is also characterized as cash crop producing area (CSA, 1994).

3.2 Research design

As the data that were collected for this research were mainly qualitative in nature, descriptive type of research was applied, in that was assumed to be the best to deal with qualitative data that would provide better knowledge of the prevailing situation in the study area. Hence, the study was intended to discover the underlining factors that influence the perceived behavioral/awareness of the farmers in effectively utilizing the available ICT services, their sources and accessibility of information to enhance agricultural development by providing answers to the research questions formulated.

3.3 Data Types and Data Sources

The types of Data collected for this research were entirely qualitative in nature as it was presumed appropriate in supplying vital information in descriptive research. Hence, both primary and secondary data were collected and employed from different sources. Accordingly, the primary data sources were small farm householders, supported by key informants such as DAs, SMS and government officials working at offices that have direct contact with farmers like Agriculture office and Woreda Administrative office/council. Likewise, the Secondary data sources were official records, reports, documents and journals obtained from those contacted offices. Further more, essential secondary data was also taken from research studies conducted by certain researchers on the same problem. Both the primary and secondary data had been collected to answer the research questions, and attain objectives of the study. So, the data collected includes information on; household socio-economic characteristics, information sources by the

farmers, ownership and use of certain ICT facilities, demographic, environmental, institutional, as well as information on access to ICTs, level of awareness, and utilization of these services and constraints that impeded them not to effectively utilize these ICT services in the study area, among others.

3.4 Methods of Data Collection

The choice of method of data collection is highly dependent on the nature of the problem, type of data, objective and scope of the study. The availability of finance, time and facilities also influences the selection of the method to be used for data collection. Then, the sample small farm household heads were interviewed using structured questionnaire (interview schedule) that had a mix of closed and open ended questions to collect Primary data. The interview schedule was pre-tested and translated in to Afan Oromo. Data was also obtained from key informants through a structured questionnaire administered to the respondents, using a written questionnaire and interview method.

Two DAs were selected and trained as enumerator who would conduct the interview and helped respondents while filling the questionnaires in order to ensure the reliability of data obtained through interview and questionnaires. The enumerators were under Continuous monitoring by the researcher through out the whole process of data collection. Moreover, secondary data were collected from different sources that had already been collected and compiled by others, census data, different publications in archives and libraries. In addition, a Checklist or compilation sheet with key questions also used to retrieve qualitative data from available sources.

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3.5 Sampling design

In principle, accurate and highly reliable information of a given population could be obtained only from a census study. However, due to financial and time constraints, in many cases a complete coverage of the population is not possible. Thus, sampling is one of the methods which allow the researcher to study a relatively small number of units representing the whole population (Saratnakos, 1998).

The basic objective of a sampling is to draw inferences about the population from which the sample is to be taken. This means that sampling is a technique, which helps the researcher in understanding the parameters or characteristics of the universe or population by examining only a small part of it. Therefore, it is necessary that sampling technique be reliable (Chandan, 1998).

3.5.1 Sample frame and sample size

Reliable research data were collected through appropriate instruments from 10 Kebeles selected at random out of the total 36 rural kebeles as well as key informants in the study area in order to address the research questions. Appropriateness of the instruments selected and used for data collection were pre tested before using them completely.

First, a list of rural farm householders was obtained from Dugda Woreda Agriculture Office to identify small farmers. The list was used to categorize farmers in the study area in to three categories/strata: small farms, large farms, and those who transformed in to an investor level according to the criteria set for this purpose. Then, farm household heads were selected only from the lower category/strata served as a sampling frame for the study.

Appropriate sample size depends on various factors relating to the subject under investigation like the time, cost, degree of accuracy desired etc. (Rangaswamy, 1995). Thus, in this study to determine sample size, different factors were taken into consideration including research cost, time, human resource, accessibility, and availability of transport facilities. By taking these factors into account, from a total of 18,386 rural household heads (Male headed households= 15,750 and Female headed households= 2,636) 150 household heads from 10 kebeles in the rural area of the *woreda* were selected as sample respondents.

3.5.2 Sampling procedure and method

The availability of prior information about the target population in the study area and the nature/characteristics of sample identified determine the decision of choosing a specific sampling technique/procedure and method.

This study used two stage sampling procedure, in which both purposive (non-probability sampling) and simple random sampling techniques (probability sampling) were used to select the sample respondents. In the first stage sampling, from the research population consisting of 18,386 rural household heads(comprising both small and big or well off farm house hold heads) in the study area, the identified 150 sample respondents were purposively drawn from the lower category/strata. Whereas, in the second stage sampling, list of small farm household heads in each village was obtained and used to select the 150 sample respondents using simple random sampling.

3.6 Data Processing and Analysis

Different types of analytical methods can be used to evaluate different research results and make a sound conclusion for a given survey information. Literature reveals that each and every analytical method has their advantages and limitations; it is always advisable to select the one that can better suit to answer the specific purpose (Hopkins et al, 1996; Duvel, 1999; Pallant, 2001). Depending on the objectives of a given study and nature of the data available, the analysis had required different approaches. Descriptive statistics was one of the techniques or approaches used to summarize information (data) collected from a sample. By applying descriptive statistics such as mean, standard deviation, frequency of appearance etc. one can compare and contrast different categories of sample units (in this case farm households) with respect to the desired characters so as to draw some important conclusions. Therefore, this particular study being descriptive in nature and almost all the data types collected were qualitative, data analysis was done through the use of simple descriptive statistics such as frequency counts, mean and percentages to satisfy the objectives of the study. However, data editing, coding and tabulation was performed beforehand to facilitate the analysis and interpretations of the data.

Chapter Four: Results and Discussion

The chapter has been organized in three major sections. Section one is dealing with general information of the respondents _ indicating their sex, age, education level, family statuses. At the same time, section two deals with socio-economic characteristics of the sample small farm households in the study area. Finally, the third section deals with agricultural knowledge and communication/ICT needs, sources, accessibility and its utilization by the farmers in the study area.

4.1 General Information of the sample respondents

These data were collected due to the fact that conceptual framework of the study was based on the assumption that access and utilization of agricultural knowledge and communication/ICT services by small farm households are influenced by personal characteristics of farmers among other factors.

Hence, as result of the study presented in Table 1 bellow indicates, the majority were male representing 88% of the total respondents while 12% were female. When it comes to the analysis of marital status, respondents were categorized as single, married, and divorced in the study. Thus, the respondents fell only under two categories _ married and divorced. Accordingly, most of the respondents (98 %) of them were married and living with their husbands/wives while 2% was divorced.

The age profile of the respondents had shown that a large majority (44%) were in the age group of 29 - 38 years, followed by the active work force group (30 %) of respondents who belong to the category of 19 - 28 years of age. On the other hand, 17 % of the

respondents were between 39 - 48 years of age while 8.66 % had fallen in the age category of 49 years and above (Table 1).

In terms of level of education, results had indicated that most respondents (80.7 %) of them had no schooling at all while 18 % had elementary, and or secondary education. Only 1.3 % of respondents had obtained tertiary-college certificate (Table 1).

Age based classification of the respondents families had further revealed that the majority of the sampled farmer householders (41.1%) had children in the age category of 1 – 15 years of age while the youth, 16 – 30 years of age constitute 35.8% . Again, the respondents had indicated that about 9.95% of their family members were in the age group of 31 – 45 years while 13.12 % belonged to the adult/old age group of 46 years of age and above (Table 1).

Table 1 Distribution of respondents based on their demographic profile (N= 150)

Particulars	Attributes along with their code	Frequency	Percent
Sex	Male(1)	132	88
	Female(2)	18	12
	Total	150	100
Marital status	Married(1)	147	98
	Single(2)	-	-
	Divorced(3)	3	2
	Total	150	100
Age	19-28 years of age(1)	45	30
	29-38 years of age(2)	66	44
	39-48 years of age(3)	26	17.33
	49 years of age & above (4)	13	8.66
	Total	150	100
Level of education	Illiterate(1)	121	80.7
	Elementary/Secondary school(2)	27	18
	Certificate/Collage(3)	2	1.3
	First Degree and above(4)	-	-
	Total	150	100
Age based Classification of households	Children, below 16 years of age(1)	450	41.1
	Youth , 16 - 30 years of age(2)	392	35.8
	Adults, 31- 45 years of age(3)	109	9.95
	Adults/old person , 46 - 60 years of ag	89	8.1
	Old persons above 60 years of age(5)	55	5.02
	Total	1095	100

*Source: computed from own collected data (Annex III Data Tabulation)

4.2 Socio-economic Characteristic of sampled respondents

Engagement or participation of farmers in different formal or informal associations/institutions in the community is a social asset which creates an opportunity to obtain, share and exchange experience/knowledge and information in innovations in the farming community. The research was conceptually framed on the assumption that different socio - economic factors of farmers influence the accessibility and utilization of agricultural knowledge and communication/ ICTs. Hence, as result of the study had shown, a total of 44.66 % sampled farm household respondents were involved in different types of formal and informal associations or institutions in the community, while the remaining (55.33%) were having no involvement in any formal and informal institutions or associations. Regarding the type of institutions they were involved in, the majority of the respondents were frequently involved in a formal local institutions such as Kebele/Village Council(24%), executive councils of kebele(9.33%), and parents committee in schools(8%). Only 3.33% of the sampled respondents had participated in informal associations or institutions like religious centers, *edir* or *mahber (Table 2.1).*

The results also show that larger percent (58.66%) of sampled respondents had earned significant amount of income from crop production only. Whereas, 40 % of the respondents were involved in both crop production and animal husbandry for their livelihood. Only 1.33 % of them were engaged in local small enterprise trading activities in villages as a source of income *(Table 2.1).*

Table2.1: Distribution of respondents according to their socio economic characteristics (N = 150)

Particulars /Factors/	Attributes along with their code	Frequency	Percent
Membership and responsibility in the Association	NO /I don't have (1)	83	55.33
	Member of Kebele/Village Council(2)	36	24
	Executive member of Kebele/Village Council (3)	14	9.33
	Leader of Religious Institution/Idir(4)	5	3.33
	Member of Family Committee at School(5)	12	8
	Total	150	100
Main sou livelihood or income	Only crop farming(1)	88	58.66
	Only animal and animal products(2)	-	-
	Both from animal and crop productions(3)	60	40
	Small scale trades around rural areas/villages(4)	2	1.33
	Agriculture labor (5)	-	-
	Permanent monthly salary (6)	-	-
	Total	150	100

* Source: computed from own collected data (Annex III Data Tabulation)

Land held for agricultural purpose is a major factor that influences the livelihood of rural households. The study was conceptually framed on the assumption that the larger the farm size, the higher possibility to access and utilize a combination of technological packages.

In the study area, the size of the land owned by respondents varies from household to household. Nevertheless, all (100%) of sampled household respondents had owned farm land. As results indicate, the size of land holding in the study area was generally very small. Of the total 150 respondents, 42% of them own about 2 hectares of land area. On

average, 7.33 % of sampled respondents had owned between 2 to 5 hectares. The remaining (22%) held a land size between 1 to 2 hectares, 19.33 % own only 1 hectare and 9.33 % less than 1 hectare on average *(Table 2.2).*

Livestock is another important component of the economic activity along with crop production and it was the basis of livelihood for local communities. In the study area, farmers were engaged in the production of different types of live stocks. Accordingly, as the result for the analysis of livestock ownership indicates local chickens (poultry production) constituted the larger share (36.03 %), goats (14.82%), cow (12.65%), sheep (8.76%), oxen (7.08%), calves (5.34%), bulls (4.81%), donkey (4.74%), heifers (3.56%), horses (1.38%) and mule (0.86%) were the smallest in size *(Table 2.2).*

Table2.2: Distribution of respondents with respect to ownership of land and livestock (N = 150)

Particulars/Factors	Attributes along with their code	Frequency	Percent
Do you have land for agricultural activities?	Yes (1)	150	100
	No (2)	-	-
	Total	150	100
Land holding size in hectares on average	Only 0ne hectare(1)	29	19.33
	Below 0ne hectare(2)	14	9.33
	Two hectares(3)	63	42
	Above one & below two hectares(4)	33	22
	Two to five hectares (5)	11	7.33
	Above five hectares(6)	-	-
	Total	150	100
Do you have animals/livestock that support your livelihood?	Yes (1)	67	44.66
	No (2)	83	55.33
	Total	150	100
Possession or ownership of animals/livestock in each type	Oxen (1)	107	7.08
	Cow (2)	192	12.65
	Young bull (3)	73	4.81
	Calves (4)	81	5.34
	Heifers	54	3.56
	Sheep (6)	133	8.76
	Goats (7)	225	14.82
	Chicken (8)	547	36.03
	Horse (9)	21	1.38
	Mule (10)	13	0.86
	Donkey (11)	72	4.74
	Total	1518	100

4.3 Agricultural knowledge and ICT utilization level of respondents

4.3.1 Need and awareness for the existence of ICT systems by respondents

Small farmers may not adopt innovations/ICTs due to lack resources needed to adopt them, or the technologies did not meet farmers' need or generally they may not be aware about the technology itself. "Awareness" of the existence of innovation is the first and crucial element in the process of adoption or rejection of an idea to include or exclude into the exiting social system (Franzal and van Houten, 1992). Hence, sampled farmers in the study area were then asked whether they need to adopt updated agricultural development information or not. They were also questioned on the usefulness of the already available ICTs in order to asses their level of awareness. In this regard, result of the study had shown that all respondents expressed the need to adopt updated agricultural knowledge and information if it can be easily accessible. Among the respondents, 41.33% of them need ICTs to access or avail agricultural marketing information, 36 % to receive information on agricultural input availability and prices, 14 % to get information on early warning and management of diseases and pests, 6 % to avail information on latest (best) packages of agricultural practices, and 2.66 % on weather forecasting **(**Table 3).

Table 3 Distribution of respondents according to their information need and awareness of ICTs (N = 150)

Particulars /Factors/	Attributes along with their code	Frequency	Percent
Need of adopting updated agricultural knowledge & information	Yes (1)	150	100
	No (2)	-	-
	Total	150	100
Awareness on the purpose of using the already available ICTs	To avail information on latest (best) packages of agricultural practices (1)	9	6
	To avail information on weather forecasting (2)	4	2.66
	To avail information on early warning and management of diseases and pests (3)	21	14
	To avail agricultural marketing information (4)	62	41.33
	To avail information on agricultural input and prices (5)	54	36
	Total	150	100

Source: computed from own collected data (Annex III Data Tabulation)

4.3.2 Ownership pattern and perceived behavior/awareness of respondents on the use of already available ICTs

Ownership of ICT facilities can also contribute toward the level of awareness of farmers. The assumption of the study was that farmers who have access to ICT infrastructures will have higher opportunity utilizing agricultural knowledge and information to the extent demanded. Sampled farmers in the study area were asked whether or not they have access to ICTs of different types. At the same time, if they already have access to ICTs, they were asked the purposes for which they are being used. Accordingly, a look at the ICTs ownership pattern of the sampled respondents reveals that 43.33% of the households had owned prepaid mobile phones or fixed line phones. In addition, 36.66 % of the respondents had radios. 5.33 % had television sets, and 14.66 % had either all or some of the specified ICTs. However, none of the respondents had owned computers **(**Table 4).

The finding of the study also indicates that, in the study area, mobile phones/ fixed line phones were primarily being used by respondents (40.66 %) for maintaining social contacts (contacting relatives and friends) and for emergencies while 30.66 % had used the various types of ICTs available to them to listen to the daily news programs. The result had also reveled that 20.66 % of the respondents had used ICTs they had at hand to watch movies, soap opera, religious programs on a regular basis. It was only 7.33 % of the respondents who access or obtain information that support their effort to agricultural development **(**Table 4).

Table 4 Distribution of respondents according to their ICTs ownership pattern and perceived behavior/awareness on the use of already available ICTs. (N = 150)

Particulars /Factors/	Attributes along with their code	Frequency	Percent
Ownership (availability) of ICTs	Radio (1)	55	36.66
	Television (2)	8	5.33
	Mobil/Fixed phone (3)	65	43.33
	Computer (4)	-	-
	All of the above specified ICTs or some (5)	22	14.66
	Total	150	100
Purpose of using the already available ICTs	To listen news (1)	46	30.66
	To watch entertaining programs like music, drama, foot ball games, etc (2)	31	20.66
	To meet or in touch with families, relatives, etc(3	61	40.66
	To play games (4)	1	0.66
	To access or obtain information that support the overall effort to agricultural development (5)	11	7.33
	Total	150	100

Source: computed from own collected data (Annex III Data Tabulation)

4.3.3 Information source and its proximity/accessibility to farmers

Information source and its use pattern was analyzed to assess the accessibility and usage of agricultural knowledge and communication/ICT system to small farm house holders in their effort to boost agriculture. Further, factors responsible for the low accessibility and poor utilization of the information demanded by farmers were analyzed. Respondents were provided with seventeen alternative sources of agricultural knowledge and communication/ICTs to choose from as their sources of information.

According to degree of proximity or closeness, ranking was made in order of importance to identify the major sources of knowledge and information/ICTs to the farmers (Table 5). Farmers in the study area received agricultural knowledge and information from a wide range of sources and channels. Based on this study, neighbors or friends were the major source of agricultural knowledge and information in the study area. Development agents (DAs) serve as the second important information source to farmers. While the third and fourth sources of information were model farmers and public meetings, respectively. Idirs, religious organizations and farmers' cooperatives had served as fifth, sixth and seventh source of information, respectively. Woreda agriculture office, rural/village markets, and rural radio programs serve as eighth, ninth and tenth information sources, respectively. Similarly, Farmers' training centers (FTCs), agricultural input suppliers, mobile phones, and NGOs as other sources of information were placed in the eleventh, twelfth, thirteenth, and fourteenth categories, respectively. On the other hand, rural television programs, leaflets and broachers and computers/ internet were identified as remote sources of information (Table 5).

Table 5 Distribution of information sources and their proximity to the farm house holders (N = 150), where f = frequency of response & % = percent

No.	Information source	Proximity/accessibility of information sources to the farmers						Score	Rank
		Not close (1)		Some what close(2)		Very close (3)			
		f	%	f	f	%	f		
1	Neighbors or friends	5	3.33	53	35.33	92	61.33	873	1st
2	Development agents(	2	1.33	77	51.33	71	47.33	369	2nd
3	Model farmers	16	10.66	81	54.00	53	35.33	337	3rd
4	Public meetings	22	14.66	84	56.00	44	29.33	322	4th
5	Idirs	17	11.33	99	66.00	34	22.66	317	5th
6	Religious organizatio	29	19.33	83	55.33	38	25.33	309	6th
7	Farmers' cooperative	36	24.00	72	48.00	42	28.00	306	7th
8	Woreda agriculture office	37	24.66	79	52.66	34	22.66	297	8th
9	Village markets	37	24.66	84	56.00	29	19.33	292	9th
10	Rural radio programe	39	26.00	88	58.66	23	15.33	284	10th
11	Farmers' training Centers(FTCs)	43	28.66	88	58.66	19	12.66	276	11th
12	Agricultural inputs su	51	34.00	73	48.66	26	17.33	275	12th
13	Mobile phones	49	32.66	78	52.00	23	15.33	274	13th
14	NGOs	59	39.33	82	54.66	9	6.00	250	14th
15	Rural TV programme	78	52.00	50	33.33	22	14.66	244	15th
16	Leaflets and folders	132	88.00	11	7.33	7	4.66	175	16th
17	Computers/ Internet	135	90.00	12	8.00	3	2.00	168	17th

Source: computed from own collected data (Annex III Data Tabulation)

4.3.4 Level of utilization of the existing or accessible agricultural knowledge and Communication/ICTs

Access to agricultural knowledge and communication/ICTs by itself would not be enough to secure agricultural development by small farm householders to change or to improve their livelihood. They should be able to utilize the accessible information in proper manner**.**

In order to measure the level of utilization of accessible agricultural knowledge and communication/ICTs, data were collected through interview/ questionnaire as well as focus group discussion. As most respondents had access to only one or two means of communication, their level or extent of utilization was evaluated by the frequency of utilization of the accessible information**.**

Accordingly, among the total respondents, 76.66 % of them were not efficiently utilizing the already available ICTs they had at hand, while the remaining 23.32% seems to use them to various degrees (Table 6).

Table6: Distribution of respondents by frequency of utilization of already accessible agricultural knowledge and communication/ICTs. (N = 150)

No.	Level/extent of utilization	Frequency	Percent
1	Usually	13	8.66
2	Some times	22	14.66
3	Never	115	76.66
	Total	150	100

Source: computed from own collected data (Annex III Data Tabulation)

4.3.5 Hindrances to accessibility and utilization of agricultural knowledge and communication/ ICTs

Inaccessibility and improper utilization of basic agricultural knowledge and communication/ICTs by rural farmers might have been the factor that have hindered farmers to change from their traditional methods of farming system and animal husbandry practices, hence, resulting in poor crop and livestock productivity.

Then, respondents were asked to identify and make list of constraints in their order of importance, whereby the constraints listed from first to eighth places in the rank were considered as the most important ones.

A look at the result of the study indicates that affordability to access ICTs due to low income of the farmers in the study area was the most important constraint that was ranked first in the list. Similarly, long distance to ICT services from farmers' residences, low level of education to operate certain ICT facilities, lack of infrastructure and unavailability of ICT centers in the area were also mentioned as important constraints to access ICT services and the utilization of the technologies to promote agricultural production and improve productivity. These constraints take second to fifth places in the rank. In addition, workload was the other important factor that adversely influenced farmers in the study area in their quest to avail and properly use essential agricultural knowledge and communication/ ICTs. This constraint takes sixth place where respondents did not have sufficient time that could help them to search for knowledge and information for better crop and livestock production. The lower level of understanding or awareness about the benefit of ICTs to farmers and lack of advice from those knowledgeable

experts/institutions were also mentioned as important constraints taking the seventh and eightieth places in the ranking order (Table 7).

Furthermore, depending on the degree of importance, inconvenience or oddness of the time at which agricultural programs were transmitted in radios and televisions to farmers, frequent electric power interruption, network problem and poor radio and television signals constitute the other constraints faced by farmers to access TCTs. These constraints ranked ninth, tenth, eleventh and twelfth places, respectively (Table 7).

Cultural taboos, problem of not broadcasting agricultural information on radio and television in the farmers' dialect, none applicability of the information supplied to the farmers need and lack of interest by the farmers in the study area in extending their effort in searching for agricultural knowledge and communication/ICTs for better crop and livestock development were considered minor constraints as they were listed and ranked lastly depending to their degree of importance (Table 7).

Table 7: Distribution of responses on the constraints to the accessibility of agricultural knowledge and communication/ICTs to farmers

No.	Constraints	f	%	rank
1	ICT services are unaffordable (Income constraint)	144	96.00	1st
2	ICT services are far away to reach	132	88.00	2nd
3	Lack of ICT manipulation capacity (inability to operate)	129	86.00	3rd
4	Poor infrastructure facility in the area	126	84.00	4th
5	Unavailability of ICT centers	121	80.66	5th
6	Time Constraint(work load)	117	78.00	6th
7	Lack of awareness and understanding what ICT can benef	113	75.33	7th
8	Lack of advice	93	62.00	8th
9	Agricultural information on radio and television is always aired at odd or inconvenient hours.	88	58.66	9th
10	Constant electric power interruption	85	56.66	10th
11	Network problem	82	54.66	11th
12	Poor radio and television signals	53	35.33	12th
13	Cultural Taboos	45	30.00	13th
14	Agricultural information is not broadcast on radio and television in the farmers' dialect	28	18.66	14th
15	None practicability of the information supplied to my situation	22	14.66	15th
16	Lack of interest	19	12.66	16th

Source: computed from own collected data (Annex III Data Tabulation)

4.4 Discussions of the study results

Influence of Demographic Profile on ICTs utilization

Demographic profile of farmers, such as sex, age, marital status, level of education and family size seem to have effect on access to and utilization of agricultural knowledge and communication/ICTs. The study had revealed more involvement of male-headed than female- headed households in the study area. This was not surprising as farming activity is more or less a tedious work that requires enormous strength and energy. The more involvement of male- headed households/farmers implies that access, utilization, and adoption or development of agricultural knowledge and communication/ICTs are gender biased where male-headed households/farmers have greater access to information than female- headed households because of the prevailing socio-cultural values and norms that exposed or provided them an opportunity to have freedom of mobility and able to participate in different meetings and trainings. This finding agrees with that of Katungi (2006), who reported that gender is one among the other factors that limits access to and utilization of agricultural knowledge and information by small farmers. According to his research finding, male headed households appear to make more friendship in general and maintain more links with individuals in off-farm activities than female headed households. Female- headed households may experience more barriers than their counterparts to acquire social capital for communication. Moreover, the finding of a research conducted by Mahlet (2005), Daniel (2008), Asres (2009) also agree with the findings of this research, indicating that male headed households have more access to technologies and information than female- headed households.

When coming to the analysis of marital status, finding of this study could not identify the influence of marital status of sampled farmer respondents on the accessibility and utilization of agricultural knowledge and communication/ICTs. This implies that there is no relationship between marital status of sampled farmer respondents and accessibility and utilization agricultural knowledge and communication/ICTs. The probable reason for the observed non- existence of relationship between access and utilization of ICTs and marital status of farmers in the study area might be due to the fact that the proportion of married respondents (98%) was much larger than that of divorced respondents (2%).

When it comes to age profile, the study was conceptually framed on the assumption that elder people have more farming experience that enable them to easily adopt new technologies and also, because of their involvement in different formal and informal groups, may help them to access ICT services and resources without difficulty. In this study the average age of sampled framers was about 36 years with the minimum and maximum ages of 20 and 55 years, respectively. The majority (74%) of the farmers who practice farming were in the age range of 19-38 years that belong to the young or middle age category. This implies that the factor that adversely contributed to access and utilization of agricultural knowledge and communication/ICTs might be due to their age. This means that, most of the young farmers had not accumulated sufficient farming experience to enable them acquire new technologies. In addition, they had no exposure to activities involving different formal and informal associations or institutions in their communities, as is the case in most rural settings. It was the elders who got engaged in such gatherings.

The finding of this study disagrees with the study conducted by Asres (2005). The report of his study had indicated that non significant and weak relationship between age of rural women and their access to and utilization of communication technologies for dairy farming. He argued that the observed weak relationship might be due to the reason that, elder women do not seek many new ideas, since they try to conform to the practices they followed for a long time in their life. On the contrary, the findings of this study indicate that the experienced and older farmers tend to access and utilize of new agricultural knowledge and information better than the younger ones.

Education is another important factor for accelerating growth and development in agriculture. Essentially, education enhances farmer's awareness to search for new knowledge and communication/ICTs for better farm management and improvement of their livelihood. It increases farmer's ability to acquire, process and use agricultural related information.

Conceptually this study was framed on the assumption that education level of farmers was assumed to influence their ability to acquire and use agricultural knowledge and communication/ICTs for better crop and livestock production. Consequently, the majority (80 %) of the respondent farmers were illiterate. The identified high level of illiteracy suggests that farmers in Dugda woreda of East Showa zone, Oromia region had faced serious constraint to access and utilize ICTs properly to the desired level. An example of such skill-intensive use of ICTs may include, such as, mobile phone among others, require some level of literacy to read and understand some important short messages (SMS) delivered for the sake of agricultural development.

The finding in this study agrees with that of Katungi (2006), who reported that households headed by better educated individuals are more likely to join and participate in economically oriented associations or organizations which create good opportunity to farmers to understand the existence of innovations and to adopt them properly for their agricultural development. Further, the findings of a research conducted by Ibrahim (2006), Habtemariam (2004), and Haji (2003) strongly agree with the finding of this research. They reported that education has significant and positive relationship with farmers' behavior to access and adopt new agricultural information and packages of productions. A similar study by Hafkin and Taggart (2001:6) also agree with this finding by stating that "the single most important factor in improving the ability of rural people in developing countries to take full advantage of the opportunities offered by information technology is more education at all levels, from literacy through scientific and technological education". Hence, rural people are poorly placed to benefit from the knowledge economy because they have less access to scientific and technical education, and less access to skills training and development.

Family size was also one of the other factors that influence farmers in Dugda woreda in accessing and utilization of agricultural knowledge and communication/ICTs demanded for better crop and livestock production. Family size in the study area ranges from three to twelve members with an average of 4 persons per household. Thus, the finding of this study indicates that farm households had large number of children, as 41.1 % were less than sixteen years of age. It is obvious that children within this age group, by-in-large, are dependent. When family size increases, the households' capacity to access and utilize essential agricultural knowledge and communication/ICTs will be adversely affected.

This implies that the income from farming is utilized to manage the health, education, food, cloth, and other essentials of the family. No surplus resources are remaining to acquire new agricultural knowledge and communication/ICTs.

Socio economic characteristics of the respondents

An assessment participation of farmers in social affairs was taken as a factor in order to see its general influence in accessing and utilizing agricultural knowledge and communication/ICTs by farmers.

As the study result had indicated, a larger number of farmer households were involved in different types of formal and informal associations or institutions in the community while the remaining were having no or little involvement in community affairs. According to some farmers that had actively involved in community affairs, being a member of social institutions and associations had created an opportunity for them to meet and discuss on development of agriculture with other persons. Their membership in informal and formal institutions and associations in their communities had exposed them to interact with some model farmers who won a prize from government bodies for their valuable efforts in increasing agricultural production which improved their livelihood. Further- more, it also had given them opportunities to interact with some knowledgeable persons or experts in the filed of agriculture. In such situations where interpersonal bondage is stronger, the people have more preference for learning through mutual discussions in formal or informal groups rather than deriving conclusions independently. The group pressure and information exchange fosters favorable decision-making on the utilization of development information.

Hence, social participation of farmers in different formal and informal institutions and associations found in their communities has a significant influence on their access to and proper utilization of agricultural knowledge and communication for better crop and livestock production. As farmers' social participation increases, utilization of accessible information also increases. The finding of this study is in line with the findings of Ebrahim (2006), where he reported a positive relationship between social participation and adoption of dairy package by rural women.

Total annual farm income is the other important factor determining the ability to access new agricultural knowledge and communication/ICTs. The assumption is that those farm households having higher earning probably acquire and utilize agricultural knowledge and technology packages and this in turn will expose them to get new information that boost their farm production.

In this study farm income is defined as any proceeds from activities related to crop production and/or livestock-raising. Non-farm income includes all proceeds from economic activities outside any farm, e.g., value-adding activities, micro-enterprises, or employment/provision of services in economic activities not connected with the farm.

In this study, the major source of income for larger number of farmers (98.66%) was from agricultural activity, representing crop production and animal husbandry. As the information obtained from farmers interviewed and participated in focus group discussion indicate their engagement in crop and animal production could not let them reap sufficient amount of income. The income they generated from subsistence agriculture had enabled them to manage the daily survival of their family. The higher dependency of farmers in the study area only in subsistence agricultural activities had generated lower income,

which had adversely affected their capacity to invest in ICT technologies (e.g., the purchase of mobile phones). Hence, they may not be able to use such technology to obtain agricultural knowledge and information that could help them transform from hand- to-mouth subsistence production.

With respect to land holdings, an overwhelming majority of the respondents (92.66%) in the study area were small farmers holding farm area only two or below two hectares of land. Widespread land fragmentation plays a major role in low level of agricultural productivity due to sub-optimal usage of inputs. Therefore, as the study indicates, with uncontrolled growth in population and the ensuing fragmentation of land, land holding size by farmers in the study area was relatively small. Probably the lower income generated from agricultural activities by farmers in the study area might have been associated with fragmentation of land. It can also be possible to recognize that there exists positive relationship between size of landholding and respondents' access to and utilization of new agricultural knowledge and communication/ICTs for better crop and livestock production. This implies that when respondents' size of land holding increases, their knowledge of farming also increases. The probable reason might be that, more land enables farmers to increase production, which provides more income that can be used to buy farm inputs. Therefore, farmers who have relatively large farm size will be more initiated to practice improved technologies. This also implies that respondents with large farm size seek many more new ideas, information and knowledge than those who have small landholdings.

Like in the other parts of the country, livestock is an important component of the farming system in the study area. The majority of the sample households covered by the survey own animals of different kinds.

In general, as this study had shown, access to and utilization of agricultural knowledge and communication/ICTs increases with the increase in annual household income due to selling of animals and their products.

Needs for ICTs, accessibility and level of utilization

As the study result indicates all the interviewed respondents need to adopt updated agricultural knowledge and communication/ICTs if accessible. On the other hand, even if there were an interest in ICTs due to inadequacy of technical know-how, the benefits of ICTs was not accessible to farmers in the study area.

Ownership pattern and perceived behavior/awareness of respondents on the use of already available ICTs

Owning facilities for ICTs was also considered as one of the important factors in the provision of different agricultural development information to the farmers. The assumption was that those farmers who own ICT facilities have a higher opportunity of getting agricultural knowledge and information to improve their agricultural practices.

Even though the types of ICTs that provide agricultural knowledge and information are many, the study concentrated on those traditional ones such as radios, television set, mobile phones and computers.

Due to the uniqueness of the technology reaching the study area, lately, a large number of farmers (43.33%) own mobile pones followed by radio ownership. As the study result indicates, the mobile phones were primarily used for maintaining social (contacting relatives and friends) and for emergencies. Similarly, the radios in the study area were primarily being used for listening the daily news and for enjoying entertainment programs only. Those farmers who owned television sets were using them to watch the news and entertainment programs like music, drama, soccer games, etc.

Computers with internet connection were totally out of reach for the farm households. This is probably due to lack of technological know- how, exuberant cost and undeveloped infrastructure in the study area. This implies that, internet- based system to access agricultural knowledge and information by the farmers' was unthinkable during the study period.

Accessing to and proper utilization of updated and scientific agricultural knowledge and communication /ICTs has become a requirement for sustainable development of farming systems. However, some farmers have managed to obtain information from other sources such as other enlightened farmers, inputs dealers, produce buyers and NGOs Qamar, (2002).

The findings in this study agree with a recent study of Chigona et al (2009), in that, the use of mobile phone-mediated internet among individuals with low income in developing countries remains low. Other studies conducted by Barrett (2008), Poulton et al.(2006) had also shown that lack of assets (also known as asset poverty) constrains smallholder farmers' ability to adopt new technologies. This suggests that access to and usage of ICTs among smallholder farmers, who usually tend to have low income, might be low due to

their lack of capacity to buy the ICT facilities or unavailability of telecom infrastructures in the vicinity.

In general, the observed findings of this study, with respect to hindrances to the accessibility and utilization of agricultural knowledge and communication/ ICTs by small farmer respondents in Dugda woreda of East Showa zone, Oromia region agrees with Aina (2007) who associated the following problems or constraints with dissemination of agricultural information in Africa:

1. Inadequate financial power of farmers in Africa.
2. African farmers are illiterate. Majority of them cannot read or write in any language.
3. Farmers in Africa live in areas, where there is lack of basic infrastructure, such as telephone, electricity, good road network, clean water, etc.
4. Few extension workers (the ratio of agricultural extension workers to farmers is low).
5. Poor radio and television reception signals in most village communities in Africa.

Chapter Five: Summary, Conclusions and Recommendations

Summary

Ethiopian farmers are making significant contribution to sustaining agriculture and to ensuring food security. In spite of their restless engagement in all agricultural activities to ensure food security, Ethiopian farmers, particularly small farm householders often face difficulties in gaining access to new agricultural knowledge and information to increase their production and productivity.

Knowledge and information is becoming one of the most important factors of production, and there is no doubt that this factor make farmers stronger in their effort to develop agriculture and ensure food security. Having timely and relevant information can fundamentally alter people's decision-making capacity and becomes critical to increasing agricultural productivity. However, it is often difficult for rural dwellers to obtain relevant and timely agricultural knowledge and information that help them to increase production and productivity.

Earlier, no study had been conducted in Dugda woreda of East Showa zone, Oromia region on accessibility and utilization of agricultural knowledge and communication/ICTs by small farm households. Therefore, this study was intended to analyze accessibility and utilization of ICTs by small farm households.

The study used two stage sampling procedure to constitute the sample. The necessary information was obtained by administering written questionnaires and conducting personal face-to-face interviews using a structured interview schedule. There were also

focus group discussions with respondents. With respect to analysis of data, simple descriptive statistics such as frequency, mean and percentages were used. Data editing, coding and tabulation was performed beforehand to facilitate the analysis and interpretations of data.

The study results had revealed that among the different demographic profiles of respondents the number of male farmers was higher than females and the majorities (74%) of the respondent farmers were in the age range of 19-38 years belonging to the young or middle age category. Further, the majority of the farmers (80 %) was illiterate and had a large number of dependent family members.

With respect to socio- economic characteristics of respondents the study results revealed that the majority of the farm households had no involvement in any formal and informal institutions or associations in their communities and larger number (58.66%) of the respondents had earned a major source of income from crop production only with overwhelming majority (92.66%) of the farmers had a land holding only two or below two hectares. In many cases the income is supplemented from selling livestock products.

Again, regarding ICTs usage, the majority of the farmers benefit only from mobile phones and radio set. Due to being illiterate and unavailability infrastructures in the study area, usage of computer was unthinkable. However, farmers in the study area received agricultural information from a wide range of sources and channels, such as extension agents, informal gathering in the community, neighbors and friends, woreda agriculture office and so on.

Even though knowledge and information is becoming one of the most important factors of production, the study had identified innumerable constraints that farmers encountered in

Dugda woreda in their quest to access and utilize agricultural knowledge and communication/ICTs for better crop and livestock production.

Conclusions and Recommendations

1. In conclusion, ICTs for imparting agricultural information was not accessible to farmers mainly due to their low educational level. Therefore, purposeful focus has to be given on literacy of farmers to address the existing gap. Greater effort must be made to educate farmers to benefit from this technology through designing and executing specialized training programs such as “meserete timhrt” (fundamental education). Farmers must get the necessary education that makes them enthusiastic/interested to new technologies and to enable them operate ICTs.
2. As farm households were constrained by relatively large family size, it had created pressure on their lower income. Therefore, action based awareness creation on population growth at family level should be strongly advocated that lead to reduction in fertility and lengthen birth spacing in order to have smaller household size. Concerned stakeholders and development actors involved on population issue should encourage households having acceptable number of children through provision of especial offer such as covering schooling cost, providing training and other related incentives.
3. Non participation of the farmers in community institutions and associations had made them lose the opportunity they might gain in sharing vital agricultural knowledge and information by being member of such associations. Therefore, it is recommended that, training programs should be organized to farmers, especial for young farmers, who did not have any involvement in the society. The training should emphasize on the advantages of being a member in various formal and informal institutions and associations where the

contents of the training should be based on farmers need, in a manner that they are encouraged to attend, taking into consideration the timing, duration, location and language of training.

4. The income generated by farm households from subsistence crop production had enabled them to manage only the daily needs of their family. Improving households' off-farm/non-farm income will have greater impact on improving the livelihood of small farmers where expansion of agriculture is no longer possible because of scarcity of land. Therefore, intervention in areas such as promoting effective credit services and creating diversified off-and non-farm activities (employment and income generating schemes) would serve in reinforcing the existing local coping strategies that only depend on subsistence crop production and absorb those who are resource poor farm households to be productive citizen. In this regard, government and NGOs operating in the area should closely relate their financial and technical knowledge to the benefit of the small farm households by diversifying off-farm/non farm activities. Access to credit and employment in income generating schemes can create an opportunity to small farm households to enable them get involved in economic activities that generate revenue in order to access and utilize agricultural knowledge and communication/ICTs for better crop and livestock production and improvement of their livelihood.
5. Farmers in the study area had pursued a traditional cropping system by highly relying on information passed on by their peers or elders, model farmers and development agents (DAs). Therefore, generating awareness among farmers on usefulness of ICT services and its value to agricultural development is the first step to be considered for the purpose of soliciting new and vital agricultural knowledge and information. Since mobile phones are

increasingly available to lower income farmer groups in the study area, simple training programs should be offered to augment the technical know-how and skill of farmers by learning on how to search for agricultural knowledge and information.

6. Poor/ lack of infrastructural facilities in the study area were the major constraint that encountered small farmers. Multi-stakeholder mechanisms or partnerships should be created among government, NGOs, private sectors, and the public- at- large- to provide infrastructural facilities in the area. The measures to redress constraints of infrastructural facilities in the area includes construction of good access roads, installation of radio and television antennas at strategic locations for better radio and television signal receptions, mounting of electric transformers in villages/communities, airing of agricultural information programs on radio and TV at appropriate time convenient to farmers to watch for the programs, provision of community rural electrification, broadcasting agricultural information programs on radio and TV in native dialect and building of community libraries in the villages.

   With respect to constraint of information and knowledge institutions or centers in the study area, both the government and NGOs working for the welfare of rural people should establish information centers in the area that should be equipped with up- to- date information and communication gadgets, such as computers with internet access, local area and wide area networks, radio and television sets, telephones and fax machines, multimedia projectors, video and audio recorders that would be able to provide the rural farmers the desired agricultural information and knowledge in a format that would be comprehensible to them, taking into cognizance the prevailing high illiteracy rate, cultural differences and limited technology. Moreover, Community libraries should be established

in villages that provide the desired agricultural information and knowledge to farmers free of cost. Community libraries will no doubt help in procuring books, newsletters, leaflets on agricultural information which the literate farmers can borrow and read. The community library staff can also create partnership with the agricultural research and other institutions that are engaged in the production and dissemination of agricultural innovations and information in order to organize seminars and workshops for farmers in the study area.

In the effort to provide ICT services to farmers, more emphasis should be given to the provision of information relevant to their farming systems and compatible with the farmers needs or expectations, literacy level, language, and social norms or cultural differences. Hence, ICT should be: affordable, scalable, sensible and appropriate to the farmers' real situations.

Finally, ICT Infrastructure for rural areas must be part and parcel of all national infrastructure planning and programs to include the integration of ICT implementation as an enabling factor for sustainable rural viability.

References

Asres, E.(2005). Access and Utilization of Development Communication by Rural Women in Dire Dewa Administrative Council, Eastern Ethiopia: Msc Thesis in partial fulfillment of the requirements for the Degree of Master of Science in Agricultural Extension, Haramaya University.

CSA,(2008). The 2007 Population and Housing Census of Ethiopia: Central Statistics Authority . Addis Ababa, Ethiopia.

Daniel T.(2008). Access and Utilization of Agricultural Information by Resettled Farming Households: The Case of Metema Woreda of North Gonder, Ethiopia. Msc. Thesis in partial fulfillment of the requirements for the Degree of Master of Science in Agricultural Extension, Haramaya University.

Deribe K.(2007). Agricultural Information Networks of Farm Women and Role of Agricultural Extension: The Case of Dale Worea of Southern Nations, Nationalities and People's Region. Msc. Thesis in partial fulfillment of the requirements for the Degree of Master of Science in Agricultural Extension, Haramaya University.

Edlu B.(2006). Extension Programmee Coverage and Utilization by different Categories of Farmers in Enemor and Endeber Woreda of Gurage Zone.

E. Geleb, A. Maru, J. Brodgen, E. Dodsworth, R. Samii, and V.Pesce.(2008). Adoption of ICT* Enabled Information System for Agricultural Development and Rural Viability: A pre-Conference Workshop Summary.

FAO,(2002). Agricultural Knowledge and Information Systems for Rural Development: Food and Agricultural Organization of the United Nations, A Strategic Vision.

Getahun S.(2009). Access and Utilization of Agricultural Information on Bread Wheat: The Case of Small Holder Farmers in Tach Gaynit Woreda of Northern Gonder, Ethiopia.

Msc. Thesis in partial fulfillment of the requirements for the Degree of Master of Science in Agricultural Extension, Haramaya University.

IICD,(2008). ICTs for Agricultural Livelihoods: Impact and Lessons learned from International Institute for Communication and Development Support Activities.

Jac S., Wietse B., and Frans N.(International Institution for Communication and Development, IICD). How ICTs Can make a difference in Agricultural Livelihoods.

Jemal K.(2010). Access and Utilization of Agricultural Knowledge and Information by Women Dairy Farmers: The Case of Ada'a District of Eastern Showa Zone of Oromia Region, Ethiopia. Msc. Thesis in partial fulfillment of the requirements for the Degree of Master of Science in Agricultural Extension, Haramaya University.

Julius J., Ruth N., and Edith O.(University of Nairobi, Michigan State University, and International Development Research Center, Nairobi). Awareness and the use of Mobile Phones for Market linkage by Small holder Farmers in Kenya.

Lishan A.(2010). Ethiopian ICT Sector Performance Review: Towards Evidence- based ICT Policy and Regulation. Volume Two, Policy Paper.

Mary S.(2008). Assessment of Agricultural Information needs in Africa, Caribbean and Pacific States. Country Study: The Case to Tanzania.

Salau E., and Saingbe N.(2008). Access and Utilization of ICT Services Among Agricultural Researchers and Extension Workers in Selected Institutions in Nasarawa State of Nigeria.

Annexes

Annex-I: Survey questionnaire to be filled by sampled respondents

1.1. Interview Schedule for the sample farm household head respondents'

An Interview Schedule for collecting data from rural household heads For M.A.Research Thesis on, Access and Utilization of Agricultural Knowledge and Communication/ICT Services/ by Small farm householders at Indihar Gandhi National Open University, Institute of Agriculture and Development Studies.

The objective of this Interview Schedule is to collect information from farmer respondents on their access to ICTs, level of awareness, and utilization of these services and constraints that impede them not to effectively utilize these ICT services in the study area. The study is conducted for academic purpose. Hence, the researcher requests your honest & fair responses to fill up this interview schedule.

Instructions to enumerators

1. Make brief introduction to each farmer before starting any question, get introduced to the farmers, (greet them in the local way) get his /her name; tell them yours, the institution you are working for, and make clear the purpose and objective of the interview. Establish a good rapport with the interviewee.
2. Please ask each question so clearly and patiently until the farmer understands (gets your point). Ask only one question at a time.
3. Allow the interviewee sufficient time to answer the question.
4. Do not show signs of surprise, shock, anger, or other emotions if unexpected answers are given and use tact in getting the subject back to an area of inquiry if the interviewee strayed too far from the theme of the question.

5. Please fill up the questionnaire according to the farmers reply (do not put own opinion).
6. Please do not try to use technical terms while discussing with farmer and do not forget the local language.

- Please try to answer all questions by putting a check mark (✓) for their choice on the space provided. Similarly, write their opinions on some of the questions when they are requested to specify.

1 Genera Information on the sample farm household respondents

1.1. Woreda _____ Kebele_____

1.2. Gender: 1 = Male, ___ 2 = Female_____

1.3. Marital Status: 1 = Married,____ 2 = Single,_____ 3 = Divorced,_____

1.4. Age: 1= (19-28) ___ ,2= (29-38) ___ , 3= (39-48) ___, 4=(above 48)

1.5. Educational Level: 1= Illiterate___ , 2= Elementary/High school____

3= college graduate (10+1,10+2, 10+3, or Diploma)____ ,

4= (First degree& above) _____

1.6. Family Characteristics: Please, provide information on your household members and their engagement in farming operations as per the table below.

Code	Age category	Number of Family Members in sex			Tick here if, working full tin on farm	Tick here if, working part time on farm
		Male	Female			
1	Children, below 16 years of age					
2	Youth , 16 – 30 years of age					
3	Adults, 31- 45 years of age					
4	Adults/old person , 46 - 60 years of age					
5	Old persons above 60 years of age					

2. Socio-economic information on the sample respondents'

2.1 What is your social position in the community (membership and role in any formal or informal institutions or associations in the community)?

1 = No, I don't have___, 2 = member of village council___, 3 = executive member of village council____, 4 = leader of religious institution/idir___,

5 = member of family committee at school____, 6 = others (specify)__

2.2 What is your main means/source of livelihood?

1= only crop farming, 2= only livestock production, 3= crop farming and allied activities, 4= rural business undertaking, 5= agricultural labour, 6= monthly salary from permanent job at any institution, 6= any other(specify)----------

2.3 Do you own land? 1= Yes____, 2= No _____

2. 4 If yes, what is the total land size covered by all crops (in hectares) 1 = Only 0ne hectare__ 2 = Below 0ne hectare___, 3 = Two hectares___, 4 = Above one & below two hectares___ 5 = Two to five hectares___, 6 = Above five hectares_____

2. 5 Do you own livestock? 1= Yes,____, 2= No_____

2.6 If yes, what is the total number of livestock you own as per the specific information indicated in the table below?

Code	Kind of livestock	Number of Livestock		
		Crossbre	Local breed	Total
1	Oxen			
2	Cow			
3	Young bull			
4	Calves			
5	Heifers			
6	Sheep			
7	Goats			
8	Chicken			
9	Horse			
10	Mule			
11	Donkey			

3. Information and Communication issues. Circle on the number for your answer.

3.1 Do you need to obtain updated agricultural knowledge and communication/ICT services? 1= Yes, 2= No

3.2 For what purpose do you need to adopt updated agricultural knowledge & information?

1 = to avail information on latest (best) packages of agricultural practices __

2 = to avail information on weather forecasting_____

3 = to avail information on early warning and management of diseases and pests____

4 = to avail agricultural marketing information_____

5 = to avail information on agricultural input prices and availability_____

3.3 Do you have Radio, Television, CD-ROM, Computer/Internet and Telephone/Cell phone? 1= Yes, 2= No

3.4 If your answer for question 3.3 above is yes, for what purpose do you mainly use it? or what do you perceive their importance/value? Circle only two of the numbers for your answer among the given list.

1= for entertainments 2= for in touch with family and friends (to meet/greet families, friends and others with it) 3= to listen to news 4= to access agricultural information and knowledge 5= to contact with agricultural input dealers/suppliers 6= to contact with agricultural output buyers

***If others, please specify*……..**

……

…….

3.5 Which sources of knowledge and communication/ICT services given below do you usually use to access agricultural information? Circle only three of the numbers for your answer among the given list.

1= Relatives, friends and neighbors 2= Farmers' training centers

3= Local markets 4= Leaflets and folders

5= Rural radio programme 6 = Mobile phones

7= Rural TV programmes 8= 'Idir' or Peasantry associations

9= Village Level Development Agents/DAs 1o= Public meetings

11= Woreda agriculture office 12= Computer/Internet

13= Farmers' cooperatives 14= NGOs

15 = Model farmers 16 = Religious organizations

17 = Agricultural inputs suppliers

If others, please specify……..

3.6 How often do you utilize your mobile phone, radio and TV to quest agricultural knowledge and information? 1 = Usually___, 2 = Some times___, 3 = Never ____

3.7 If your answer for question 3.3 above is No, what are the factors that hinder you not to access and utilize the already available ICT services effectively?

1= ICT services are unaffordable (Income constraint) 2= ICT services are far away to reach 3= Lack of ICT manipulation capacity (illiteracy) 4= Poor infrastructure facility in the area 5= Time Constraint 6= Unavailability of electric power/ constant power interruption 7= Lack of awareness and understanding what ICT can befit in the agricultural endeavor

8= Unavailability of ICT centers/ institutions in the surrounding 9= Cultural Taboos 10= Poor radio and television signals 11= Agricultural information on radio and television is always aired at odd hours when farmers who desire such information have gone to their farms 12= Agricultural information is not broadcast on radio and television in the farmers' dialect 13 = Lack of advice

14 = Network problem 15 = none practicability of the information supplied to my situation 16 = Lack of interest 17 = Others (specify)…….....

3.8 What would you recommend to rectify your problem of ICT services access and utilization to enhance its contribution toward the attainment of agricultural development? Pleas, mention them below.

……

……

***Annex-II*: Interview Schedule for key informants**

1 Genera Information of key informants

1.1 Name of the respondent _____

1.2 Occupation or sectoral office and if not government worker specify your status in the area _____

1.3 place of work: 1= at the office level, 2= at the field level,

3= other (specify).----------

2 Information seeking behavior

2.1 Do you think that the farmers in the study area consciously demand agricultural knowledge and Information/ICT services? 1= Yes, 2= No, 3= I don't know. If NO, specify the reason……..

2.2 If the answer for the above question 2.1 is Yes, specify the purpose they use for.

1= to facilitate and support their effort in increasing agricultural production and productivity 2= for entertainment and greetings

3= for some other purpose. Specify…….

2.3 If the answer for the above question 2.1 is Yes, specify how quickly they wish to accept and adopt the differential new agricultural technologies?

1= after most of the people accept/adopt it.

2= after consulting others who are more knowledgeable and benefited using it.

3= after they getting training on the adoption of new agricultural technologies, secure the readily availability of other supplementing inputs, whenever they come across field visit, etc.

3 Information Source

3.1 Can you specify the source where do farmers get information they need for their agricultural practices?

……..

……..

3.2 Do you belief that the farmers have adequate access to ICT services to their reach?

1= Yes 2= No 3= I don't know

3.3 If the answer for the above question 3.2 is No, specify the constraints.

……..

……

3.4 If the answer for the above question 3.2 is Yes, do you think that they are effectively utilizing the already available ICT services?

1= Yes, 2= No

If your answer is No, Specify the constraints for their less/poor utilization.

……

……

3.5 What would you recommend to overcome farmers' problem of agricultural information/ICT Services accessibility and utilization?

……

……

……..

Annex III Data tabulation

I. General Information of the respondents (Total Respondents 150)

Numbers that represent each Particulars of questionnaires	Numbers of alternatives provided to be chosen by respondents that reflect their opinion to the questionnaires.						
	1	2	3	4	5	6	
1.1		1.1		1.1		1.1	
1.2	132	1.2	132	1.2	132	1.2	132
1.3	147	1.3	147	1.3	147	1.3	147
1.4	66	1.4	66	1.4	66	1.4	66
1.5	121	1.5	121	1.5	121	1.5	121
1.6	450	1.6	450	1.6	450	1.6	450

II. Socio-Economic Information of the respondents

Numbers that represent each Particulars of questionnaires	Numbers of alternatives provided to be chosen by respondents that reflect their opinion to the questionnaires											
	1	2	3	4	5	6	7	8	9	10	11	12
2.1	83	2.1	83	2.1	83	2.1	83	2.1	83	2.1	83	2.1
2.2	88	2.2	88	2.2	88	2.2	88	2.2	88	2.2	88	2.2
2.3	150	2.3	150	2.3	150	2.3	150	2.3	150	2.3	150	2.3
2.4	29	2.4	29	2.4	29	2.4	29	2.4	29	2.4	29	2.4
2.5	67	2.5	67	2.5	67	2.5	67	2.5	67	2.5	67	2.5
2.6	107	2.6	107	2.6	107	2.6	107	2.6	107	2.6	107	2.6

III. Agricultural Knowledge & Communication/ICTs demand, sources, access & utilization of the respondents

Number for particulars of each questionnaire	Numbers of alternatives provided to be chosen by respondents that reflect their opinion to the questionnaires															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
3.1	150	-														
3.2	9	4	21	62	54											
3.3	55	8	65	-	22											
3.4	46	31	61	1	11											
3.5																
3.6	13	22	115													
3.7	144	132	129	126	117	85	113	45	53	88	28	93	82	22	19	19
3.8																

Annex IV: Calculation of Mean Value of ages of the sample respondents.

Exact Class Intervals of ages	Mid-Point(X) of Class Intervals	Frequency of responses(f)	Deviation from the assumed mean(AM), (X')	Product of frequency & deviation from the assumed mean (fx')
18.5 – 28.5	(18.5+28.5)/2= 23.5	45	(23.5 – 33.5)/10= -1	(45*-1)= - 45
28.5 – 38.5	(28.5+38.5)/2= 33.5	66	(33.5 – 33.5)/10 = 0	(66*0)= 0
38.5 – 48.5	(38.5+48.5)/2= 43.5	26	(43.5 - 33.5)/10= 1	(26*1)= 26
48.5 – 58.5	(48.5+58.5)/2= 53.5	13	(53.5- 33.5)/10= 2	(13* 2)= 26
Total		**150**		**7**

* The Assumed Mean (AM) is 35.5, because, it is the value having the maximum frequencies.
* The Class Width of Class intervals (i) is the difference between the upper class boundaries and lower class boundaries for each class intervals.
  Hence, i = (28.5 – 18.5), = 10.

$$M = AM + \frac{\sum fx'}{N} * i$$

where, M = Mean

AM = Assumed Mean

X'= Deviation from the assumed mean

N = Number of responses

$\sum fx'$ = Sum of the Product of frequency & deviation from the assumed mean

i = Class Width of Class Intervals

So, $M = AM + \frac{\sum fx'}{N} * i$

$= 33.5 + (7 / 150) * 10$

$= \mathbf{34}$