THE ROLE OF ICT ON AGRICULTURAL KNOWLEDGE MANAGEMENT IN ETHIOPIA

A CASE STUDY ON WOREDA KNOWLEDGE CENTERS IN BURE, GOMA, ALABA AND ALAMATA

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DEDICATION

I dedicated this thesis to my love Gelaye Fraol,

who supported me in all regards through my

Personal development.

Thank you very much Gelaye!

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LIST OF ABBREVIATIONS

AKIS	Agricultural Knowledge and Information Systems
BoARD	Bureaus & Rural Development
CSA	Central Statistical Authority
EAP	Ethiopian Agricultural Portal
FTC	Farmer Training Centre
ICT	Information and Communication technology
ILRI	International Live Stock research Institute
IPMS	Improving Productivity & Market Success of Ethiopian Farmers
KM	Knowledge Management
KMS	Knowledge Management System
MoARD	Ministry of Agriculture & Rural Development
RDO	Research and Development Officer
SNNP	Southern Nation and Nationalities people
TCP/IP	Transmission Control Protocol/Internet Protocol
WKC	Woreda Knowledge Centre
WOoARD	Woreda Office of Agricultural Research and Development

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Abstract

This Study analysed the perspective that information technology can play a central role in knowledge management processes and its challenges and opportunities in the context of Ethiopian infrastructure in the cases under study.

It was undertaken in four regions of Ethiopia taking one Woreda Knowledge Centre (WKC) from each region based on purposive sampling method. The study was aimed to assess the role of ICT in IPMSs' projects of ICT-based Woreda Knowledge Centers (WKC) to investigate if such centers can exploit the opportunity of the ICT-based WKCs for the purpose of enhancing effectiveness of the users. The respondents are the staffs of WOoARD who are using the knowledge centers. Both qualitative and quantitative data were used to obtain reliable information from primary and secondary sources. Data is analysed more qualitatively and also done using descriptive statistics, Percentage and Ranking. The study indicated that the role of ICT in the WKCS is moderate. Due to lack of computer basic skills, shortage of ICT tools and others, there are many challenges that have to be given solutions. The study recommended the way these challenges can be solved. The study also revealed that, the inefficiency of Ethiopian Telecommunication is becoming the obstacle for the process of Knowledge Management (KM) by hindering that there is very poor network connection in all regions so that it is difficult to get and/or disseminate the agricultural information and knowledge by the agricultural service providers.

Chapter 1

Introduction

1.1. Background of the Study

Improving Productivity and Market Success of Ethiopian Farmers (IPMS) project initiated ten Woreda Knowledge Centers (WKCs) in four regions of Ethiopia_ Amhara, Oromia, Southern Nation and Nationalities people (SNNP), and Tigray to set Successful Knowledge Management (KM) system. As mentioned in Knowledge Management Implementation Guideline, March 2006, of the project, in order to help in being adaptive to changes in the agri-food chain, learning from organizations with good research output and innovations record, benefiting from indigenous knowledge, being responsive to farmers and pastoralists needs and requirements, addressing inertia due to lack of information among farmers and pastoralists, creating a stable technology infrastructure over a long period of time, creating a capable agricultural management regime with a good development process supporting them, and developing a loyal and capable workforce with the core aim of sharing knowledge to the right people, at the right time and the right place. It is a common belief that ICT can be a source of competitive advantage through strengthening firm's knowledge, and based on this research it would like to explore this issue. ICT is a fundamental enabler and tool for knowledge management implementation – but it is not the driver. Good ICT strategy will: address today's needs without ignoring the future, adhere to accepted standards to ensure maximum compatibility and sharing, ensure a clear upgrade path to make scaling up easier, make it easily accessible for the intended users, ensure data integrity and security is maintained. (Ermias, 2006). As it is indicated above, it is important to assess whether the WKC are in a position to fit with the strategy of the project. Much research addresses this subject from a multiple viewpoints. However, in this stream of literature I have to the best of my ability found little evidence on the application of ICTs as a support in developing WKCs. What is new in my contribution is how WKCs are able to use ICTs in relation to development of knowledge capturing, storing, sharing, and managing by the users to our country Ethiopia infrastructure context. Agriculture is the main economic sector in Ethiopia and the majority of the rural population depends on it. The sector faces major challenges in enhancing production in

a situation of diminishing natural resources necessary for production. ICT can play an important role as enabling tools when addressing these challenges. IPMS project has both ICT-based and non-ICT-based knowledge management initiatives, this research aim to investigate the potential roles of ICT to the agricultural KM in districts supported by IPMS in terms of the capturing, storing, accessing and disseminating of relevant and timely information to the target beneficiaries – which primarily includes agricultural service providers in 10 districts (referred to by IPMS as Pilot Learning Woredas or PLWs). The research also aims to assess the challenges and opportunities in developing ICT-based agricultural KM by undertaking a case study of IPMS experiences in four of their 10 pilot learning Woredas. The following are the four Woreda Knowledge Centers (WKCs) taken as cases by this study.

2.6.1. Alamata

Alamata Woreda is located 600km north of Addis Ababa and south of Tigray. The WKC was established by IPMS/ILRI in 2004 to support the agricultural productivity of the farmers in the Woreda by providing the opportunity to access relevant agricultural information via WKC.

2.6.1. Bure

Bure is found 400 km northwest of Addis Ababa and southwest of the Bahia Dar. The Woreda has good opportunity with regard to the road infrastructure because it is linked to about three regional states, such as to Oromia through Wollega, to Benishangul Gumiz through Metekel. Therefore, Bure has good opportunity to share agricultural experience and information among these regional states. This is also a good market opportunity for the Woreda farmers.

The WKC was established by IPMS/ILRI in 2004 to support the agricultural productivity of the farmers in the Woreda by providing the opportunity to access relevant agricultural information via WKC.

2.6.1. Goma

Goma Woreda is located 390 km south west of Addis Ababa and west of the Jima. This worda is well known by its unique product that is coffee. The WKC was established by IPMS/ILRI in 2004 to support the agricultural productivity of the farmers in the Woreda by providing the opportunity to access relevant agricultural information via WKC.

2.6.1. Alaba

Alaba Woreda is located 310 km south of Addis Ababa and southwest of the Awasa. The WKC was established by IPMS/ILRI in 2004 to support the agricultural productivity of the farmers in the Woreda by providing the opportunity to access relevant agricultural information via WKC.

The focus of this research is to assess the role of Information and Communication technology (ICT) in IPMSs' projects of ICT-based Woreda Knowledge Centers (WKC) to investigate if such centers can exploit the opportunity of the ICT-based WKCs for the purpose of enhancing effectiveness of the users. This is of primary importance to identify the gaps and challenges exist in the centers to have more comprehensive knowledge in order to further strengthening the WKCs and also to identify the way the centers use ICTs resources in the execution of their daily job.

1.2. Statement of the problem

Making relevant knowledge and information available to farmers is still extremely poor in developing country. The infrastructure, the hardware, the software, the people and the network are not well developed, used and managed. [International Service for National Agricultural Service, EFITA 2006 Conference]

Ethiopia has been suffering from food insecurity even though the country holds plenty of fertile arable lands, big water resources, and cheap labor. By recognizing the fact that lack of access to relevant agricultural knowledge is part of the problem, IPMS established Woreda Knowledge Centers (WKCs) in 10 districts (Woredas) where it is active. But establishing and operating these centers is not a guarantee for access to knowledge. While these knowledge centers use both ICT and non-ICT based methods for disseminating knowledge and information, ICT plays an important role in capturing, processing, managing, and disseminating information. Therefore, assessing the role of ICT in enabling the processes in the WKCs in the context of Ethiopian infrastructure will demonstrate whether it is a desirable approach to follow in larger scale interventions (especially considering the significant investment ICT tools require) and also to identify gaps that exist in achieving the full potential of using these ICT-based Agricultural KM systems.

1.3. Objectives of the Study

This research aims to recognize the role of ICT on agricultural KM as implemented by IPMS ICT-based initiatives in selected areas of Ethiopian regions. The research objectives can be summarised as follows:

- To identify the role of ICT in capturing, storing, processing, managing, and disseminating knowledge by IPMS project KM initiatives.
- To identify whether the ICT-mediated information is timely, appropriate, and in the right format for the intended beneficiaries.
- To explore the challenges and the opportunities of ICT-based efforts in WKCs and suggest possible solutions for identified problems.
- To get lessons from this experience that could inform a robust strategy for employing ICT-based KM efforts in other areas within Ethiopia?

1.4. Research Questions

1. What is the role of ICT in agricultural knowledge management within IPMS ICT-based KM initiatives?
2. Is the information available in Woreda knowledge centers timely, in appropriate format and is the technology friendly to agricultural service providers?
3. To what extent are agricultural service providers using the Woreda knowledge centers?
4. Do the services provided in the ICT-based KM centers positively influence the efficiency of the agricultural service providers?
5. What are the challenges facing these IPMS ICT-based agricultural KM centers?

1.5. Significance of the Study

This research investigates the impact of ICT-based agricultural KM centers in the cases of four regions of Ethiopia under the study. The following specific significances might be obtained as a result.

- Analyze the performance, challenges and opportunities of each agricultural KM centers so that it helps them to fill the gap, if any.
- Attempt to capture leading practices in agricultural KM that may be identified during the research process.
- Provide evidence-based and methodological assessment of the role of ICT in agricultural KM to inform policy makers making relevant decisions in this sector.
- This study can also serve as an input for future researchers looking into broader questions of agricultural development.

  Fore example, what is the impact of KM on the livelihood of framers who are using the output of the WKCs?

1.6. Scope and Limitation of the Study

This research is being conducted to assess the impact of ICT-based agricultural KM centers in four regions of the country, Amhara, Tigray, SNNP, and Oromia. Due to time limitations, the study only focused on only four of the ten Woreda knowledge centers established by IPMS. The study also not looked into the knowledge and/or information centers established by IPMS in regional bureaus of agriculture, regional agricultural research institutes, and zone offices of agriculture, and instead focuses only on centers at Woreda offices of agriculture.

1.7. Organization of the Study

This thesis is organized into five chapters. Chapter one introduces the back ground of the problem of the study areas, significance of the study, the research objectives, research questions and scope and limitations of the study. Chapter two covers the review of the related literature that includes conceptual explanation of the ICTs contribution to agricultural knowledge

management and the like. Chapter three presents the research design and methodology that used to carry out this research. Chapter four is the central theme or core of this paper where data is presented analyzed interpreted and discussed. Finally, Chapter five comprises summery, conclusions and recommendations of the findings.

Chapter 2

Review of Related Literature

2.1 Knowledge Management Concepts and Definitions

To define Knowledge management System (KMS), it is necessary first to define knowledge and knowledge management. Based on the work of Nonaka and Huber, Knowledge is a justified personal belief that increases an individual's capacity to take effective action (Nonaka 1994, Huber 1991).

Action in this context requires physical skills and competencies (e.g., playing tennis, or carpentry), cognitive/intellectual activity (e.g., problem solving), or both (e.g., surgery which involves both manual skills as well as cognitive elements in form of knowledge of human anatomy and medicine).The definitions of knowledge found in the information systems literature further make a distinction among knowledge, information and data. For example, Vance defines information as data interpreted into a meaningful framework whereas knowledge is information that has been authenticated and thought to be true (Vance 1997). Maglitta suggests that data is raw numbers and facts, information is processed data, and knowledge is "information made actionable" (Maglitta 1996).

While each conceptualization makes inroads into understanding differences among the three terms, they fall short of providing a means to readily determine when information becomes knowledge. The problem appears to be the presumption of a hierarchy from data to information to knowledge with each varying along some dimension, such as context, usefulness, or interpretability.

What we consider key to distinguishing effectively between information and knowledge is not found in the content, structure, accuracy, or utility of the supposed information or knowledge. Rather, knowledge is information possessed in the mind of an individual: it is personalized or subjective information related to facts, procedures, concepts, interpretations, ideas, observations and judgments (which may or may not be unique, useful, accurate, or structurable). Within the field of knowledge management there exist two quite distinct and widely accepted types of knowledge: tacit and explicit. Tacit knowledge as identified by Polanyi is knowledge that is hard to encode and communicate (Polanyi 1967). Further, tacit knowledge is personal, context-specific and hard to formalize (Nonaka and Takeuchi, 1995). Towards the other end of the scale, explicit knowledge is exactly that kind of knowledge that can be encoded and is transmittable in language. It is explicit knowledge that most current knowledge management practices try to, and indeed are able to, capture, acquire, create, leverage, retain, codify, store, transfer and share.

It may basically positing that knowledge is not a radically different concept than information, but rather that information becomes knowledge once it is processed in the mind of an individual ("tacit" knowledge in the words of Polanyi (1967) and Nonaka (1994)). This knowledge then becomes information again (or what Nonaka refers to as "explicit knowledge") once it is articulated or communicated to others in the form of text, computer output, spoken, or written words or other means). The recipient can then cognitively process and internalize the information so that it is converted back to tacit knowledge. This is consistent with Churchman's (1972) conceptualization of knowledge and his statement that "knowledge resides in the user and not in the collection [of information.]"

According to (Smith and McKeen, 2003) Knowledge Management (KM) is a process that helps organizations identify, select, organize, disseminate, and transfer important information and

expertise that are part of the organization's memory and that typically reside within the organization in an unstructured manner. The structuring of knowledge enables effective and efficient problem-solving, dynamic learning, strategic planning, and decision making. Knowledge management initiatives focus on identifying knowledge, clarifying it in such a way that it can be shared in a formal manner, and leveraging its value through reuse.

The information technologies that together make knowledge management available throughout an organization are referred to as a knowledge management system (KMS) (Santosus and Surmacz, 2001; Smith and McKeen, 2003.)

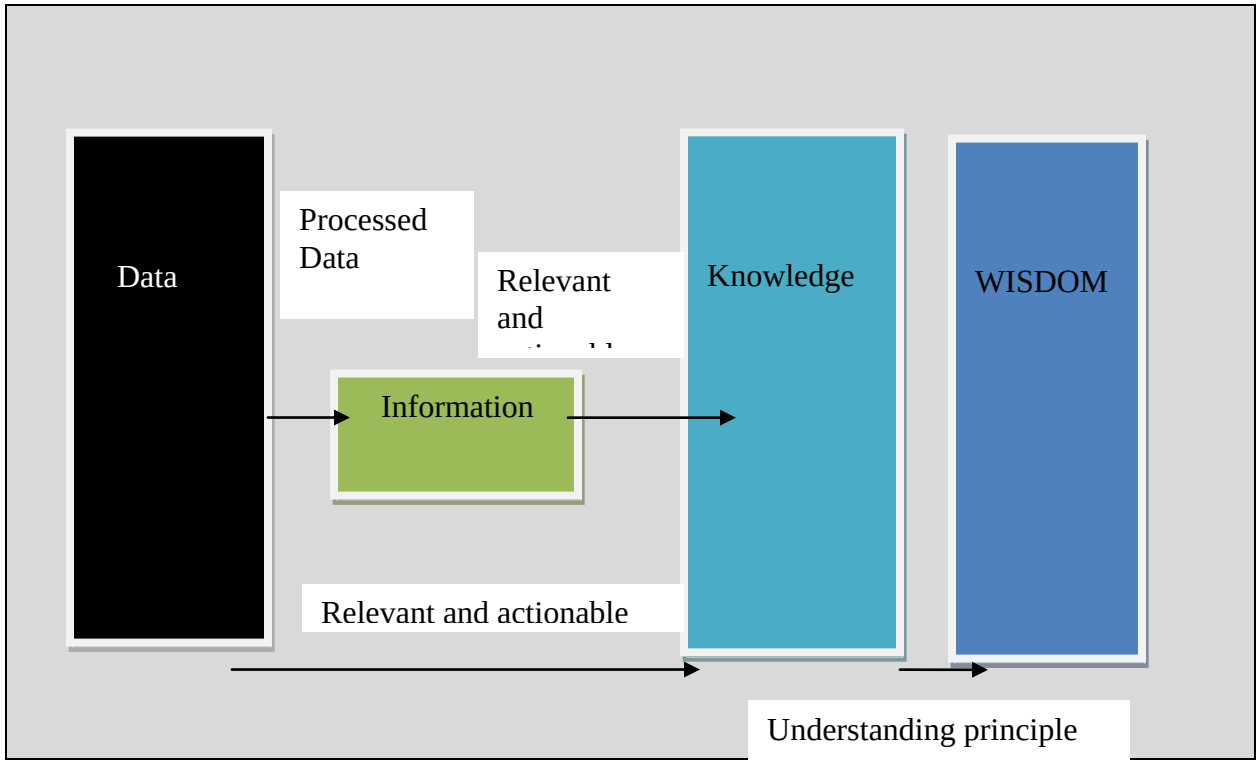
Through a supportive organizational climate and modern information technology, an organization can bring its entire organizational memory and knowledge to bear upon any problem anywhere in the world and at any time. For organizational success, knowledge, as a form of capital, must be exchangeable among persons, and it must be able to grow. Knowledge about how problems are solved can be captured, so that knowledge management can promote organizational learning, leading to further knowledge creation.

As we can see in the related literature review different scholars said different ideas about the similarities and differences between knowledge and information. For instance what Polanyi and Nonaka stated and what Hoffer, Prescott and McFadden, and Watson, agreed were not the same. Knowledge is very distinct from data and information in the information technology context (see Figure1). Whereas data are a collection of facts, measurements, and statistics, information is organized or processed data that are timely (i.e., inferences from the data are drawn within the time frame of applicability) and accurate (i.e., with regard to the original data) (Hoffer, Prescott and McFadden, 2002; Watson, 2001). To the understanding of the investigator of this study the perception about the difference between knowledge and information is similar to Hoffer's idea.

Knowledge is information that is contextual, relevant, and actionable. However, having the current conditions as information is only useful if you have knowledge that will enable you to avert the construction zone. The implication is that knowledge has strong experiential and reflective elements that distinguish it from information in a given context. Having knowledge implies that it can be exercised to solve a problem, whereas having information does not carry

the same connotation. An ability to act is an integral part of being knowledgeable. For example, two people in the same context with the same information may not have the same ability to use the information to the same degree of success. Hence there is a difference in the human capability to add value. The differences in ability may be due to different experiences, different training, different perspectives, and other factors. While data, information, and knowledge may all be viewed as assets of an organization, knowledge provides a higher level of meaning about data and information. It conveys meaning, and hence tends to be much more valuable.

Figure 1a. Data, Information, Knowledge and Wisdom



Source: (Ackoff, R.L. 1989) "From Data to Wisdom"

Wisdom is defined by different scholars at different time. For instance, Wisdom is a sustainable human ability that is created and fostered by the contribution of individual talents, skills, and diverse experiences to support a common purpose; it is also a dynamic ecosystem for individual and collective learning in which emergent patterns of meaning, coordination flows, insights, and inspiration interact, cross-fertilize, feed upon, and grow on each other (Pór, 1995). Wisdom can be defined as the ability to gain a profound insight into deep understanding the essence of the world, which is derived from the processes of divergence, convergence, integration and

creation of individual members' multiple intelligences in a group/team, organization or the whole society (Gan, 2005, p.70).

2.2 The ICT contribution to Agricultural KM

Information and communication technology (ICT) is an umbrella term that includes computer hardware and software, digital broadcast and telecommunications technologies as well as digital information repositories online or offline (Selwyn, 2002), and includes contemporary social networking aspects, read/write interfaces on the web and file sharing systems online. It represents a broad and continually evolving range of elements that further includes television (TV), radio, mobile phones and the policies and laws that govern the widespread use of these media and devices. The term is often used here in its plural sense (ICTs) to mean a range of technologies instead of a single technology.

From the perspective of Agricultural Knowledge and Information Systems (AKIS), ICTs can be seen as useful in improving linkages between research and extension systems. Agricultural extension brings information and new technologies to farming communities, allowing them to improve their production, incomes and standards of living. Extension has a major role in pointing the way to increasing the use of knowledge and information through its people orientation. As Buford (1990) pointed out, agricultural extension depends to a large extent on information exchange between and among farmers on the one hand, and a broad range of other actors on the other hand.

The experience of rural tele-centres in the developing world shows that ICT can help in enabling rural development workers to gather, store, retrieve, adapt, localise and disseminate a broad range of information needed by rural families (Davison *et al* 2005). The above literature showed how the tele-centres in developing countries can enable rural development. ICTs in extension can lead to the emergence of knowledge workers that will result in the realisation of a bottom-up, demand-driven paradigm for technology generation, assessment, refinement and transfer (Meera, 2003; Meera *et al* 2004). In a year long study of international KM best practices (Skyrme and Amidon 1997), two main thrusts were identified. The first is that of

making better use of the knowledge that already exists within the firm, for example by sharing best practices. This address the often cited lament: “if only we knew what we knew”. Too frequently people in one part of the organization reinvent the wheel or fail to solve customer’s problems quickly because the knowledge they need is elsewhere in the company but not known or accessible to them. Hence, the first initiative of many knowledge management programs (between a third and a half according to surveys) is that of installing or improving an Intranet, and adding best practice or ‘expert’ databases. An intranet often gets confused with the Internet. While there are a lot of similarities between them, they really are two different things. Simply put, the Internet is the global World Wide Web, while an intranet is a private Internet operating within a company. Both the Internet and an intranet use Transmission Control Protocol/Internet Protocol (TCP/IP) protocol as well as features like e-mail and typical World Wide Web standards. One main difference is that users of an intranet can get on the Internet, but thanks to protection measures like computer firewalls, global Internet users cannot get onto an intranet unless they have access to it. In fact, an intranet can be run without an Internet connection. While Internet technologies like browsers, servers, and chat scripts are still used, an intranet can be a separate entity as long as its owners do not require that users have access to information found on the Internet.

The second major thrust of knowledge-focused strategies is that of innovation, the creation of new knowledge and its conversion into valuable products and services. This is sometimes referred to as knowledge innovation (Amidon 1997). This requires an environment where creativity and learning flourishes and knowledge is encapsulated in a form where it can be applied. One way is to embed knowledge into products, where it is more easily disseminated.

The range of knowledge management activities is broad, and touches many aspects of operations, According to (Skyrme and Amidon 1997) for example the main findings are:

- Creation of knowledge databases - best practices, expert directories, market intelligence etc.
- Effective information management - gathering, filtering, classifying, storing etc.
- Incorporation of knowledge into business processes e.g. through the use of help screens in computer procedures or access to experts from icons

- Development of knowledge centers - focal points for knowledge skills and facilitating knowledge flow
- Reuse of knowledge at customer support centers e.g. via case-based reasoning
- Introduction of collaborative technologies, especially Intranets or groupware, for rapid information access
- Knowledge webs - networks of experts who collaborate across and beyond an organization's functional and geographic boundaries
- Augmentation of decision support processes, such as through expert systems or group decision support systems.

The continuous innovation in ICT is causing an industrial and societal revolution based on information acquisition and knowledge dissemination (Branscomb, 1994), information networks represent the vehicles through which information and knowledge are being acquired and disseminated. During the 1990s, there has been an unprecedented link between the technological innovation process and the economic and social organization. Moreover, as the links between socioeconomic development and the availability of information became more apparent, governments around the globe started to invest heavily in building their national information infrastructure (Petrazzini and Harindranath, 1997). Here it is important to note that the more the infrastructure of ICTs the more the agricultural KM processes are effective. As most of the related literature coved by the investigator of this study showed, to be more effective in agricultural KM the importance of strategic alliance between the stakeholders to build their capacity to have a better ICT infrastructure is more emphasised. The changeover towards a knowledge society is a very complex process requiring new forms of partnership and cooperation between public and private sectors organizations. This could be done through collaborative strategies to be implemented that target the diffusion of best practice and development of ICT applications, which is the fundamental objective in view of the contribution that it can make to restoring growth and strengthening competitiveness (Kamel and Wahba, 2002). Different studies indicated that for effective use of knowledge and information, equivalent to growth and development of information and Knowledge the ability to manage these resources have to be optimized. Today, the motto for development and growth is the

development of the information society (Kamel, 1995) where value resides in the accumulated information and knowledge (Davis and Meyer, 1998). However, the advantage will rely on the ability to manage these amounts of information and knowledge to the best of the organization in the direction where it can realize optimum organizational objectives. However, ICT is not the only enabler for the Agricultural KM. Considerable gross national product, per capita, adequate basic infrastructure, lower rates of illiteracy, and familiarity with information sources such as newspapers, television and the Internet among others, can be considered the main enablers for the establishment of the knowledge management system (ESCWA, 2007). Moreover, culture is one of the most important factors in the formulation of the agricultural KMS.

Knowledge and ICT innovation are becoming important values for business, socioeconomic development and wealth creation with implications at macro and micro levels affecting societies, organizations and individuals (ESCWA, 2003)**.** There is no doubt that ICT innovations are increasingly having important implications on agricultural development due to its role in introducing and diffusing the concepts of knowledge sharing. The implications could be felt at the individual, organizational and societal levels. ICT advances have always changed the way human interact. ICT has becoming one of the basic needs.

As with other economic sectors, effective agricultural development requires access to information on all aspects of agricultural production, processing and marketing and it seems likely that if anything this need is increasing (Jones, 1997). ICT is already showing the potential to play an important role in the delivery of this information to this sector in both developed and developing countries (Zijp, 1994). Even though it is commonly believed that ICT is an enabler, some times this might not work due to various reasons. As to the IPMS projects_ WKC, the roles of ICT for the users are going to be assessed in order to explore the potential opportunities to tackle the challenges that exist.

2.3 Sources of Agricultural Knowledge and Information for WKCs in Ethiopia

It is important to realize that knowledge and information is dynamic and continuously changing to respond to the changing environment. According to Samuel (2001) there are three major

organizations, which generate formal (official) agricultural information in Ethiopia. These are Government agricultural extension systems both at federal and regional levels, Central Statistical Authority (CSA), and research institutions. The CSA is responsible mainly for macro-level data and statistics, whereas the Federal Ministry of Agriculture & Rural Development (MoARD) and Regional Agricultural Bureaus & Rural Development (BoARD) are also mandated by law to collect process and disseminate data with respect to the performance of agricultural projects and programs. Agricultural research centers generate and disseminate technical data on new findings and other recommendations. Therefore, knowledge is produced in agricultural research and disseminated through different channels. Farmers have also their own indigenous knowledge that means the knowledge that they acquired via long term experience. Knowledge is produced through agricultural research; it is not the only avenue for knowledge generation; learning from experience, interaction and farmers' experimentation are other sources (Fekadu 1997). Salomon and Engel (1997) indicated that farmers have been innovators for centuries, based on their own on-farm experimentation.

Farming families, agricultural cooperatives, agri-businesses, agricultural press, and extension service can serve as source of agricultural knowledge/ or information for the farmers.

Here again in the above literature what are assessed and analyzed are about the generation and source of knowledge. Often, the tools we use to do a given task have impact on the results achieved. In the case of ICTs, it is often speculated that ICT can be an empowering tool in development.

2.4 Knowledge Sharing and Communication

Communication can be defined as "the exchange of messages" between two or more partners, or establishing "commonness" between two or more parties through a particular medium, or an active, dynamic process in which ideas and information are exchanged leading to modification of people's knowledge, attitudes and practices (Burnett, 2003). The knowledge sharing and communication network is not a simple task in Ethiopia due to various reasons. The presence of high diversity in nature, attitudes and experience, leads to the existence of different communication networks. However, there are always gaps between what certain

individuals and what other individuals know in any society. Farmers are no exception. The consequences of these gaps can often be serious. Not everyone in an economy has the right kind of knowledge and information to produce output efficiently. People may be poor not because of laziness. They may be hard working people but lack proper knowledge and information (Suhermanto, 2002).

To close this gap Suhermanto (2002) suggested two ways of distribution of knowledge and information. First, public sector or government-facilitated efforts might close the gap through the distribution of knowledge and information to the needy. Such government-assisted programs include, for example, training, media, publications, leaflets, and the opening of educational institutions. The obtained information from this method may also be shared through local information exchange system. (Ejigu *et al.,* 1999). Farmers participating in training reported that they had expanded their knowledge and understanding of local problems. Many farmers involved in training activities reported that they had shared information with other farmers, and a few trained farmers took on a training role themselves, motivated to defend new technologies and to demonstrate technologies to other farmers.

Secondly, communication among individuals can help knowledge and information to be transmitted from one individual to another. According to Katungi (2006), a household can participate in information exchange as an information receiver, information provider (sender) or both. There is a link among the households in form of clubs (associations) and/or private social networks. Associations describe finite closed groups with a common interest while private networks refer to a set of bilateral links the household is directly connected to. The linkages between these households are used in the exchange of resources based on norms of reciprocity. Let information be one of those resources that households exchange among themselves through their links. This allows us to model the social network as exogenous to information exchange. Each household can engage in information exchange with other households it has a direct link with, whether through associations or private networks. Thus, information from other households, indirectly linked to the household, is only accessed from direct contacts through the other established links (Katungi, 2006).

2.5 Knowledge Sharing Practice

Different scholars stated about the role IT in sharing knowledge. Electronically mediated exchange can substitute for face-to-face interaction only when the identities of the interactants are not very important, when their circumstances at hand are certain and unambiguous, when the actions necessary are standard and routine, and when ongoing interaction does not depend on a robust structure of relationships (Nohria and Eccles (1992) quoted in McLoughlin and Jackson (1999, p. 181–2)).

Studies showed that knowledge has different implications for the role of information technology systems in knowledge-sharing processes. The reasons they stated is primarily due to the enormous range of contexts in which knowledge sharing can occur. For example, it may be between people who know each other well or who are complete strangers, it could involve a small number of people or a large group, it may involve knowledge which is highly tacit or which has a significant explicit element, it could be between groups/people who have a lot of opportunities for interacting socially or who will never meet face to face, it may involve people/groups with similar or quite different knowledge bases or any combination of the above. In all these situations, the possible role for information technology systems is likely to vary greatly. In order to make some conclusions about the role of information technology systems in such processes different scholars examines some of the main factors which affect the dynamics of knowledge sharing and briefly discusses how they are likely to affect the role that information technology systems can play in these processes.

Arguably, the single most important factor in benching knowledge-sharing processes is the degree of tacitness of knowledge. Studies drawn from a diverse range of contexts have shown that, where knowledge is highly tacit, the effective sharing of it requires a significant amount of intense social interaction (MacKenzie, 1996; Lam, 1997; Leonard and Sensiper, 1998). Thus information technology systems are likely to be most useful in situations where knowledge has a significant explicit element. However, as the epistemology of practice perspective suggests, there is no such thing as fully explicit knowledge. Therefore, even where knowledge is partly explicit, knowledge sharing will be most effective where information technology-based knowledge sharing is supported by other mechanisms.

Another important factor is the degree of common knowledge that exists between the parties involved in knowledge sharing. A number of writers have suggested that the sharing of knowledge between people with only a limited stock of common knowledge will always be difficult, whether done through information technology systems or face-to-face interaction (Brown and Duguid, 1998; Bolisani and Scarso, 2000). Information technology systems are particularly disadvantaged in this context as they provide a much less 'rich' medium of communication than face-to face-interaction due to the loss of social cues (Symon, 2000). One of the articulated advantages of communities of practice is that participants in a community develop a significant stock of common knowledge (such as tacit assumptions, values, etc.) through working intensively together, which makes knowledge sharing within a community relatively straightforward (Brown and Duguid, 1998; Leonard and Sensiper, 1998). Thus, information technology systems are arguably likely to have the greatest potential role where there is a significant amount of common knowledge between the parties involved in the knowledge- sharing process, such as within a community of practice.

The contemporary knowledge management literature has shown that, for knowledge sharing to be effective, people have to be willing to share their knowledge and that an important factor shaping this willingness is the extent to which trust exists between relevant parties (Flood et al., 2001; Storey and Quintas, 2001). This is particularly important where opportunities for face-to-face interaction are limited, such as in virtual team working (Jarvenpaa and Leidner, 1999; Nandhakumar, 1999). Thus, without some degree of trust existing and where opportunities for social interaction are limited people may be unwilling to attempt to share their knowledge via information technology systems.

The 'best case scenario', where information technology systems may be able to play a useful role, is thus likely to be where a (significant?) degree of common knowledge exists between the individuals sharing knowledge, when there is such a degree of trust between these individuals that they are willing to share their knowledge in this way and when the degree of explicitness of the knowledge is relatively high. Not all of these circumstances are simultaneously necessary for effective information technology-based knowledge sharing to occur, but the more that exist the greater the likelihood of success (Flood et al., 2001)

2.6 Organization Knowledge Management

Different organizations implement knowledge management differently. According to Honeycutt each has unique knowledge assets and unique challenges within their organizations and each has different processes and measures success in different ways. Knowledge-management solutions are unique to the organizations that implement them (Honeycutt 2000 P.5). The following figure illustrates the key issues that organizations deal with when they implement a knowledge-management solution.

Figure 1b: Knowledge management

Source: (Honeycutt 2000 P.5)

The potential role of information technologies in organizational knowledge management according to (Berger and Luckman, 1997) is based on the view of organization as a social collectives and knowledge systems. According to this framework, organizations as knowledge systems consists four sets of socially enacted knowledge processes:

- Knowledge creation (knowledge construction)
- Knowledge storage/retrieval
- Knowledge transfer and
- Knowledge application (Pentland 1995). These four points are discussed under the following subtopics.

2.6.1 Knowledge Creation in an Organization

Organizational knowledge creation involves developing new content or replacing existing content within the organization's tacit and explicit knowledge (Pentland 1995). Computer – mediated communication may increase the quality of knowledge creation by enabling the forum for constructing and sharing believes, for confirming consensual interpretation, and for allowing expiration of new idea (Henderson and Sussman, 1997). By providing an extended field for interaction among organizational members for sharing ideas and prospective, and for establishing dialog, information systems may enable individual to arrive at new insights and /or more accurate interpretations than it left to decipher information on their own (Boland et al., 1994).

2.6.2 Knowledge Storage/Retrieval in an Organization

Empirical studies have shown that while organizations create knowledge and learn, they also forget (i.e. don't rember or lose track of the acquired knowledge) (Argote et al., 1990). Thus the storage, organization and retrieval of organizational knowledge, also referred to as organizational memory (Stein and Zwass, 1995) constitute an important aspects of effective organizational knowledge management. dvanced computer storage technology such as query languages, Database Management Systems (DBMSs) can be effective tools in enhancing organizational memory. These tools increase the speed at which organizational memory can be accessed.

2.6.3 Knowledge Transfer

Having discussed knowledge creation and knowledge storage and retrieval, the other important process in knowledge management is that of knowledge transfer. Knowledge transfer occurs at various levels:

- transfer Knowledge between individuals
- transfer from individuals to explicit sources
- from individuals to groups
- Between groups
- Across groups and
- Form group to organization

Information Communication Technology (ICT) can increase knowledge transfer by extending the individual's reach beyond the formal communication lines. The reach for knowledge source is usually limited to immediate co-workers in regular and routine contact with the individual. However, individuals are unlikely to encounter new knowledge through their class-knit networks because individuals in the clique tend to possess similar information (Robertson et al 1996). Moreover studies showed that individuals are decidedly unaware of what their cohortys are doing (Kogut and Zander, 1996). Thus expanding the individual's network to more extended, although perhaps weaker, connections is central to the knowledge diffusion process. Because such network expose individuals to more new ideas (Robertson et al 1996). Computer network and electronic bulletin boards and discussion groups create a forum that facilitates contact between the people seeking knowledge and who may have access to the knowledge.

Providing the organizational knowledge maps enables individuals to rapidly locate either the knowledge, or the individual who has the needed knowledge, more rapidly than would be possible without such ICT support (Offsey 1997).

2.6.4 Knowledge Application

An important aspect of knowledge based theory of the firm is that the source of competitive advantage resides in the application of the knowledge rather than the knowledge itself (Grant 1996).

Technology can support knowledge application by embedding knowledge into organizational routines. Procedures that are culture bound can be embedded in to ICT so that the systems themselves become examples of organizational norms. ICT can have a positive influence on knowledge integration and application by facilitating capturing, updating, and accessibility of organizational directives (Grant 1996).

2.7. ICT Challenges and Opportunities

A number of specific policy areas need to be addressed by ICT policies seeking to promote agricultural development. These pertain to poverty and end- user competencies, levels of access to ICT in agriculture, knowledge management and information generation, research and development, the price of technology and the cohesion between government departments' directly affecting ICT initiatives (Barrentes 2005).

ICT face a number of unique barriers in rural communities that will have to be overcome. As (Kenny et al, 2000 P.18) observe geography plays a very strong part in the determination of communications costs and functionality. In rural communities, where a sparse population implies that potential users live in area of low demand density, communications costs will be higher and services will be less well developed. Different studies showed that even if subsidized, ICT may be beyond the reach of many potential beneficiaries, especially in rural communities in which poverty tends to be most prevalent. The issue of connectivity for universal access comes with affordability and cost issues, especially with reference to computers with Internet (Kenny et al 2000 P.18). Certain factors inhibit sectors of the agricultural industry such as farm businesses, to adopt ICT services and innovations. Geographic remoteness and sparseness of communities, especially in rural areas, and Internet access are economic circumstances affecting both service providers in the agricultural industry as well as members. Thus, separating technology limitations from cases where the end-user faces capacity constraints that inhibit them from engaging in the technology, such as lack of skills, confidence and motivation (Barrentes 2005). As well as providing low cost (or donated) equipment, private sector bodies can assist in developing appropriate technologies to provide agricultural communities with ICT services to assist with project initiatives.

Chapter 3

Research Methodology

The previous chapter showed how the literature has been conceptualized in this study and provided a visual explanation of the emerged frame of reference. This chapter will cover the methodology used in this research. The selection of methodology is based on the research problem and stated research questions.

3.1 Sources of Data

Both primary and secondary data were being used in this study. In Ethiopia there are ten Woreda Knowledge Centres (WKCs). The study population, therefore, included all WKCs. These WKCs are found in four administrative regions of the country; that is, in:

i. Amhara (Bure, Metema and Fogera WKCs);

ii. Oromia (Goma, Adaa Liben, and Mieso WKCs);

iii. Tigray (Alamata and Atsbi Wenberta WKCs); and

iv. SNNPS (Alaba and Dale WKCs)

3.1.1 Primary Source

In order to achieve detailed data for analysis; the investigator used to address almost all Woreda knowledge workers and some from Woreda agriculture bureau.

The primary data in this research is from interviews with key informants representing different levels in the organization. At management level the investigator used a semi structured interview guide. At the operating level survey questionnaire were used. All interviews were audio taped.

3.1.2 Secondary Source

Through projects implementation documents' of WKCs and Review of the literature The researcher was able to understand how the project was implemented to capture, store, manage, and disseminate agricultural information, how employees would be able to train in using ICT, and how they are applying instructions on how to arrive at best practices relevant for their tasks.

Here the primary data can be checked against the secondary data and vise versa in addition to bringing forward new and supplementing information.

3.2 Sample Size and Methods of Sampling

The study sample WKCs were selected by purposive sampling technique. The selection of case studies were taken into consideration; geographical diversity of the centres which also results in the local language diversity of the centres. In this case the local languages spoken in the centres constitute the three of the major languages (Afan Oromo, Amharic and Tigire) of Ethiopia. The second factor in selecting the cases is the period of operation since the centres were established. In this respect Alaba was the first knowledge centre established by the project support with Alamata coming in next. Bure & Goma knowledge centres were established last in the series of 10 knowledge centres established by the project. Therefore, the centres being included had both homogenous and heterogeneous characteristics. Accordingly, the selected sample WKCs were Bure, Goma, Alamata, and Alaba.

Within the case studies the respondents were selected taking into consideration to focus on relatively regular users of KM centres who have a basic appreciation of Information Communication Technology (ICT) tool and to a lesser extent KM practices and concepts.

The respondents differ by the type of position and job description they have. As listed here under, they were categorized in to three groups according to their position and job type.

I. ***Administrative staff:*** these are those who are the administrators of Woreda Office of Agricultural Research and Development (WOoARD) in each selected Woreda of the regions.

II. ***Experts*****:** these are those people who are working in the WOoARD as SMS in agricultural extension service delivery.

III. Improving Productivity & Market Success of Ethiopian Farmers (IPMS) *staff*

   a. ***IPMS Project Research and Development Officer (RDO):*** these are those people working in WKCs as project coordinators and researchers.

   b. ***WKCs assistants:*** these are those people working in WKCs as facilitators and IT personnel for troubleshooting and managing the centres.

Concerning the selection of respondents, the three categories, i.e., administrative staffs, experts, and IPMS staff were selected purposefully. The sample size and the response rates by sample is presented in Table 1a below.

Table 1a Response rates by sample WKCs

Stratum Sample	WKCs	Respondents Position						
		WOoARDO	IPMS/RDO.	WKCsASST	Experts	Sum	Returned	%age
Amhara	Bure	1	1	1	12	15	15	100.0
Tigray	Alamata	1	1	1	14	17	12	70.5
Oromia	Goma	1	1	1	9	12	9	75.0
SNNP	Alaba	1	1	1	13	16	14	87.5
Total		4	4	4	48	**60**	**50**	**83.3**

Source: Researcher own primary data

To this end, one administrator from each WOoRAD was selected purposely due to he/she is the administrator of the centre since the centres were institutionalized. Furthermore, these administrators are responsible and watch over each and every activity of the WKCs. So it is assumed that they could be the right sources of data for this research. Moreover, all experts from each WKC were participated in responding to the survey (since their size is manageable). These experts were those who had got the chance to take training on basic skills of computer in the WKCs. The experts were so benefited from the WKC and were happy to respond to the research requirements. This made the data collecting activities easy for the researcher. The RDO and WKCs assistants were included since they run the function of the centres.

3.3 Data Collecting Instruments

This research was performed as case studies. As most of the literature showed, it is more effective if the multiple data gathering tools is used. Based on this assumption the investigator used the combination of three popular data collection methods such as semi-structured interviews, questionnaires, and observation.

3.3.1 Questionnaire

Based on the basic research questions and in light of the review of related literature, the questionnaire is prepared in English since the medium of instruction at higher institutions level is English and it was believed to be well responded as per the educational level of the respondents is concerned.

The items in the questionnaires comprised of both close-ended and open-ended items. The close-ended items were used for the very reason that they are easier to categorize the responses gathered. The others were open-ended items and their major purpose was to give opportunity to experts to express their feelings and perceptions related to the items without restriction.

3.3.2 Semi-Structured Interviews

Interviews help to obtain relevant data that cannot be handled by questionnaire and essential to countercheck the information already obtained. To this end, a semi-structured interview was employed

All interviews were audio taped. In addition to making notes, unclear points can be elaborated due to the interview was done face to face. Taping of the interview was clarified with senior management, project manager and the person being interviewed. Taping the interview allows me to take notes and do follow-up questions, or deviating from the questionnaire, whenever that was required. This opened for more extensive exploration for open-ended interviews.

When conducting the interview for the case studies, respondents included the personnel involved in managing or those who had been active in enabling the process in the WKCs. Though the interviews were face to face the respondents were allowed to talk freely with the interview guide as a base. Notes were taken throughout the interview and the interview guide followed, except when the respondent wanted to add something further to a particular topic. Each interview lasted for approximately 20 minutes.

3.3.3 Observations

This was done in the form of participating in using the WKCs at each of the four Woreds. The investigator assumed that observations provide an opportunity to collect data on a wide range of behaviors, to capture a great variety of interactions, and to openly explore the desired data or facts. By directly observing operations and activities, the investigator can develop a holistic perspective, i.e., an understanding of the context within which the project operates. To this end, such source of data enabled the investigator to understand how the WKCs are working, and prepared me for the interviews to take place with good understanding.

3.4 Procedures of Data Collection

The questionnaires were distributed to 16, 17, 15, and 12 respondents from Alaba, Alamata, Bure, and Goma respectively. A total of 60 questionnaires were distributed and those filled in and returned yielded a response rate of 87.5%, 70.5%, 100%, and 75% from Alaba, Alamata,

Bure, and Goma respectively. Among them, one questionnaire was not yet fully filled. As a result, a total number of questionnaires that were successfully filled and returned were 50 out of 60 which (83.3%) is. Finally, they were coded and prepared for analysis. Thus, the data obtained were sufficient enough to keep on the study.

Second, an interview guide was prepared and then administered with WOoARDs administrators and assistants of WKCs. On the date of appointment, necessary and detailed information was gathered. Since their number is small, the data gathering process was properly managed.

Thirdly, to have a clear understanding about what is going in each of the WKCs the researcher has got adequate observation while the WKCs were providing the service to the users.

As indicated in Table 1a the overall response rate Bure 100% stood first followed by Alaba 87.5%, Goma 75%, and Alamata 70.5%. These constitute on average 83.3% of the data collection process was successfully accomplished. In general, except the postponement of filling questionnaires by some respondents and some minor problems, the data gathering process was successfully carried out.

3.5 Methods of data presentation

The data will be presented using tables, graphs, and for better clarity further analysis using descriptive statements. The interpretation of the research outcomes will have both subjective interpretation as well as objective facts with emphasis placed on the underlying meaning and understanding of the findings. The analysis of the research will be largely qualitative; however quantitative analysis will be used, if that shows up in the research process.

3.6 Methods of Data Analysis

A mixed method approach was used in this study to permit a parallel mixed analysis. This approach allows for the concurrent analysis of both quantitative and qualitative data. In this section the investigator performing examining, comparing and contrasting, and interpreting meaningful patterns or themes. Meaningfulness is determined by the particular objectives of the topic under study.

This research presents a multiple-case study (Alamata, Bure, Goma and Alaba), and therefore, the comparisons will be conducted within the different cases and as well as between the cases, in a cross-case analysis.

Finally, conclusions from these analyses will be drawn based on the patterns of similarities and differences identified, answering each research question based on the analysis. The following sections outline the detailed steps used to conduct this analysis.

3.6.1 Process for Analyzing Quantitative and Qualitative Data

Quantitative measures strive for precision by focusing on items that can be counted into predetermined categories and subjected to statistical analysis. Quantitative data in this study originated from cross sectional surveys. The steps for analyzing the quantitative data for this analysis include:

Step 1

Step one involved a series of analyses to test the integrity of the data. Validity checks of the data were conducted to identify:

a) inconsistencies in the data within each data collection instrument,
b) unreasonable entries and
c) impossible entries. All problems and errors were checked and corrected against the original instrument.

Step 2

Step two involved conducting descriptive analyses. In most cases percentile, ranking, and frequency is used.

Step 3

Step three involved the cross-tabulation and comparison of information within and between target groups where sufficient sample size existed. Comparative analysis or analysis of group differences, required test of statistical difference. A variety of tests were used to determine if real differences existed among certain target groups. For example, the analysis of variance (ANOVA) was used to determine differences in satisfaction ratings across four WKCs.

Qualitative data consists of detailed descriptions of situations, events, interactions, direct quotations from individuals about their experiences, attitudes, beliefs, and thoughts. Qualitative data are collected as open-ended narrative without predetermined or standardized categories. Qualitative analysis examines multiple groups to identify common themes that, having cross-confirmation, take on a greater significance.

Qualitative data from this study came from interviews, open-ended survey questions and detailed observation. The process for systematically analyzing the qualitative data collected as part of this study is summarized in the steps below.

Step 1: Coding

Step one involved the coding of recurring words or themes relevant to the research question. This was done by reading through the open-ended responses to identify themes and patterns which were recorded on a worksheet. This step involved determining the basic unit of analysis and counting how many times each word or theme appeared.

Step 2: Categorization

Step two involved creating meaningful categories to which the codes could be assigned. Categories were created and organized under each strategy.

Step 3: Classification

Step three involved verifying that the codes could be easily and unambiguously assigned to the appropriate categories. This step emphasizes replicability and reliability.

Step 4: Comparison

Step four involved comparing the categories in terms of word-count frequencies and the performance of relevant statistical analysis.

Step 5: Conclusion

Step five involved drawing conclusions about the content in its context based on the result of the analysis.

Chapter4

Presentation and Analysis of Data

As stated in chapter one, the basic questions focus on this research aims to assess the role of ICT on agricultural KM as implemented by IPMS ICT-based initiatives in selected areas of Ethiopian regions. That means, to identify the role of ICT in capturing, storing, processing, managing, and disseminating knowledge by IPMS project KM initiatives, to identify whether the ICT-mediated information is timely, appropriate, and in the right format for the intended beneficiaries, to explore the challenges and the opportunities of ICT-based efforts in WKCs and suggest possible solutions for identified problems, and to exploit the lessons from this experience that could inform a robust strategy for employing ICT-based KM efforts in other areas within Ethiopia.

The data obtained through questionnaire, interview, and observation were presented, analyzed, and discussed in line with the respective basic questions as indicated hereunder.

4.1. Description of Respondents

Three relevant demographic variables of the respondents were gathered as background information. These are position, level of education, and experience of the respondents. These characteristics of the respondents are summarized in Table1. As far as position, education level and experience distribution of the respondents were concerned, as one can easily depict from Table 1, respondents with different background were participated in all WKC of which most of them are with the background that enables them to fairly react to the requirement of this study. The survey showed that from all WKCs more than average of the respondents were

experts of which Bure exceeded all following by Alaba, Alamata, and Goma. On average 76.0% of the total sample who responded to this study were experts.

With regard to qualification of the respondents, the percentage of respondents of 3rd degree from Alaba and Bure were 7.1% and 6.6%. Those with second degree from Alaba, Alamata, and Bure, were 7.1%, 16.6%, and 6.6% respectively. The total number of respondents with second degree who were responded to this study constitutes 8%. In relative terms, the immense number of respondents with 1st degree from Alaba, Alamata, Bure, and Goma were 78.5%, 75.0%, 80.0%, and 77.7% where the diploma levels were 7.1%, 8.3%, 6.6%, and 22.2 respectively.

Table 1. Demographic Characteristics of Respondents

Items		WKCs Respondents								Total	
		Alaba		Alamata		Bure		Goma			
		N	%	N	%	N	%	N	%	N	%
Position	Experts	11	78.5	9	75.0	12	80.0	6	66.6	38	76.0
	RDA	1	7.1	1	8.3	1	6.6	1	11.1	4	8.0
	RDO	1	7.1	1	8.3	1	6.6	1	11.1	4	8.0
	WOoARDA	1	7.1	1	8.3	1	6.6	1	11.1	4	8.0
	Total	14	100.0	12	100.0	15	100.0	9	100.0	50	100.0
Qualification	3rd Degree	1	7.1	-	-	1	6.6	-	-	2	4.0
	2nd Degree	1	7.1	2	16.6	1	6.6	-	-	4	8.0
	1st Degree	11	78.5	9	75	12	80	7	77.7	39	78.0
	Diploma	1	7.1	1	8.3	1	6.6	2	22.2	5	10.0
	Total	14	100.0	12	100.0	15	100.0	9	100.0	50	100.0
Years of Experience	< 2 years	4	28.5	3	25.0	7	46.6	3	33.3	17	34.0
	2 – 5 years	3	21.4	6	50.0	7	46.6	1	11.1	17	34.0
	6 – 10 years	4	28.5	2	16.6	1	6.6	1	11.1	8	16.0
	>10 years	3	21.4	1	8.3	0	-	4	44.4	8	16.0
	Total	14	100.0	12	100.0	15	100.0	9	100.0	50	100.0

Source: researcher own primary data

Note: RDA = Research and Development Assistant, RDO = Research and Development Officer, WOoARDA = Woreda Office of Agriculture Research and Development Administrators

As it is illustrated on Table1, the status of the respondents 4%, 8%, 78% and 10% are holders of 3rd degree, 2nd degree, 1st degree, and Diploma, respectively on average. As a result it would be possible to conclude that they can respond to this study by providing the relevant data to the expectation of the investigator. In addition to this, based on the question raised on Knowledge Management to identify the level of their understanding about the concept of the subject, indicated that most of the respondents answered the right way which was also a good sign for relevant data could be obtained.

4.2 Number of Staff and Subject Matter Specialists (SMS) in Respective WKC

Employees are the major components of any organization. Most of the developing countries lacked adequate number, quality of personnel, and managing it well in different sectors. Same is true in Ethiopia in agricultural sector. The quality of service delivered to the user is greatly affected by the knowledge of the service providers and the technology they employed. ICTs are the elements that facilitate and enable activities in easing the life. To bring out how much the existing ICT facilities are playing a role in the WKCs, it is reasonable to assess the number of staff and their knowledge on the subject matter. Based on this fact the investigator reviewed the document from each respective Woreda and presented in table 2 below.

Table 2. Number of Staff and Number of SMS in the WOoARD

	Alaba	Alamata	Bure	Goma
No. of staff	60	55	52	40
No. of SMS	16	17	15	12

4.3. The Existing Facilities of ICT in WKCs

To elicit the facts from respondents about the existing facilities and users of ICT in their respective WKCs some questions with different characteristics were raised. These characteristics were brought together from all sections of the questionnaire and assessed.

Because of the nature of the items and the category they have, these characteristics were categorized in to three sections and were analyzed accordingly. These categories encompass items with options that intended to identify what facilities exist and the status of the users of ICT with regard to basic skills in the WKCs.

4.3.1 Computers and Other ICT Tools

To search for data related with ICT tools the document reviews were made to investigate the numbers of computers that are serving in each WKC. As a result, the following data were obtained. (See Table 3)

Table 3. Number of Computers in WOoARD and WKCs

	Alaba	Alamata	Bure	Goma
No of computers in the WOoARD	15	12	6	5
No. of computers dedicated to WKC	10	6	5	3

Source: Researcher's own primary data

From this data one can possibly see that relatively more computers are found in Alaba WOoRAD, followed by Alamata, and Bure and Goma. The basic question here is, for how many users these computers are serving in each WOoRAD in order to detect the role of ICT in the Woreds; and from these numbers of computers in each WOoRAD the computers that are dedicated to the WKC may show us the role of the computers in the WKCs.

As it is indicated in the analysis, it is reasonable to compare the number of users of the knowledge centers with the computers available in the WKCs.

Hence, to compare the number of staff or employees in each WOoARD with the computers dedicated to the WKC which are providing service for the given number of staff it is good to refer Table 2 and Table 3. As a result, 10, 6, 5, and 3 computers are dedicated to WKC in Alaba, Alamata, Bure and Goma respectively. In comparison to this, when we see the number of users of these computers, 60, 55, 52, and 40 employees from Alaba, Alamata, and Bure, and Goma

are expected to be the users of the WKCs. This means, on Average, when we see the ratio of computers to WKCs users, one computer is providing a service for about 6, 9, 11, and 13 people in Alaba , Alamata, Bure, and Goma WKCs respectively. Here again, before concluding how this number of computers are playing a role in each respective WKCs, it is better to assess what the needs look like. To determine the needs of each WKC, the next question was asked. "Do you think it help to have more computers than there are now in the WKC?" The responses for this question from the respondents' indicated that 14.2% and 11.1% from Alaba and Goma respectively said no, and 14.2% and 6.6% from Alaba and Bure respectively answered as the existence of more computers in the WKCs makes no difference. To the contrast, as it is indicated in table5 below, 71.4%, 100%, 93.3%, and 88.8% from Alaba, Alamata, Bure, and Goma respectively pointed out that having more computers in the WKC will make a positive difference in the agricultural service delivery in their organization.

To this end, based on the survey result in almost all WKCs there is no sufficient number of computers that can enable the knowledge workers in storing, processing and facilitating the agricultural knowledge and information to address the needy for the accomplishment of the intended purpose. Similarly, the responses for the question that intended to identify the need of the computers on each Subject Matter Specialists' (SMSs') desk indicated 28.5%, 8.3%, and 11.1% from Alaba, Alamata and Goma respectively showed that having computers on each SMS is not important while 64.2%, 83.3%, 93.3% and 88.8% from Alaba, Alamata, Bure and Goma proved that computers on each SMS is so important. Generally, on average of the total response, 82.4% said computers on each SMS can improve agricultural service delivery.

Those respondents who said having computers on each SMS desks is not important or makes no difference, for the two items discussed above reason out that it is due to most of them lack basic computer skills to use it. To say it in their own terms "we do not have enough basic computers skills to use it, so adding more computers or even presenting on each SMS makes no difference than manually." The majority who said 'yes' or said having more computers in WKCs helps, and having computers on each SMS improves quality of service reasoned out as summarized below.

Summary of use of computers in WKC as it is indicated by the respondents from all WKCs:

- To have unlimited access to computers to get adequate period of time in using computers.
- To use for data storing, and processing and easy our routine tasks
- Because of that computers are versatile it helps to improve our efficiency in performing different agricultural activities
- It gives us the chance to write reports and other work related materials.
- It helps us to practice and learn more using computers and other computer application programs
- Local area network it helps us to share information and experience among the local agricultural experts.
- Improvements in network in the future, it helps us to access large volume, diversified and relevant agricultural information and knowledge that assists us to provide quality service in the agricultural service delivery.
- It motivates us to produce agricultural researches in our field of study. With out computers it is difficult to manage research papers.
- It helps us to manage large documents in friendly usable manner, can help us to exchange and use in soft copies, and also with computers it is simple to duplicate and share important documents among the agricultural knowledge workers.
- It reduces the time wastage that we are waiting to access computers at the WKCs. Because the number of users and the computer number available at the WKC are not matching.

Here, most of the respondents emphasized having computers on each SMS is more useful if further basic computer training courses will be given in parallel.

To this end, as the survey result indicated and of observation taken by the investigator, which also coincide with the opinion given on open ended items, it is safe and sound to conclude that because of the shortage of computers and also lack of basic skills of computers by the users at each of the respective WKCs, the role of computer technologies in the WKCs is currently not significant but it is a good start. Because most of the WOoARD motivated to use computers in their daily tasks in order to simplify activities and provide quality services with lesser cost than

annually. To clearly determine the role of ICT in the WKCs in addition to computers, the use of other ICT tools like TV, CD/DVD was assessed. Thus, for the question item asked to notice how TVs/DVDs are used in WKCs, as it can be observed from Table 4 below, 42.8%, 16.6%, 53.3%, 22.2% from Alaba, Alamata, Bure, and Goma respectively answered as they are not using TV/DVD in their WKCs., the larger proportion of the staff respondents 57.1%, 83.3%, 77.7% from Alaba, Alamata, and Goma respectively agreed that they are using TV/DVD for the success of their agricultural service delivery in their respective WKCs.

Table 4 Comparison on usage of computers and other ICT tools

Items		Respondents									
	Responses		**Alaba**		**Alamata**		**Bure**		**Goma**		**Average**
		N	%	N	%	N	%	N	%	N	%
More computers are needed in WKC.	Yes	10	71.4	12	100	14	93.3	8	88.8	44	**88.3**
	No	2	14.2	-	-	-	-	1	11.1	3	**6.3**
	ND	2	14.2	-	-	1	6.6	-	-	3	**5.2**
Computers are needed on each desk of Woreda SMS.	Yes	9	64.2	10	83.3	14	93.3	8	88.8	41	**82.4**
	No	4	28.5	1	8.3	-	-	1	11.1	6	**11.9**
	ND	1	7.1	1	8.3	1	6.6	-	-	3	**5.5**
TV,CD/DVD are used in WKCs.	Yes	8	57.1	10	83.3	7	46.6	7	77.7	32	**66.1**
	No	6	42.8	2	16.6	8	53.3	2	22.2	18	**33.7**
	ND	-	-	-	-	-	-	-	-	-	-

Source: Researcher's own primary data, ND = No Difference

However, about 53.3% of the respondents from Bure indicated they are not using TV/DVD in their WKC whereas only 46.6% of the respondents agreed that they are using it. From this survey result it might be feasible to induce that TV, CD/DVD are playing a role in most of the WKCs. But to answer 'how much role' will be answered after discussing the frequency of using TV/DVD in the WKCs.

The response of respondents on the frequency of using TV/DVD in their respective WKCs is also presented in the following ANOVA Table 5 below.

Table 5 Comparison of frequency of using TV/DVD in WKCs

WKCs	Mean	SD	F	p
Alaba	2.2857	1.13873	.788	.507
Alamata	1.8333	1.11464		
Bure	2.0667	.96115		
Goma	1.6667	.86603		
Total	2.0000	1.03016		

**significant at the 0.05 level (p<0.05)*

As the data enumerated in Table 5 disclosed, there is no statistically significant difference in the mean value of frequency of respondents in making use of TV/DVD in their WKC. Hence, it might be safe to conclude that all WKCs had almost similar rate (incidence) in using these ICT equipment. Moreover, the cumulative mean 2.00 showed irrespective of their WKC the respondents operated TV/DVD two to five times per week. As it was proved by the investigator during the observation session, the CDs/DVDs are materials that contain the agricultural information and knowledge important for the knowledge workers. So, what is the implication of the CDs/DVDs are being used two to five times per week? Even though there is no standard for some expert how frequent he/she has to use these materials, from the interrelated nature of the contents of these materials and the nature of the duties of the knowledge workers, from the prospective of the shortage of the printed materials and absence of other sources like Internet due to very poor network, it might be possible to conclude TVs, CDs/DVDs are less

used in the WKCs because the agricultural knowledge workers have to use these crucial materials at least once a day.

The survey also included the question item that extract for what purpose TV/DVD used most for. Accordingly, as it is presented on Table 6 below, 21.4%, 50%, 71%, and 56% from Alaba, Alamata, Bure, and Goma respectively revealed that TV/DVD were being used for training others. Those who said TV/DVD were being used for learning new things, 42.8%, 17%, 21%, and 44% from Alaba, Alamata, Bure and Goma respectively. And 35.7%, 33%, 14% from Alaba, Alamata, and Bure respectively specified that TV/DVD were being used for TV news i.e. as information source and for entertainment purpose.

Table 6 Purpose that TV/DVD used most for.

	Items	**WKCs Respondents**									
		Alaba		Alamata		Bure		Goma		**Sum**	
		N	%	N	%	**N**	**%**	N	%	**N**	**%**
What do you use TV/DVD for	A. For training others	**3**	21.4	6	50	10	71	5	56	**24**	**48**
	B. For learning new things	**6**	42.8	2	17	3	21	4	44	**15**	**30**
	C. For TV news, information and/or entertainment	**5**	35.7	4	33	2	14	0	0	**11**	**22**
	Total	**14**		**12**		**14**		**9**		**50**	**100**

Source: Researcher's own primary data

In all cases as it can be seen from the survey, the users are using TVs, CDs/DVDs but in different rate. According to the survey result these materials are used mostly for training others followed by for learning new things and for TV news consecutively. Hence, it might be fair to conclude that TVs, CDs/DVD are serving for the intended purpose in the WKCs even thought it is not with optimal utilization.

4.3.2. Level of Usage of ICT Tools in the WKCs

To identify whether the respondents are using the facilities in the WKC, which aspect of it do they use most, and how do they use ICT tools in terms of facilitating access to Agricultural information and knowledge, about three questionnaire items were asked under this category. The first question was asked whether they are using the facilities in the WKCs or not and the responses are presented in Figure 1

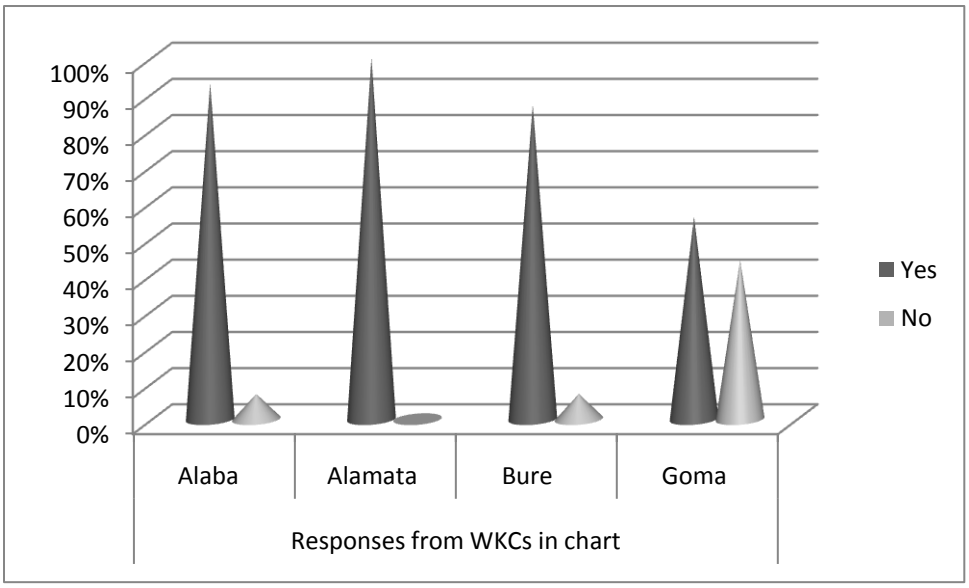


Figure 1 Usage of the facilities at the WKCs

The second question item posed to recognize which aspect of the facilities of the WKCs the users are using were ranked as it is showed on Table 7 below. Those who used Computers as their first choice based on the frequency of use as it can be portrayed in the survey results, 64%, 83%, 93%, and 67% from Alaba, Alamata, Bure and Goma respectively. 43%, 17%, 47%, and 56% from Alaba, Alamata, Bure and Goma respectively indicated that TV/DVD is their second choice according to the frequency of use. Similarly, the percentage of the respondents who place third in their preference in use of books and other printed materials were 50%, 17%, 60% and 56% from Alaba, Alamata, Bure, and Goma respectively. The survey also showed that 72%, 67%, 66% and 89% from Alaba, Alamata, Bure and Goma respectively were being used demonstration products as their fourth preference based on the frequency of use. In summary, as the survey result pointed out, except Alamata in which its precedence is computers, books and other printed materials, TVs, CDs/DVDs, and demonstration products as their 1st, 2nd, 3rd,

and 4th the other three WKCs surprisingly draw a parallel response rate of similarly ranking computers, TVs, CDs/DVDs, books and other printed materials, and demonstration products as their 1st, 2nd, 3rd, and 4th areas of interest they used most.

Table 7 Aspect of WKC facilities used in ranks

Items	Alaba (%)				Alamata (%)				Bure (%)				Goma (%)			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1st	64	-	21	7	83	-	17	-	93	-	7	-	67	-	33	-
2nd	29	43	21	7	17	17	66	-	7	47	33	7	22	56	11	-
3rd	-	36	50	14	-	50	17	33	-	20	60	27	11	33	56	11
4th	7	21	8	72	-	33	-	67	-	33	-	66	-	11	-	89
Total	100	100	100	100	100	100	100		100	100	100	100	100	100	100	100

Source: Researcher's own primary data

A=Computers, B=TV/DVD, C=Books and other printed materials, D=Demonstration products

What we can infer from this might be ICT tools are the preference of the practice of almost all WKCs. From this point of view, it might be possible to conclude that with rigorous training procedure, if it is possible to availed additional ICT tools in each of the WKCs it would have been sounder to say ICTs have a significant impact in the agricultural WKCs that enables them to render the quality agricultural service delivery. And as Knowledge is becoming the economic driving force of the time, equipping the agricultural service delivery with Knowledge, Knowledge Management enabling tools, and Knowledge Management Systems will be definitely result in conducive environment for agricultural service delivery.

The third question that planned to asked to distinguish how the users use ICT tools in their respective WKC in terms of facilitating access to knowledge, as it can be seen from Table 8, showed the distribution of 86%, 71%, 73%, and 89% from Alaba, Alamata, Bure and Goma respectively specified they are using ICT tools as data storage devices.

Table 8 ICT tools usage in WKCs

	Responses from (WKCs)				
Items	**Alaba**	**Alamata**	**Bure**	**Goma**	**Average**

As data storage device	86%	43%	43%	29%	80%
As data processing device	71%	47**%**	35%	53%	59%
As communication device	73%	67%	40**%**	80	44%
As Knowledge Gathering device	89%	78%	56%	**89%**	**22%**
As analysis and decision support tools	**15%**	**25%**	**14%**	**11%**	**16%**

Source: Researcher's own primary data

The percentage of the respondents responded as they are using ICT tools as data processing devices were 43%, 47%, 67%, and 78% from Alaba, Alamata, Bure and, Goma respectively. The respondents who said they are using ICT tools as communication device were 43%, 35%, 40%, and 56% from Alaba, Alamata, Bure and Goma respectively. From the response gathered 29%, 53%, 80%, and 89% of the respondents showed they are using ICT tools as knowledge gathering device. In Relative terms the smallest number of the respondents such as 15%, 25%, 14%, and 11% from Alaba, Alamata, Bure, and Goma respectively indicated they are using ICT tools as analysis and decision support tools. On average 80%, 59%, 44%, 63%, and 18% from the total respondent rate indicated that they are using ICT tools as data storage device, data processing device, as communication device, as knowledge gathering tools, and analysis and decision support tools respectively.

To have a clear sight on the percentage distribution in Table 8 the average response rate is graphically represented as it is located in Figure 2 below.

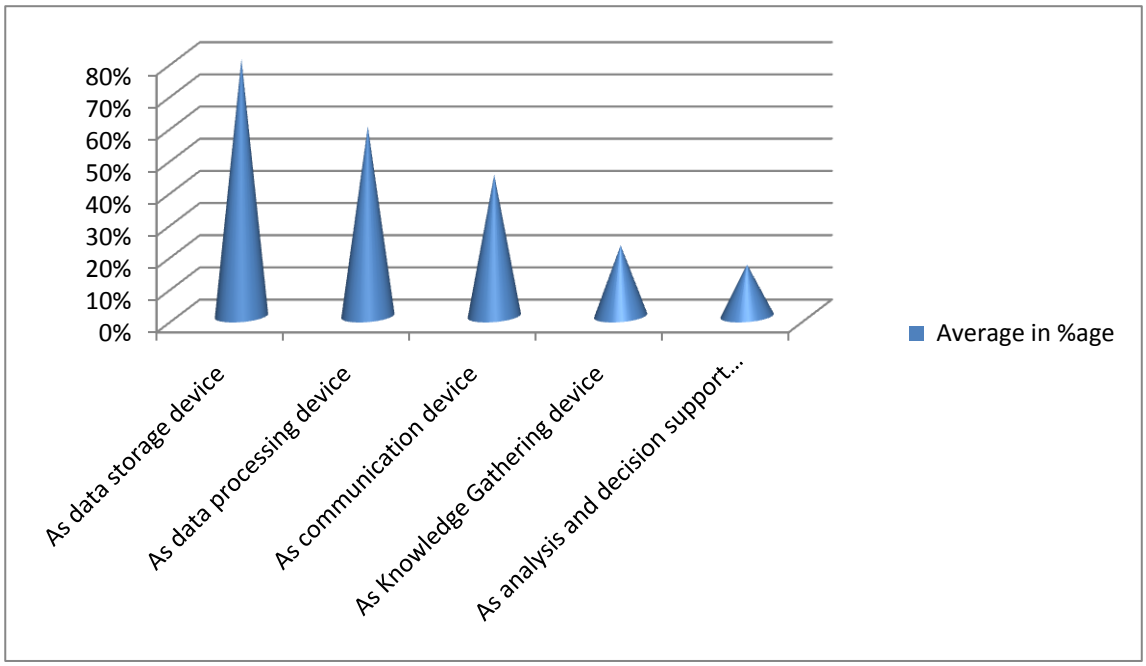


Figure 2 Usage of ICT tools in WKCs

As it can be clearly seen from figure 2, the ICT tools are largely used for the first three aspects such as data storage device, as data processing device, and as communication tools. It's current role as Knowledge gathering tools and as analysis and decision support is so minimal. To this end, it might be possible to conclude even though ICT tools are currently not in a position to play a significant role; the effort made by International Livestock Research Institute (ILRI/IPMS) showed it is in a good start.

4.4. LAN, WAN, and Internet in the WKCs

To access easily resources found locally or at remote area, LAN, WAN or Internet connection is the most important in an organization in this time. To examine the role of ICT on agricultural Knowledge Management in the respective WKCs it is better to determine whether LAN and/or WAN or Internet exist and/or working properly, with what average connection speed and its accessibility in the WKCs. To differentiate this about three questionnaire items and in addition to that observation by the investigator were used. From the observation it is proved that there is no any LAN or WAN in all WKCs but there is Internet connection. So it might be possible to conclude the agricultural service providers are not using network to exchange any type of

information with colleagues in their respective WOoARD via LAN or WAN. The first question was posed to identify the average connection speed of the Internet in each WKC, and the responses were as follows. The largest number of the respondents from each four WKC showed that they don't know the average connection speed of the Internet as shown in Table 9 below. Thus, 64%, 61%, 57%, and 71% from Alaba, Alamata, Bure and Goma respectively indicated that they don't know the average speed. The reason they forwarded for why they don't know is that the Internet connection is not working most of the time. Even some respondents said, "It is better to say there is no Internet connection in general, it is only nominal." But 29%, 25%, 30%, and 22% from Alaba, Alamata, Bure, and Goma respectively answered that the average connection speed is bellow 14kbps. As it can be seen from the table, on average 24% of the respondents said that the average connection speed of the Internet is below 14kbps, and 62% answered as they don't know it. The investigator also proved during the observation time the average connection speed of the internet in each WKC is below 14kbps. Therefore, based on this finding it might be safe to conclude, though Internet can be a big source of information for the WKCs, due to very, very poor network connection it is playing a little role in all WKCs.

Table 9 Average connection speed of Internet

		Responses from WKCs				
Item	Response	Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Average (%)
Average connection speed of Internet	Below 14 kbps	29	25	30	22	24
	14- 19kbps	0	0	13	7	5
	19-33kbps	0	0	0	0	0
	19-56kbps	7	14	0	0	8
	I don't know	64	61	57	71	62
Total		100	100	100	100	100

The second question was intended to identify whether respondents (users of the WKCs) are using the Internet via their WKC. Accordingly, as the response of the respondents were concerned and can be seen in Figure 3 below, 36%, 25%, 53%, and 33% from Alaba, Alamata,

Bure, and Goma respectively indicated that they are currently using Internet via their WKC even though it is not easily accessible.

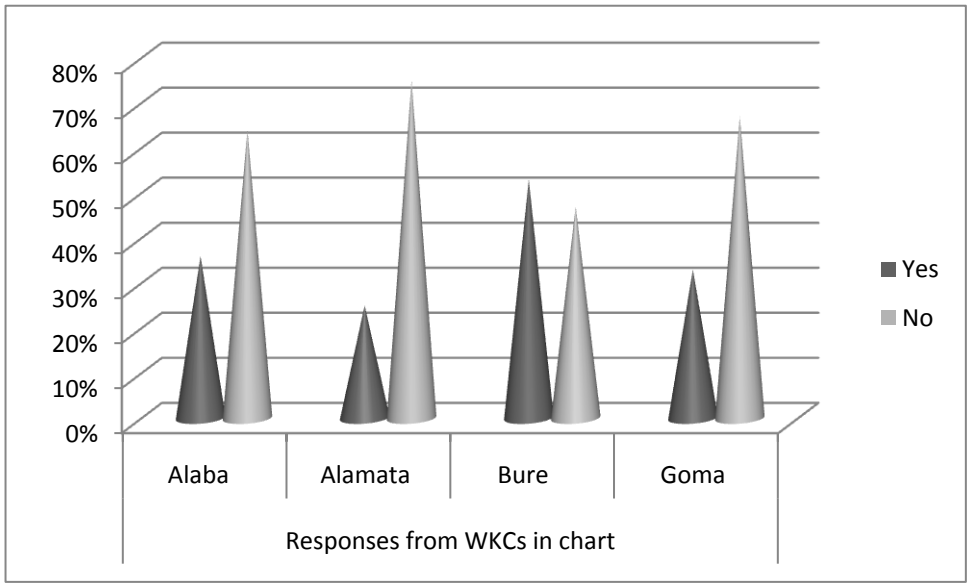


Figure 3 Usage of Internet via WKC

The rest of the respondents which is 64%, 75%, 47 from Alaba, Alamata, Bure, and Goma respectively showed that they are not using the Internet via the WKC. These respondents said that, as the Internet started functioning they tried to use it, but due to the problem of the Internet network connection i.e. it took too much of their time that forced them to stop using the Internet at the WKCs. To have a comprehensive view on the role of the Internet in the WKCs under study, it is better to further analyze the responses given to the third question item. That is, those who responded as they are the users of the Internet via their respective WKC gave responses, how they rate the amount of the time that is allowed at the WKCs to access the Internet as follow. As it is presented in Table 10 below, 50%, 8%, 27%, and 56% form Alaba, Alamata, Bure and Goma respectively responded that the time that is allowed to use the Internet at their respective WKCs is too few minutes. The respondents also claimed that the file or the document that they found important and started downloading didn't successfully downloaded most of the time. They said, in comparison to the time allowed to use the Internet, it didn't allow us to perform any meaningful activities in the WKC.

Table 10 Amount of Internet allowed at WKC

		Responses from WKCs				
Item	Descriptions	Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Average (%)
Amount of Internet time allowed at WKC	Too few minutes	50	8	27	56	34
	Adequate	29	0	47	11	24
	Plenty of time	0	17	20	11	12
	No-Internet connection	21	75	7	22	30
Total		100	100	100	100	100

Source: Researcher's own primary data

As the analysis indicated these problems are more reflected in Goma where Alaba showed 50% claims there is time limitation in using the WKC. Comparatively, only 8%, from Alamata followed by Bure i.e. 27% claim as there is a shortage of time in using the Internet in the WKCs. Responses that indicated the time allowed to use the Internet in their WKC is adequate were 29%, none, 47% and 11% from Alaba, Alamata, Bure and Goma respectively. Those who said the time allowed is plenty were, none,17%, 20%, and 11% from the successive WKCs. The percentage of the respondents that answered as there is no Internet connection in their WKC were, 21%, 75%,75, and 22% from Alaba, Alamata, Bure and Goma correspondingly. To this end, it might be safe to conclude that only due to the inefficiency of Ethiopian Telecommunication service; currently Internet is playing a little or almost no role in the Knowledge Management initiatives executed by ILRI/IPMS project.

4.5. Basic Knowledge of Computers, Training, and Development of WKCs staff (Competence)

To use computers and other ICT tools basic skill is required. The basic knowledge of computer skills can be acquired via formal or informal learning ways. To develop the basic skills of the agricultural knowledge workers training and development is the best option. Furthermore, to solicit the status of the staff of the WOoARD of each four cases under study, different question items were posed, analyzed, and discussed in the following subtopics.

4.5.1 Basic Computer Knowledge of Respondents (users of WKCs)

To verify how the ICT have sound effects on the Knowledge Management in the WKCs, it is fair to examine the basic computer skills of the respondents. Thus, two questionnaire items were used. The first question raised was intended to identify the number of the staff who uses computers in their daily tasks in their WKC. Accordingly, as it can be represented in Table 11, 50%, and 87% of the responses from Alaba and Bure indicated that it is between 6 and 10, 50% of the response from Alamata indicated 11 to 15, and 100% of the response from Goma showed only 1 to 5 staff use computers in their daily tasks.

Table 11 No. of staff who use computers in their daily tasks

		Responses from WKCs				
Items	Descriptions	Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Average (%)
No. of staff who use comp. in their daily tasks	1-5	0	0	13	**100**	22
	6-10	**50**	33	**87**	0	48
	11-15	29	**50**	0	0	20
	More-than 15	21	17	0	0	10
Total		100	100	100	100	100

Source: Researcher's own primary data

Here the point is, from total number of staff i.e. 60, 55, 52 and 40 from Alaba, Alamata Bure and Goma respectively, only 1 to 5 staff from Goma, only 6 to 10 from Alaba and Bure, and only 11 to 15 people from Alamata uses computers in their daily tasks. Again when we see the case of Goma, out of 40 numbers of staff only 1 to 5 staff members are using computers in their daily tasks. Based on these findings it might be fair to conclude as, in comparison to the numbers of the staff in almost all WKCs, very few are using computers in their daily tasks which is a signal for a great effort has to be made in order to uplift using technological opportunities in all WKCs.

It is clearly seen from the analysis that a few members of the staff are using computers in their daily tasks. In addition to this point, the question item intended to determine computer use proficiency was posed. The respondents' responses are presented in Table 12 as follows.

Table 12 Computer usage proficiency knowledge of respondents

		Respondents from WKCs				
Item	Descriptions	Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Average (%)
Computer Use-proficiency Knowledge	Beginner	93	85	93	100	93
	Intermediate	7	8	7	-	6
	Advanced	-	-	-	-	-
	It professional	-	7	-	-	1
Total		100	10	100	100	100

Source: Researcher's own primary data

As it can be depicted from the table, from all the WKCs with the responses rate of 93%, both from Alaba and Bure, 85%, and 100% from Alamata and Goma showed that they are beginners in computer use proficiency knowledge. From this result, it might be possible to conclude the

users are currently not yet competent to utilize computer technologies in efficient and effective manner in the WKCs.

4.5.2. Training and Development

In most of the sectors, training for staff development is given superior attention. On this study, it has been seen that most of the users of computer is in a position of beginners. To identify how much is training and development has given attention in WKCs, three questionnaire items were asked. The first question helps to determine whether the respondents (users of WKCs) have taken basic computer training courses or not. As a result the following response rate was gathered.

Table 13 Computer training courses of respondents

		Respondents (WKCs)				
Item	Response	Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Average (%)
Those who have taken Comp. Training courses	Yes	71	83	100	89	86
	No	29	17	0	11	14
Total		100	100	100	100	100

Source: Researcher's own primary data

As it can be seen from Table 13 above, 71%, 83%, 100%, and 89% from the Alaba, Alamata, Bure and Goma respectively proved that they have taken computer training courses. Only 29%, 17%, and 11% from Alaba, Alamata, and Goma said they didn't take any computer courses, and are computer illiterate. Those who said they have taken computer courses strongly declared the courses they took were not satisfactory to the level they can use computers even to the

minimum level. Some of these respondents clearly articulated most of them can not yet use most of the tools of any of the MS's simple application. From this response result it might be possible to conclude, thought the trainings were given in the WKCs, it did not continued to the level that enables the users of the WKCs to optimize their computer use efficiency to the desired stage.

The second question was asked as, how they were taking the computer training courses, the response as it can be seen from Table 14 below, 14%, 13%, 13%, and 11%, from Alaba, Alamata, Bure, and Goma respectively showed that they had taken the formal computer training. While, the greater number of the respondents which are 58%, 79%, 73%, and 55% of the respondents from the respective WKCs proved that they had taken short term training as referred in the Table. Almost all of the respondents who had taken short training courses specified that the short courses were given by the respective WKCs of IPMS's project. They also stated that before this WKCs were established most of the staff even didn't know how to open and shout down the computers.

Table 14 Ways of computer training

Item	Description	WKCs				Average (%)
		Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	
Ways of training	Formal-Computer training	14	13	13	11	13
	Short term intensive training	58	79	73	55	65
	Self-study courses	21	8	8	22	15
	On job training	0	0	6	12	5
	Other	7	0	0	0	2
Total		100	100	100	100	100

What the investigator observed during the observation period at each four WKCs was most of the staffs fear computers as if it will be failed when they use it. Even those who had taken the computer training courses have no adequate skill to use computer, and also they don't have confidence to use it. These be a sign of the staff still lacked the basic computer skills, which

enable them to exploit the opportunity of the technologies availed by IPMS project. As it can be seen from Table 14 above, 21%, 8%, 8%, and 22%, from Alaba, Alamata, Bure, and Goma WKCs respectively showed that the staff followed self-study courses using the opportunity that the WKCs provided. Being tried to learn by oneself might be appreciated but to be adjusting ourselves with the time especially for the knowledge workers in the WOoARD needs additional support such as providing intensive staff training and development.

4.6. Acquisition, Storing, and Dissemination of Agricultural Information and Knowledge

Agriculture is the major economic sector in Ethiopia. Most of Ethiopian people source of income is also agriculture. But the sector is still in traditional mode of production where people are suffering from food insecurity. To alleviate this problem adopting technologies and utilizing it might be the best option. This can be done through acquiring new information and knowledge. Information and knowledge have to be created, acquired, disseminated and used in order to be effective and efficient in providing quality agricultural service. As it is observed by the investigator the indigenous agricultural knowledge of the farmers such as how to treat cattle diseases using cultural medicine, other useful traditional mechanisms of farming and breading are video taped and the knowledge is transferred to other framers. The research outputs by the Agricultural Research Institutes like ILRI are also disseminated to the WKCs and then the knowledge is applied using Farmers Training Centers (FTCs). To clearly discuss this issue it is categorized under about five sub-categories as follows.

4.6.1 Sources and Means of Acquisition of Knowledge/Information

To solicit the sources of the agricultural information and knowledge of each four WOoARD about four questionnaire items were used. The first question item was asked to know what sources the respondents are using to get information and knowledge to fulfill their responsibilities in their official capacity. As it can be seen from Table 15 below the larger numbers from each four WKCs i.e. 93%, 92%, 67%, and 78% from Alaba, Alamata, Bure, and

Goma respectively indicated that they acquired information and knowledge via talk to senior experts. While 64%, 75%, 53%, and 56% from Alaba, Alamata, Bure, and Goma respectively showed they get agricultural information and Knowledge from government provided package guide lines. Those who responded they used colleagues in the local WOoARD as a source of agricultural information and knowledge was, 57%, 67%, 27% and 44% from Alaba, Alamata, Bure and Goma respectively. The percentage representation of the respondents, those who used Internet, WKC DVD/CD, or refer books and other previously training manuals as source of information and knowledge were 64%, 50%, 60% and 56% from Alaba, Alamata, Bure and Goma respectively.

Table 15 Source of agricultural information/knowledge

	Respondents from WKCs				
Items	**Alaba (%)**	**Alamata (%)**	**Bure (%)**	**Goma (%)**	**Aver. (%)**
Refer to Government provided package	64	75	53	56	62
Talk to more senior experts	93	**92**	67	78	83
Talk to colleagues in the local WOoARD	57	67	**27**	44	49
Search on the Internet, WKC DVD/CD or refer books & manuals	64	50	60	**56**	**58**

Source: Researcher's own primary data

The second question which targeted to identify their top three information sources of agricultural information and knowledge source was raised for further investigation. Accordingly, the responses were presented in percentage in Table 16 below. From Alaba, the responses indicated, the top three information sources are talk to more senior experts and Internet, WKC DVD/CD or refer books and manuals with equal percentage response (79%), and government provided package guide lines with 71%. Here on the open ended question item what almost all respondents emphasized was it is not the Internet but the WKC DVDs/CDs that they are using as source of information. The Internet is not functioning most of the time according to their comments. Even some of them stated that saying that we have an Internet connection is only hope but in reality trying to use the Internet or even trying to e-mail a

message is time consuming. One of the respondents from Alaba stated that he decided not to use the Internet because he couldn't even able to send a single e-mail to his friends.

Table 16 Top three information and knowledge sources

	Responses from WKCs				
Descriptions	**Alaba (%)**	**Alamata (%)**	**Bure (%)**	**Goma(%)**	**Aver. (%)**
Refer to Government provided package guide lines	71	53	87	89	75
Talk to more senior experts	79	**83**	87	100	87
Talk to colleagues in the local WOoARD	50	75	**60**	33	55
Search on the Internet, WKC DVD/CD or refer books and manuals	79	58	67	**78**	**71**

Source: Researcher's own primary data

The top three information sources for Alamata as the respondents data indicated are 83% get information by talking to more senior experts 75% get information by talking to their colleagues in the local WOoARD, and in the third place, 58% of them acquire information and knowledge from WKC DVD/CD or refer books and manuals. When we come to Bure WKC as the response indicated 87% of the respondents are using equally indicated government provided package guide lines and talk to more senior experts as their source of agricultural information and knowledge to fulfill their responsibilities in their official capacity.

In Goma WKC the three top information source as it is indicated by the respondents are: talk to more senior experts, refer to Government provided package guide lines and WKC DVDs/CDs or refer books and manuals.

On average, it is indicated by the survey result, talk to more senior experts (87%), refer to government provided package guide lines (75%) and WKC DVD/CD or refer books and manuals (71%) are the top source of information for their need. From this information it might be induce that as the DVDs/CDs and other printed manuals and books provided by the knowledge centers are one of their top three information sources, ICT tools are also playing role in each WKC. But with regard to the Internet facilities, all WKCs argued that as if there is no Internet

service in their WKC. If there were adequate network for the WKCs it would have been more positively influencing the service delivered by the agricultural knowledge workers.

The third question, aimed to identify whether they are aware of the Ethiopian Agricultural Portal (EAP) was asked, which also help to clearly determine the source of the agricultural information for the respondents.

As a result, indicated on Figure 4 below, 57%, 67%, 80%, and 67% from Alaba, Alamata, Bure and Goma respectively indicated that they don't have any information about the EAP.

To the contrast 43%, 33%, 20%, and 33% from Alaba, Alamata, Bure and Goma respectively indicated that they know about the EAP. But to access the resources from this source the very poor network of the Internet connection in their WKC would not allow them.

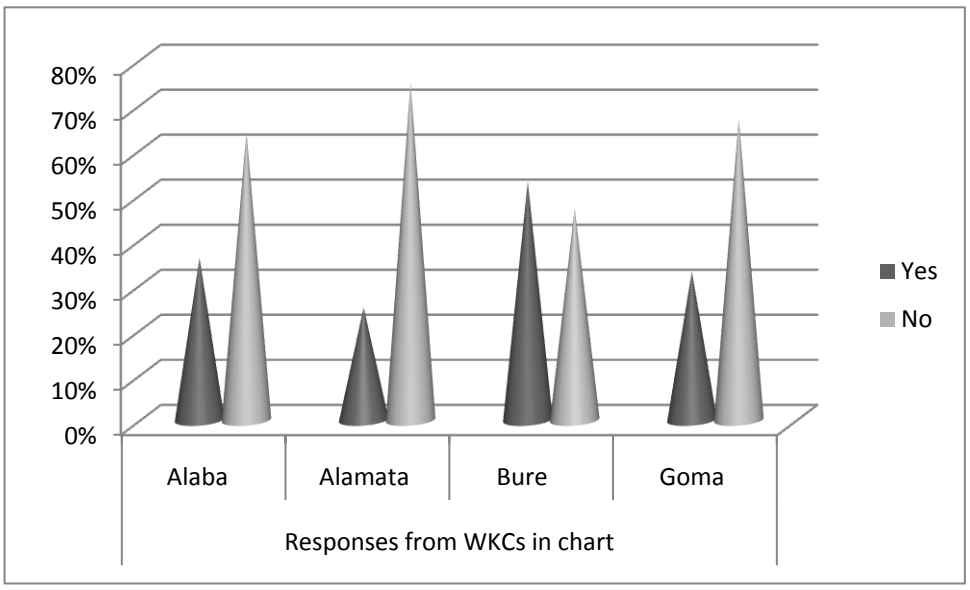


Figure 4 Awareness of Ethiopian Agricultural Portal (EAP)

Here, the investigator likes to raise the questions like: Why the network at each WKC is poor or rather not working? What are the basic problems behind? How this problem can be solved? Having this problem, is it possible to succeeded development goals by the nation? What alternate solutions are there? Why the private sectors are not investing in the Telecommunication sectors? Is the investment policy needs further analysis to support nations in empowering via ICT? And other related questions need the right answers in order to solve this big problem.

The fourth question intended to ask about whether they search for the agricultural information they need in the EAP. To this end, the survey result is presented in Figure 5. Hence, 36%, 8%, 13%, and 33% from Alaba, Alamata, Bure, and Goma showed they are not searching. Some of the respondents clearly reasoned out they are not searching currently because it is not easily accessible.

The rest of the respondents, 64%, 92%, 87%, and 67% from Alaba, Alamata, Bure, and Goma answered they are searching for the agricultural information in the EAP

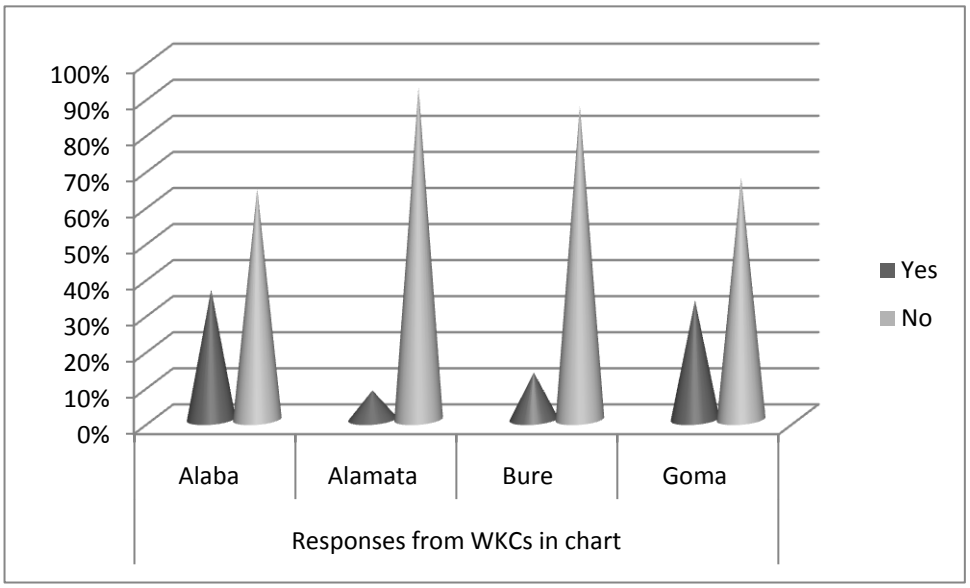


Figure 5 Searching information in EAP

4.6.2. Accessibility of WKCs by Users

To identify the accessibility of each WKC i.e. to know how much the WOoARD agricultural service providers are using the opportunities availed by IPMS project of WKCs, seven questionnaire items were used. The first question that helps to extract information about accessibility of the Internet during business hours was raised. Based on this as it can be seen from Figure 6 below, the responses 78% from Alaba and Goma equally indicated that the Internet is not accessible during business hours. The responses from Alamata and Bure with response rate of 58% and 67% indicated the Internet is accessible during business hours. Repeatedly, what the users were claimed was that, in their own terms, "trying to use the Internet is time killing, it is better to use IPMS's DVDs/CDs and other printed materials instead of going the hard way."

Table 17 Official access to Internet

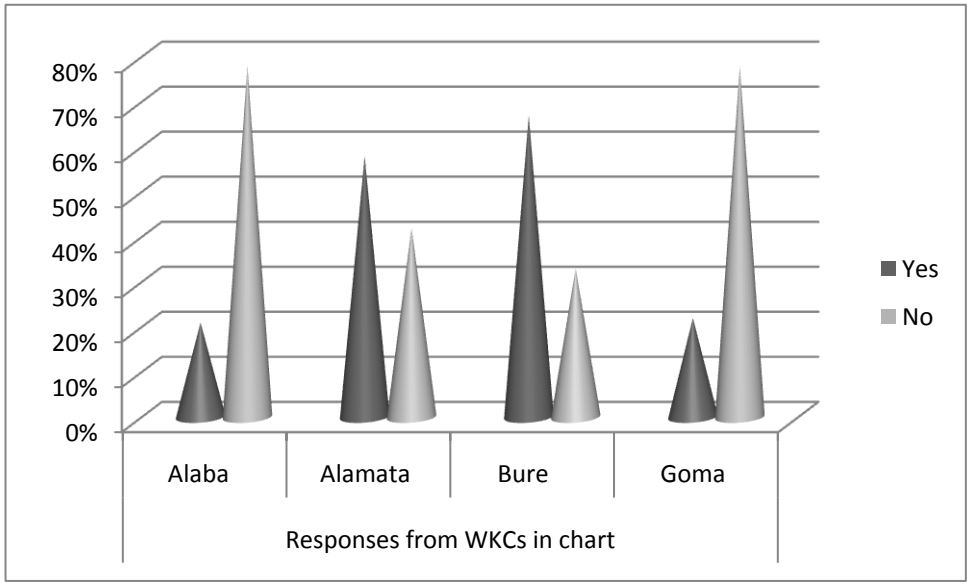


Figure 6 Accessibility of Internet during business hours

On average 58% of the respondents showed that the Internet at their WKC is not accessible during business hours. This might be an indication of the Knowledge Centers are not properly working in Alaba and Goma whereas Bure is better followed by Alamata even though it is also not satisfactory.

From this result of the survey, it might be possible to induce that most WKCs are not providing satisfactory Internet service to the users.

The second question asked was to identify who has the official access to Internet in the WKCs. In view of that, as it can be seen from Table 17 below, 50 %, 34%, 7%, and 56% from Alaba, Alamata, Bure and Goma respectively showed every SMS of the WOoARD has access to Internet. 21%, 8%, 26%, and 22% from Alaba, Alamata, Bure and Goma indicated only few designated staff have official access to the Internet.

Item	Descriptions	Respondents from WKCs				
		Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Aver. (%)
Official access to Internet	Every SMS of WOoARD	50	34	7	56	34
	Few designated staff	21	8	26	22	20
	Everyone in the WOoARD	29	8	67	22	34
	Other	-	50	0	-	12
Total		100	100	100	100	100

Source: Researcher's own primary data

On the other hand, 29%, 8%, 67% and 22% from Alaba, Alamata, Bure and Goma respectively indicated everyone in the WOoARD has official access, and only from Alamata, 50% of the respondents answered as others who have official access to the Internet in their WKC. On average, at equal rate i.e. 34% of the respondents indicated every SMS of WOoARD or everyone in the WOoARD has official access to the Internet. From this information it might be possible to conclude that in most of the WKCs every SMS of WOoARD or everyone in the WOoARD has the official access to the internet which can be considered as a good opportunity for the staff to access the resources in the WKCs. But what we have to remind is, even if everyone in WOoARD has official access to the WKCs, there is a problem to access the WKCs due to various reasons already discussed in the previous sections. Such as accessibility of the WKCs during business hours/out of business hours by most of the WKCs might be a limitation.

The third question was asked to determine the frequency to visit the WKC by the users. As a result, only few respondents said they visit not at all. As it can be seen on the respondents' response distribution on Table 18 below, 33% from both Alamata and Bure, 36% from Alaba, and 44% from Goma said they visit the WKC 30 minutes to one hour per week. Whereas, 29%, 25%, 7%, and 22% from Alaba, Alamata, Bure and Goma respectively showed that they visit the Knowledge center one to two hours per week. Similarly, 21%, 25%, 47%, and 33% from Alaba,

Alamata, Bure and Goma respectively indicated that they visit the center more than three hours per week.

Table 18 Frequency to visit WKC

Item	Discretion	Respondents from WKCs				
		Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Aver. (%)
Frequency to visit WKC per week	Not at all	7	0	7	0	4
	30 minutes to 1 hour	36	33	33	44	36
	1 -2 hours	29	25	7	22	20
	2-3 hours	7	17	7	0	8
	More than 3 hours per week	21	25	47	33	32
Total		100	100	100	100	100

Source: Researcher's own primary data

On average, the frequency of the users to visit WKC per week: 36% showed 30 minutes to 1 hour, 32% showed More than 3 hours , 20 % 1 to 2 hours, 8% 2 to 3 hours, and only 4% of the respondents said not at all.

To easily see the frequency distribution to visit WKCs by the users see Figure 7 below.

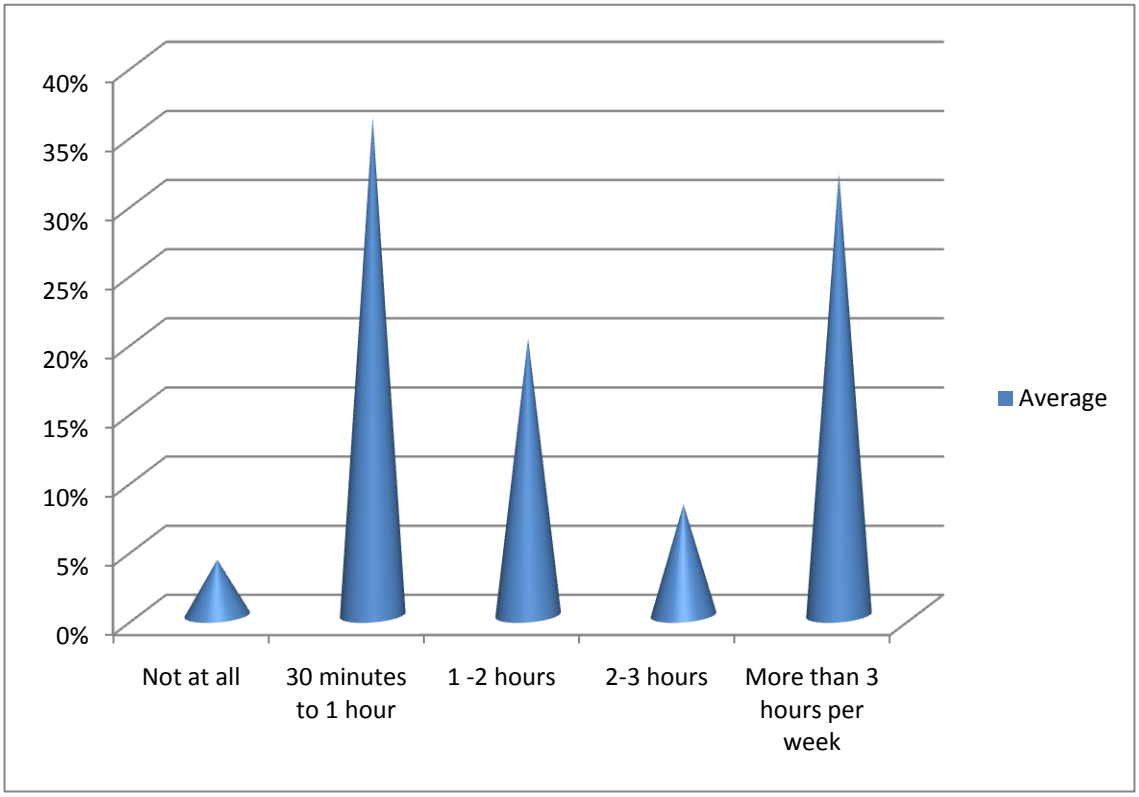


Figure 7 Frequency to visit WKC per week on average

Based on the findings, it might be possible to conclude, the frequency of visiting the WKC by the staff is not satisfactory. Because as it is already seen in the analysis, most of the materials that support the WOoARD to accomplish their tasks are found in these WKCs. So visiting the WKC from 30 minutes to 3 hours per week is not enough to be effective in achieving the goals. The knowledge workers have to visit at least 2 to 3 hours per day.

The fourth question continued for further analysis that planned to identify the precedence of the tasks the respondents are performing at the WKC in order to denote it in ranks. Accordingly, as the data indicated on Table 19 below, Alaba WKC respondents ranked the tasks they do at the WKC such as Internet browsing seeking agricultural information, E- mail, writing report, personal development, and entertainment were ranked as 1^{st} , 2^{nd}, 3^{rd}, 4^{th} and 5^{th} correspondingly. According to Alamata WKC, Internet browsing seeking agricultural information, E- mail, entertainment, personal development, and writing report were ranked as 1^{st}, 2nd, 3^{rd}, 4^{th} and 5^{th} respectively. When we see the case of Bure, writing report, personal development, Internet browsing seeking agricultural information, E- mail, and entertainment

were ranked as 1st, 2nd, 3rd, 4th and 5th respectively. As to the respondents from Goma WKC, Internet browsing seeking agricultural information, writing report, personal development, E-mail, and entertainment were ranked as 1st, 2nd, 3rd, 4th and 5th correspondingly.

Table 19 Rank of the tasks they perform in the WKC

	Alaba (%)					Alamata (%)					Bure (%)					Goma (%)				
Ranks	Internet browsing	E-mail	Writing report	Personal Develop't	Entertainment	Internet browsing	E-mail	Writing report	Personal Devlop't	Entertainment	Internet browsing	E-mail	Writing report	Personal Develop't	Entertainment	Internet browsing	E-mail	Writing report	Personal Develop't	Entertainment
1st	**44**	21	14	14	7	**42**	25	17	8	8	**13**	13	**47**	20	7	**44**	-	22	33	-
2nd	21	**57**	14	-	7	25	**67**	17	-	-	20	**13**	13	**27**	7	33	-	**44**	11	11
3rd	-	7	**44**	43	7	-	7	32	**50**	**67**	**40**	7	13	33	13	11	32	11	**33**	11
4th	28	7	20	**29**	**14**	**25**	-	8	**25**	**17**	13	**40**	27	13	33	12	**46**	22	22	-
5th	7	7	7	14	**64**	8	-	**27**	17	**8**	13	27	-	7	**40**	-	22	-	-	**78**
Total	100 %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Researcher's own primary data

The response rate of ranking the tasks they do at WKCs clearly showed the respondents at each of the respective WKCs are using the facilities at the WKCs. Furthermore, it is clearly indicated on the responses except Bure who ranked writing report as their first activities at the WKC the other three ranked Internet browsing searching for agricultural information in the WKC as their first choice. Most of the respondents from all WKCs argued, because of the hope to get the agricultural information we need, we always browse trying to get it. But even if we found the document we need, it takes the whole our time to download it. Most of the time it is so difficult for us to complete the download and we left it in between. From this one might be able to conclude the ICT and other resources or facilities at the WKCs are playing a role in supporting the agricultural workers in achieving their goals. But as it was indicated on the findings, the workers are wasting their time in trying to access the information they need hoping to get it. How this problem can be resolved is another issue that needs further research.

The fifth question was in relation to whether there is any restriction regarding the use of the WKC in terms of one can spend at WKC, the respondents responses are presented in percentage in Table 20 below.

As it can be seen from Table 20 below, the largest number from all WKCs with response rate of 86%, 92%, 80% and 89% from Alaba, Alamata, Bure, and Goma showed they are encouraged to use the WKC. Those who said they go to WKC anytime if it look for specific work related task were 36%, 33%, 27%, and 56% from Alaba, Alamata, Bure, and Goma respectively. Relatively, the smallest percentage of the respondents, 29%, 25%, &%, and 11%, from Alaba, Alamata, Bure, and Goma respectively said they can go to WKC on their free time but not during work hours.

Table 20 Usage of WKC in terms of the amount of time one can spend there

	Respondents (WKCs)				
Descriptions	Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Average (%)
We can go to WKC anytime if it look for specific work related task	36	33	27	56	36
We can go to WKC on our free time but not during work hours	**29**	25	**7**	11	18

We are encouraged to use the WKC to develop ourselves professionally	86	92	80	89	86
We discouraged from using the WKC since it is considered a waste of time	-	-	-	-	-

Source: Researcher's own primary data

On the other hand 14%, 16%, 14%, and 22% of respondents from Alaba, Alamata, Bure, and Goma proved the WKC can be open at anytime by individual or group request. Only a few percentages such as 7% from both Alaba and Bure, 8%, from Alamata and 11% from Goma said the WKCs are open after office hours once or twice a week only for not more than 30 minutes. From all the WKCs none said the WKCs are open during weekends.

From these finding, it might be possible to conclude in most of the Woredas, there is good awareness about how the knowledge centers can assist the Staff in accomplishing their tasks. Therefore, there is good encouragement to use the facilities or resources found at the WKCs. The sixth question was asked to identify the hours of operation for the WKC. The percentage of the responses from the respondents is indicated in Table 21 below. 50%, 67%, 53%, and 56% from Alaba, Alamata, Bure, and Goma indicated the WKCs are opened during all regular office

hours. To the contrary, 36%, 16%, 27%, and 22% from Alaba, Alamata, Bure and Goma respectively showed the WKCs are open only at certain times of regular office hours.

To the lesser percentage from all WKCs, there are respondents who said the WKC is open after office hours and they can have the WKC open anytime by request.

Table 21 Hours of operation of the WKC

	Respondents from WKCs				
Descriptions	Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Aver. (%)
The WKC is open during all regular office hours	50	67	53	56	52
The WKC is open after office hours	**7**	8	**7**	11	10
The WKC is open anytime by request	14	16	14	22	12
The WKC is open during weekends	-	-	-	-	-
The WKC is only open at certain times of regular office hours	36	16	27	22	26

Source: Researcher's own primary data

Based on these findings one might be able to conclude, on average the WKCs are in operation during business hours, so that the ICT tools and other resources are ready to serve the agricultural workers.

The seventh or last question under this subtopic was asked to determine how the establishment of the WKCs positively influences in getting the agricultural information, i.e. how do they compare their access to agricultural knowledge and information before the WKC was established with their access after the WKC was established. The following percentages of responses were gathered.

	Respondents (WKCs)

Descriptions	Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Aver. (%)
You get about the same amount and type of information	7	17	7	11	10
You get about more volume information	**57**	42	**27**	56	44
You get about more diverse information	86	92	80	89	86
You get less information	-	-	-	-	-

Table 22 Comparison of getting information

Source: Researcher's own primary data

As it can be seen from Table 22 above, the majority of the respondents indicated such as 86%, 92%, 80%, and 89% from Alaba, Alamata, Bure and Goma respectively proved that it was after the establishment of the WKCs that they get about more diverse information. Similarly, 57%, 42%, 27%, 56% and 44% of the respondents showed it was after the establishment of the WKC that they acquire more volume of information and agricultural knowledge.

Nobody answered as they get less information but a few percentages showed they get about the same amount and type of information.

From these findings one might be able to conclude after the establishment of the WKCs the staff has got the chance to access about more volume and diverse agricultural information.

4.6.3. Documentation of Agricultural Information and Knowledge

Agricultural information and knowledge have to be documented in an organized manner in order to be easily accessed by the needy whenever it is required. To dentify how much documentation is given attention and what role is ICT playing, about two questions were asked.

The first question item asked to identify if there is any formal/ informal means to document and /or preserve indigenous knowledge of farmers, which means the best cultural agricultural knowledge of farmers on breading and farming in their respective WKC. Accordingly, the result of the survey indicated in Figure 8 below.

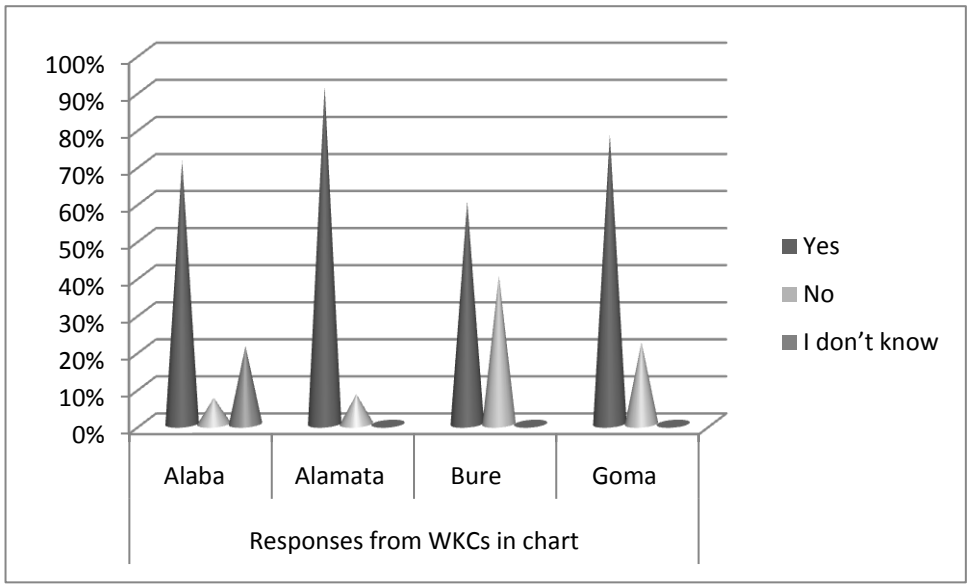


Figure 8 Means of documentation of indigenous knowledge

Thus, 7%, 8%, 40%, and 22%, from Alaba, Alamata, Bure, And Goma respectively said there is no formal or informal means of documentation or preserving indigenous agricultural knowledge in their district. Whereas, 71%, 91%, 60%, and 78% from Alaba, Alamata, Bure and Goma showed there is formal (in plan of the organization)/ informal mechanisms to document and /or preserve indigenous agricultural knowledge. Only 21% of respondents from Alaba answered as they don't know about it. Hence, it might be possible to conclude that, in almost all Districts there is a documentation mechanism to document and/or preserve indigenous agricultural knowledge of farmers.

The second question aimed to investigate about if ICT plays, any role in facilitating the documentation and /or preservation of indigenous agricultural knowledge of farmers was asked. As a result, only 14%, 13%, and 11% from Alaba, Bure and Goma answered as ICTs have no role in documentation and /or preserving indigenous agricultural knowledge. The other or the larger number of the respondents such as 86%, 100%, 87%, and 89% from Alaba, Alamata, Bure, and Goma proved ICTs are playing a role in documentation and /or preserving indigenous agricultural knowledge of farmers in their respective WKC. See Figure 9 below.

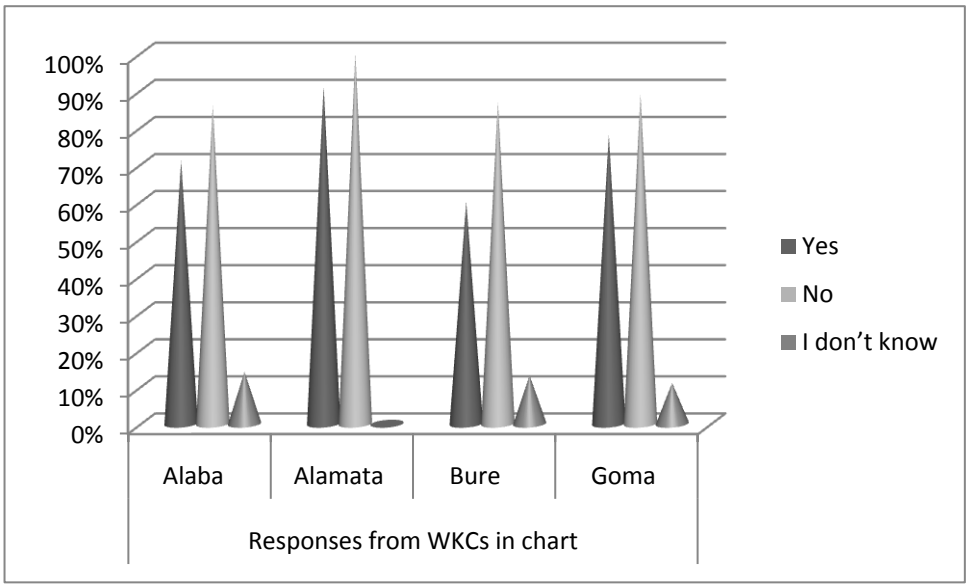


Figure 9 Roles of ICT in preserving indigenous knowledge

2.6.1. From these response results, it might be possible to conclude that the ICT tools are using/playing a role in documentation, preserving indigenous agricultural knowledge of farmers in each WKC.

4.6.4. Dissemination of Agricultural Information

Agricultural information has to be disseminated via proper channels. To identify how the agricultural information and knowledge is disseminated, detailed interview were carried out with RDO and the WOoARD officer in each four districts of the cases under study. Based on the survey, as the RDOs and WOoARD from respective WKCs reacted to the interview question, the agricultural information and knowledge is disseminated between knowledge workers or agricultural service providers and to the end users or farmers in different means. As it was discussed by the respondents, they disseminate the information or knowledge through person to person, and using ICT tools Like TV, CDs, DVDs and the like in FTC to disseminate agricultural knowledge. According to the respondents' opinion, FTCs are so effective and the convenient means of disseminating the agricultural information and knowledge to the farmers with less cost. But the problem is CDs/DVDs are not prepared in local language of the farmers that they can easily able to understand the points.

4.6.5. The Roles of ICT Tools in Capturing, Storing, and Disseminating Agricultural Knowledge

It is understandable that ICT has a significant role in enabling the processes of Knowledge Management. But this might be true if and only if we have adequate skills to manage and able to use it. In the case of this study to determine the role ICTs in each of the WKCs under study the question that helps to identify on which aspects of the agricultural Knowledge Management the ICTs have played a role was posed. Accordingly, 86%, 83%, 87%, and 89% of the responses from Alaba, Alamata, Bure and Goma indicated that ICTs play a major role in facilitating and speeding up the process in the WKCs. (See Table 23 below)

Table 23 Role of ICT in different areas KM processes

Item	Respondents (WKCs)				
ICT played a role in	Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Average (%)
In facilitating and speeding up the process	86	83	87	89	86
In minimizing the cost of dissemination	**71**	75	**67**	78	72
Support to easily understand the agricultural knowledge content	93	92	87	100	92
Have no difference than manually	-	-	-	-	-

Source: Researcher's own primary data 1

In the same way, 93%, 92%, 87%, and 100% from Alaba, Alamata, Bure and Goma respectively indicated ICTs have also a significant role in support to easily understand the agricultural knowledge content. The response rate of 71%, 75%, 67% and 78%from Alaba, Alamata, Bure and Goma respectively showed that is playing the a great role in minimizing the cost of dissemination of agricultural information and knowledge. To clarify their idea on this fact they took how DVDs and CDs, and TVs are using in Farmer Training Centers (FTCs) to show the agricultural research outputs from research institutes particularly ILRI/IPMS to directly farmers at their destination. None of the respondents from all the WKCs claimed that ICTs have no difference than manually.

So, it might be possible to conclude currently ICTs are playing a role in facilitating and speeding up the process, in minimizing the cost of disseminations, and by providing support to easily understand the agricultural knowledge content in all WKCs.

4.7. Usefulness, Relevance, Timeliness and Format of the Information and Knowledge Availed at the WKCs

To identify how much the agricultural information or knowledge availed by WKCs to the WOoARD are useful, relevant, can solve current problems, and in the desired and easily understandable manner or not, under the first three categories two question items for each and, for the last category one question were posed.

4.7.1. Usefulness of the Agricultural Information and Knowledge in the WKCs

To solicit how much the information and agricultural knowledge available at the WKC are useful the following two question items were used for extracting the information required for analysis. The first question which aimed to identify whether the agricultural information they get from WKCs is useful or not was asked.

In view of that, as it is presented in Table 24 below, the responses of 57%, 58%, 80%, and 56% from Alaba, Alamata, Bure, and Goma showed the agricultural information they get from WKC is useful. On the other hand, 36%, 42%, 20% and 44% from Alaba, Alamata, Bure and Goma respectively indicated it is average.

Table 24 Usefulness of agricultural information in WKC

		Responses from (WKCs)				
Item		Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Aver. (%)
Usefulness of Agri. Information in WKC	useful	57	58	80	56	64
	Average	36	42	20	44	34
	Not useful	7	-	-	-	2
Total	100	100		100	100	100

Source: Researcher's own primary data

The second question was asked to determine the reasons of the respondents who said the information they get from the WKC is not useful if any. Hence, only 7% as indicated in the table responded as the information they get is not useful. They reason out why it is not useful; as to their opinion, it is due to language barriers.

4.7.2. Relevance of the Agricultural Information and Knowledge in the WKCs

To identify whether the agricultural information availed at the WKCs is relevant or not two question items were used.

The first question aimed to identify the relevancy of the agricultural information and knowledge at the WKCs. On this base, as it can be seen from Table 25 below, 64%, 58%, 87% and 56% from Alaba, Alamata, Bure and Goma respectively answered the agricultural information and knowledge they get from the WKC is relevant; whereas 29%, 42%, 13%, and 44% from Alaba, Alamata, Bure and Goma indicated it is relatively average. Only 7% from Alaba said it is not relevant.

The second question was about, if it is not relevant, to identify what factors do they think are the main reasons for this problem. Accordingly, the respondents reasoning out that the document/information available are too complex to be relevant for us.

Table 25 Relevance of agricultural information at WKC

		Responses from WKCs				
Item		Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Average (%)
Relevance of Agri. Info. at WKC	relevant	64	58	87	56	68
	Average	29	42	13	44	26
	Not relevant	7	-	-	-	2
Total		100	100	100	100	100

Source: Researcher's own primary data

So, based on this analysis one might conclude the information the WOoARD staff get from the WKCs are relevant which can help the employees achieve the organizational goals.

4.7.3. Timeliness of the Agricultural Information and Knowledge in the WKCs

Based on the question item asked to find out whether the information the users get from WKCs are timely or not, as it can be seen from Table 26 below, 36%,34%, 40%, and 22% from Alaba, Alamata, Bure and Goma respectively indicated the information they get from their respective WKC is on average help to solve current problems. On the other hand, 57%, 58%, 60%, and 67% from Alaba, Alamata, Bure and Goma respectively proved it is exactly fit with the current situations. Only 7%, 8%, and 11% from Alaba, Alamata, and Goma respectively said it is outdated.

Table 26 Timeliness of agricultural Information at WKC

		Responses from WKCs				
Item		Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Average (%)
Timeliness of Info. at WKC	Timely	36	34	40	22	34
	Average	57	58	60	67	61
	Outdated	7	8	-	11	5
Total		100	100	100	100	100

Source: Researcher's own primary data

Based on the facts of the analysis, it is might be safe to conclude the information and Agricultural knowledge that the WOoARD get from the WKCs go with the current need of the agricultural service providers.

4.7.4. Format of Agricultural Information and Knowledge in the WKCs

To determine what type of format do the users in the WKCs prefer to get agricultural information the question item asked to rank their preference on what format do they prefer to

get agricultural information, was asked. Accordingly, as it can be seen from Table 27 below, from Alaba: printed materials, CD/DVD based video format, Internet source, in person explanation by someone who knows it best, and e- mail were ranked consecutively as their 1st, 2nd , 3rd ,4th, and 5th preferences. For Alamata WKC users: CD/DVD based video format, Internet source, printed materials, e- mail, in person explanation by someone who knows it best were indicated as their 1st, 2nd , 3rd ,4th, and 5th preferences respectively. When we see the preference of the users of Bure WKC: printed materials, CD/DVD based video format, Internet source, in person explanation by someone who knows it best, and e- mail were ranked as their 1st, 2nd, 3rd, 4th, and 5th preferences respectively. In the case of Goma WKC the respondents were responded as Internet source, in person explanation by someone who knows it best, CD/DVD based video format, e- mail, and printed materials as their 1st , 2nd ,3rd, and 4th choice of format of information.

In general as it has been seen in the analysis, it is might be safe to conclude the information and agricultural knowledge accessed by the WOoARD staff from almost all WKCs are useful, relevant, can solve current problem and in the desired format.

Table 27 Format preferred to get Agricultural information

	Alaba					Alamata					Bure					Goma				
Rank	Printed materials	E-mail	CD/DVD-based-video format	In-person explanation	From Internet source	Printed Materials	E-mail	CD/DVD based video	In-person explanation	From Internet source	Printed Materials	E-mail	CD/DVD based video format	In-person explanation	From Internet source	Printed Materials	E-mail	CD/DVD based video	In-person explanation	From Internet source
1st	43	14	29	14	23	7	-	50	25	17	40	13	20	13	13	11	11	11	-	67
2nd	36	-	43	7	20	15	15	15	8	46	27	13	33	7	7	11	33	-	44	11
3rd	7	14	-	7	29	28	16	16	25	13	13	13	27	7	33	11	-	67	22	22

4th	14	21	14	43	18	25	42	8	8	16	-	20	27	33	11	44	22	33	-
5th	-	50	14	29	10	24	27	11	34	8	20	-	40	27	13	56	11	-	-	-

Source: Researcher's own primary data 2

4.8. Influence of ICT Tools in Agricultural Service Delivery

To determine the influence of ICT tools in agricultural service delivery, about three question items were asked. That is to differentiate whether ICT tools have positive/negative impact and to sort out the most typical impact according to the respondents' opinion.

The first question asked was concerning whether the ICT tools in the WKCs bring about any positive impacts in terms of agricultural service delivery. The respondents' opinion was 100% of the respondents said ICTs have positive impact in the agricultural service delivery.

The second question asked was intended to extract the most typical impact of ICT on the WKCs. Thus, the survey as it can be seen from Table 28 showed 79%, 75%, 60%, and 89% of the respondents from Alaba, Alamata, Bure, and Goma respectively indicated it facilitates access to new information.

Table 28 Impact of ICT on agricultural service delivery

Item	Respondents (WKCs)				
The most typical impact of ICT on Agri. service delivery in their WKC	Alaba (%)	Alamata(%)	Bure (%)	Goma (%)	Average (%)
It facilitates access to new information	79	75	60	89	74
It makes getting new information quicker	14	0	13	0	8
It helps to make routine tasks faster and better	7	25	27	11	18

Source: Researcher's own primary data

Only 14% and 13% from Alaba and Bure said it makes getting new information quicker whereas none of the respondents from Alamata, and Goma supported the idea. 7%, 25%, 27%, and 11% from Alaba, Alamata, Bure, and Goma showed ICT tools in the WKC help to make routine tasks faster and better.

From this point, it might be possible to conclude that ICT tools in the WKCs have atypical impact in facilitating the access to new information. But with regard to assisting in getting new information quicker and enabling the routine tasks faster and better it still play a little role. The reasons for these problems can be drown from the analysis made in the previous parts. The role it is playing in accessing new information is too little because of the Internet network connection in all WKCs, and particularly, in Alamata and Goma, as it is indicated in the previous analysis, is too low. Regarding to why ICT tools play that much little role in enabling the agricultural service deliverers' routine tasks make faster and better can also be referred from the previous analysis. That is due to most of the staff in all WKCs lacks basic skills in using computers and also for the fact that the number of computers and the number of the staff of WOoARD who use the WKC are by too far different. Thus ICT tools are not in a position to play meaningful roles in these two cases.

The third question asked was, if having ICT tools in the WKCs brings about any negative impact in terms of agricultural service delivery. Based on this question the responses gathered from the respondents as it is indicated in Table 29 below, 14%, 8%, 7% and none from Alaba, Alamata, Bure, and Goma respectively indicated having ICT tools in their WKC have negative impact.

Table 29 Negative impact of ICT on agricultural service delivery

Item	Responses (WKCs)				
Negative impact of ICT on agri. service delivery	Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Average (%)
Yes	14	8	7	0	8
No	79	91	93	100	90
Make no difference	7	0	0	0	2

Source: Researcher's own primary data

79%, 91%, 93%, and 100% FROM Alaba, Alamata, Bure and Goma respectively indicated having ICT tools in their WKCs have no any negative impact in terms of agricultural service delivery. Only 7% from Alaba said it has no difference. The reason those who said it has negative impact stated as, they waste time searching for the information that they couldn't get due to Internet network connection problem.

So, from the clue of the findings, one might be able conclude, in most cases having ICT tools in the WKCs have no negative impact in agricultural service delivery. But thought it is few percentage of respondents' response, the reason those who said it has negative impact mentioned has great meaning.

4.9. Challenges and Opportunities of the WKCs

To determine the challenges and opportunities exist in the WKCs during establishment, running, and institutionalizing a detailed interview were carried out with RDO, WOoARD officer, and the assistant of the WKC from all the four districts under study. Hence, for clarity, it is going to be discussed under four sections.

4.9.1. Challenges with Regard to People, Process and Technology

In managing the agricultural information and knowledge in the WKCs there are challenges with regard to people, process and technology. To noticeably identify these challenges, two questions from questionnaire item and survey data from interview guide were used.

For the question item intended to find out the challenges in capturing, storing, and disseminating agricultural knowledge in their respective WKCs, as it can be seen in Table 30 below,71%, 75% 87% and 85% from Alaba, Alamata, Bure and Goma respectively indicated unavailability of important ICT tools is the major challenge in their Woreda.

Table 30 Challenges in processing Agricultural knowledge in WKCs

Challenges in capturing st	Respondents (WKCs)

	Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Aver. (%)
Unavailability of important ICT tools	71	75	87	89	80
Inappropriateness of the existing ICT tools	57	67	80	78	70
Lack of skill to use ICT tools	86	92	93	100	92

Source: Researcher's own primary data

As it is depicted in Table 30 above 57%, 67%, 80%, and 785 from Alaba, Alamata, Bure and Goma respectively showed inappropriateness of the existing ICT tools by itself is another challenges in their Woreda. Also the largest number of respondents such as 86%, 92%, 93% and, 100% from Alaba, Alamata, Bure and Goma proved lack of skill to use ICT tools are the major challenge. As it is located on the analysis, on average the response rate with the percentage of 80%, 70% and 92% indicated that unavailability of important ICT tools, inappropriateness of the existing ICT tools, lack of skill to use ICT tools respectively and the like are currently serious problems that hinder capturing, storing and disseminating agricultural knowledge.

Concerning the challenges with regard to people and processes in each WKC, detailed interview were done with the WOoARD officer, RDO and the assistants of the centers. As to the result of the interview and the observation taken for about seven days in each WKC, it is proved that there are some problems concerning people and process as summarized below.

- Except Alamata all the other three WKCs have no skilled man power who can properly manage the WKC.
- With simple problem which can be fixed by simple trouble shooting mechanism the computers are left ideal as if it was failed.
- If some one encountered a problem while he/she is working on the computer and request for help, there is no one who can solve their problem.

- As special case, surprisingly in one of the WKC, the Coordinator/ assistant of the center even don't know how to properly open and shutdown the computer. This is a good indication of what the people's skills looks like in most of the WKCs.

- There are no proper ICT tools to capture indigenous knowledge of farmers in almost all four WKCs.

- CDs/DVDs are not in local language that local users can use it directly to disseminate agricultural information and knowledge. Or, there is no capacity in both people and technology to translate and use these materials in the FTCs.

- Improper use of computers is causing the computers out of service. In addition to that there no any skilled man power who can setup the computers even with very minor problems.

- Computer viruses are causing a big trouble in almost all WKCs; the anti viruses provided by the IPMS are not updated so that viruses are the most serious problem in all WKCs except Alamata WKC.

- Turnover of the staff is one of the problems in the WOoARD. This means the new comers every time need awareness to use the KKCs. And not only awareness but also the new comers are most of the time have no any skills in using the computers.

To this end, it might be possible to conclude that unavailability of important ICT tools, inappropriateness of the existing ICT tools, lack of skill to use ICT tools and the others which are mentioned in bulletin above are currently the serious challenges in capturing, storing and disseminating Agricultural knowledge.

4.9.2. Opportunities created in the WOoARD

To determine the opportunities that are created due to the establishment of the WKCs in their district, two questionnaire items of one open ended and the other close ended type and detailed interviews were made with RDO, WOoARDA, and Knowledge centre assistant.

Based on these surveys, the following main points are summarized from open ended question and interview results.

i. The Establishment of knowledge center availed the WOARD with modern technologies and other relevant resources crucial for agricultural service delivery.

   People can easily go to the knowledge center and refer to the agricultural information whenever needed. The knowledge center facility will help the agricultural service providers to find the right things from the WKC in order to answer their problem by themselves immediately. In addition to this it helps to develop the skills of WOoARD staff both in their profession and also in their computer/other ICT tools use proficiency. As an example, from all districts interviewees proved, it was after the establishment of the WKCs that most of the staff of the WOoARD able to use the computer even if it is with less proficiency.

ii. Reduces time of learning and cost of agricultural information and knowledge dissemination.

   WKC s is a good environment to learn new things. So, those who are as a new comer into the WOoARD can learn by using knowledge centers. They can learn easily without taking too much time to acquire knowledge required for accomplishing their tasks. As an example, one of the RDO from Bure said that most of the new employed workers of the WOoARD are fast to use the WKC to develop their skill, and to search for more experiences. It was also discussed by the respondents that the WKC also helps to disseminate the agricultural information and knowledge using ICT tools like CDs/DVDs and TVs to large number of farmers at once using FTCs by less cost.

iii. Enhancement of team work

   By using the WKC the staff will work very closely with each other so that they can work together in completing certain task and mission of the WOoARD. The WKC is currently using as a center where most of them communicate each other, help each other and make good group discussions.

iv. Increase Quality and Productivity

The WKC will help or motivate people work closely so that they shared experience, exchange ideas and information, and practically learn form each other. In this case, people who are working for certain task will keep maintain their task with reducing of mistakes and at the same time they will work and produced the best services as well as to increase quality and productivity.

v. Overcome cultural barriers by WOoARD staff

The WOoARD staff will overcome cultural barriers to knowledge sharing. Knowledge sharing practice will be grown among the staff; especially SMSs have got the chance to an easy access agricultural information and knowledge with enormous benefits. It also create the WOoARD a learning environment i.e. enables people to respond to their colleague and public inquires regarding certain knowledge at anytime and anyplace as a learning center.

vi. Generation of Agricultural Knowledge

The presence of the WKC motivate the SMSs to do researches and make use of the facilities and knowledge at the center and generate additional agricultural knowledge. Thus they add it into the knowledge center for the benefits of the internal users and future use.

The second question asked was to identify whether the staff of the WOoARD are aware of using the opportunity of the resources availed at the website of the EAP. Based on that the following survey results were gathered and analyzed. For further clarity and simplicity see Table 31 below. As it can be seen from the table, only 43%, 33%, 20% and 44% of the respondents from Alaba, Alamata, and Bure and Goma said we have information about EAP. While, 57%, 67%, and 80% and 56% from Alaba, Alamata, Bur, and Goma said they don't have any information about the existence of the EAP which is a big resource of agricultural information and knowledge.

Table 31 Awareness of Ethiopian Agricultural Portal (EAP)

		Responses from WKCs				
Item		Alaba (%)	Alamata (%)	Bure (%)	Goma (%)	Average (%)
Awarenes	Yes	43	33	20	44	35

	No	57	67	80	56	65
Total		100	100	100	100	100

Source: Researcher's own primary data 3

On average 65% of the users of the WKCs do not know about the EAP.

From the above result of analysis based on the survey result, it can be concluded that the establishment of the WKCs provides big opportunities to the districts where it exist. But due to different reasons; the WOoARD staffs are not exhaustively utilizing the resources that they can exploit via their WKC fro instance, like EAP.

Chapter 5

Summery, Conclusion and Recommendations

5.1 Summery

ILRI/IPMS project initiated ten ICT-based WKCs in four regions of Ethiopia namely, Amhara, Oromia, SNNPS, and Tigray to promote the productivity of farmers starting from 2005. Because it is believed that knowledge is a very valuable asset to any individual and organizations. These WKCs are expected to provide the local farmers with reliable, relevant, and timely agricultural knowledge and information which can help the local farmers to be more efficient and effective in agricultural production. The application of KM system in agriculture is a good platform which can be used for creating knowledge repositories, improving knowledge access and

sharing as well as to communicate through collaboration, enhancing the knowledge environment and managing knowledge as an asset among communities. By using the knowledge in the agricultural sector, we can produce the best work and deliver it in no time and at the right place, while achieving the good quality and productivity. In this process ICTs play a significant role in enabling by easing and providing the facilities to the users. This study also aimed to identify whether the ICTs facilities availed by IPMS are playing a desired roles to determine the challenges and opportunities to forward the best possible alternative solutions to exceed the service rendered by the WKCs.

The study comprises about four WKCs from ten WKCs taking one from each four region based on purposive sample selecting methods taking into account the geographical location, language, and the time they were established.

Data were collected using the common data gathering tools such as questionnaire, semi-structured interview, and Observation. The primary data sources were the staffs of WOoARD who are using the WKC in their Woreda, RDOs and the WOoARD administrators. Data were analysed using both qualitative and quantitative methods.

As to the demographic characteristics of the respondents concerned, qualification, years of experience and positions were assessed. Based on that in almost all WKCs, the largest numbers of respondents are first degree holders, 2 to 5 years of experience, and experts. But from all WKCs there are also few respondents with PHD, second degree and diploma.

With regard to the facilities exist in each WKC, in Alaba knowledge centre; the responses indicated about 15 to 20 computers are found in the WOoARD, and from this number of computers 5 to 10 computers are dedicated to the WKC providing service for about 50 to 60 employees.

In Alamata WKC, there are about 11 to 15 computers in the WOoARD of which 6 to 10 computers are dedicated to the WKCs serving 31 to 40 numbers of staff. For the case of Bure and Goma in similar manner, 6 to 10 computers are found in the Woredas and of which 1 to 5 computers are dedicated to the WKCs rendering service for about 31 to 40 users.

For the survey made to identify the interest and reasons of the respondents on the need of the computers on each SMS desk, 71.4%, 100%, 93.3% and 88.8% of the respondents from Alaba,

Alamata, Bure and Goma indicated computers are required on each SMS desk. They reason out that starting from personal development, it helps them to: store, process, disseminate agricultural information, and easily perform their routine tasks, produce agricultural researches, etc to render quality service to agricultural service delivery.

Relating to the network connection, it is indicated that in all WKCs there is no LAN at all. The Internet is inefficiently serving with the average connection speed of less than 14kbps. Because of the connection problem most of the respondents proved that they are currently not using the Internet via their WKC because it is waste of their precious time with a little or no gain. But the smaller percentage respondents showed due to the interest they have to access the agricultural information necessary to accomplish their responsibilities, they always try to search.

To use the facilities of the WKCs there is limitation of time in Goma WKC whereas other WKCs relatively have adequate time to access Internet via their WKCs.

In connection with basic knowledge of computers, training and development, in almost all WOoARD only few staff members are using computers in their daily tasks. This is due to various reasons. First, Even if short term training courses were given by the WKCs, most of the staff member has still no satisfactory basic computer skill to use it. Most of the staff indicated that they have taken short term training courses by the WKC but it was too short and did not enable them to explore the opportunity availed by the technology Second there is shortage of computers to use in almost all WKCs.

The sources of agricultural knowledge and information were also assessed. Based on that, as the analysis indicated, WKCs' CDs/DVDs, colleagues', senior experts, and government provided package guide lines are used in all Woreds. But due to connection problem the big agricultural knowledge and information source like EAP couldn't be accessed. Even most of the respondents said they don't have any information about EAP. Those who know about it couldn't access it due connection problem in all WKCs.

The Accessibility of the Internet during the business hours, were assessed. As a result it is indicated that there is no satisfactory Internet service in all WKCs. But in most cases everyone in the WOoARD has official access to it. Regarding the frequency of visiting the WKCs by the

staff, on average 36% showed 30 minutes to 1 hour, 32% showed more than 3 hours, 20% said 1 to 2 hours, 8% said 2 to 3 hours per week, and only 4% said not at all.

The tasks the users of the WKCs are performing according to the rank of their preference slightly vary from Woreda to Woreda. In general, in most of the WKCs browsing Internet seeking for agricultural information despite the fact that it is hard to access, E- mail, writing report, personal development, and entertainment are ranked as their 1^{st}, 2^{nd}, 3^{rd} , 4^{th} and 5^{th}. This showed the users are using the facilities of the WKCs for the intended purpose. In addition to that, it is proved by the analysis that in most cases the users of the WKCs are encouraged to use the facilities availed at the knowledge centre indicating the WKCs are in operation during business hours.

It is also seen in the study; the users of the WKCs get about more diverse and more volume of agricultural knowledge and information after the establishment of the WKCs than before the establishment of the WKCs.

In relation to the role of the ICTs in documenting and preserving the agricultural information and knowledge of the farmers, it is indicated in the study that there is formal and informal mechanism to document and/or preserve indigenous agricultural knowledge of farmers where ICTs are playing a role in all WKCs.

The agricultural information and knowledge are disseminated from person to person, and also using ICT tools such as TVS, CDs/DVDs, and the like especially at the FTCs.

It is also seen in the study result that ICTs plays a role in facilitating and speeding up the processes, minimizing the cost of dissemination, support to easy understanding of the agricultural knowledge content in all WKCs.

The result of data analysis showed the agricultural information and knowledge they get from the WKCs is useful relevant, fit to solve their current problem, and in appropriate format. But a few respondents reflected that the agricultural information and knowledge they get is not relevant due it is too complex, and also few respondents showed the encountered language barriers.

In case of the choice of the format that the users of the centre prefer, it varies from centre to centre. But in most cases, respondents from all WKCs ranked CD/DVD based video format, Internet sources and printed materials as their first three preferable choices.

As the result of the analysis indicated, in all WKCs, ICT tools have positive influence on agricultural service delivery. The most typical impact in almost all WKCs is, it facilitates access to new information. But it plays a little role in enabling getting new information quicker due to poor network connection again in all WKCs. Also ICT tools are playing a little role in making the routine tasks of the users faster and better in all WKCs because of most users of ICT tools have no adequate basic computer skills.

According to the finding there are challenges pertaining to people, processes and technologies or running the WKCs. This means in almost all WKCs the analysis indicated, unavailability of important ICT tools, inappropriateness of the existing ICT tools, and lack of skills to use ICT tools or to fix problems related to computers are the most critical challenges in capturing, storing, and disseminating agricultural information and knowledge.

There are a lot of opportunities that the Woredas are harvesting due the establishment of the WKCs in their district. Some of these are:

- Access to modern technologies and other relevant resources that help for agricultural service delivery.
- Reduce time of learning and cost of agricultural information and knowledge.
- Enhancement of team work.
- Increase quality of service that could result in productivity.
- It initiates the culture of sharing knowledge among the staff of WOoARD.
- It motivate in generation of agricultural information and knowledge.

5.2 Conclusion and recommendation

On the basis of this study, the following are lessons learned and recommendations suggested for practical action.

1) The study revealed that most of the users of WKC almost in all with Alamata relatively in a better position, have got only a short term training on basic skills of computers form their respective WKCs. But the courses were too short and not continued until they acquired the basic computer skills that enable them to utilize the technology to the desired level in order to be efficient and effective in performing their tasks. Therefore, it is recommended that continuous and intensive training has to be given to the agricultural service deliverers to efficiently and effectively utilize the resource availed at the WKCs.
2) As observed in the study, the ratio of number of computers to the number of the users in each WKC is not proportional. That means as the survey indicated, on average one computer is providing service for about 6 to 10 users. In the other way round, the study showed that in almost all WKCs the users are go to the knowledge centre in the first place not to read books or other printed materials but to use computers for various purpose. So that following the intensive continuous training, it is recommended to arrange the proportion of computers to users as much as possible for the sake of future development of the agricultural sector in all WKCs.
3) The results of descriptive statistics indicates that all WKCs had almost similar incidence in using TVs, CDs/DVDs indicating that they are using this ICT tools two to five times per day or visiting the WKCs on average 30 minutes to three hours per week. Also it is already seen in the analysis; most of the materials that support the WOoARD to accomplish their tasks are found in the WKCs. Therefore, it is recommended that the WOoARDs have to more encourage the knowledge workers/the agricultural service providers in order to utilize the resources available in their respective WKC.
4) This research results proved that there is no LAN in anyone of the WKCs and the Internet connection is also with the average speed of less than 14kbps. It indicated that, now a day, some of the respondents are believed that trying to access the Internet is wasting time. Therefore, it is recommended to set LAN, and all the stakeholders have to work in collaboration to solve the serious problem appearing in the Internet net work connection.

5) The findings of this research indicated that in the WKCs except Alamata, the coordinators assigned at each respective knowledge centres are not skilled people that can lead and provide the desired support in the centres. They are expected to solve the problem of the users in at least technology related aspects. So it is recommended that at least the person who can handle the case has to be assigned to the centres. Or if this is not possible adequate training has to be given to those individuals assigned to the centres.
6) In relation to format of the agricultural information and knowledge the respondents indicated that to directly use the CDs/DVDs in the FTCs; it is more useful if it was prepared in the local language to easily understand by farmers directly with out translation. So it is recommended that CDs/DVDs have to be prepared in the local language in order to meet it target.
7) In this research the result of the analysis also indicated that though ICT tools are playing a fine role, still there are challenges in unavailability of important ITC tools, inappropriateness of the existing ICT tools, and lack of skill to capture or preserve indigenous agricultural knowledge of farmers to process and disseminate to the beneficiaries. So it is recommended that appropriate ICT tools have to be availed equivalently with the required training on the area.
8) The study result showed that except Alamata, the other three WOoARD did not set clearly defined strategies for future development of their respective WKCs. So it is recommended that each WOoARD has to have a strategy for future development of their respective WKCs since knowledge management is the main factor of production in this era.

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Appendences

Appendix 1 Questionnaire

Introduction

You are invited to participate in a research project to study the role of ICT on AKM. *This research project will be done for the partial fulfillment of MBA degree at Unity University and is sponsored by IPMS/ILRI.* Along with this letter is a short questionnaire that asks a variety of questions about the case mentioned in the title. I am asking you to look over the questionnaire and, if you choose to do so, complete it and *give* it back to me. I am sure that you will be cooperative. It will take you about 45 minutes to complete.

Through your participation, I am sure that the results of the survey will contribute to the growth of your AKM center.

Your responses will be kept confidential and used only for the research purpose. I promise not to share any information that identifies you with anyone. I hope you will take the time to complete this questionnaire and return it. Your participation is voluntary and vital.

If you have any questions or concerns about completing the questionnaire or about being in this study, you can contact me on cell phone no. 0911 85 54 77. You do not have to place your name on the survey.

Background Information of Respondents

I. Position----------
II. Education level----------
III. Experience:
    a. What areas of work you have performed in the past----------
    ----
    b. For how many years you have been in your current job? ----------
    c. What is your professional level? ----------
IV. How do you understand what Knowledge Management (KM) is? (you can tick more than one)
    a. KM is the advanced form of ICTs ----------
    b. KM is data-fact and figures----------
    c. KM is simply relevant information ----------

d. KM is a systematic discipline of policies, processes, activities and tools which empower organizations to apply knowledge to improve effectiveness, innovation, and quality. ---------

e. In your understanding if it is different from the above choice how do you express KM?----------

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1) How many computers do you have in your Woreda? ----------
2) How many of these computers are dedicated to the Woreda knowledge center? ----------
3) How many staff members are there in your Woreda office of agriculture? _____
4) How many the staff members of the Woreda are considered subject matter specialists (SMS) or experts? ----------
5) How many of the staff members in the Woreda know how to use a computer to do their daily tasks? ----------
6) How do you rate your computer use proficiency knowledge?
   a. Beginner (can turn a computer on and off and is able to write letters and memos. Cannot use spreadsheets (Excel), or use e-mail, or the Internet----------
   b. Intermediate (can use Word, Excel, PowerPoint, E-mail, and the Internet)----------
   c. Advanced (Can do all the above at an expert level and do programming as well)----------
   d. IT Professional----------
7) Have you ever taken a computer training course?
   a) Yes ----------
   b) No ----------
8) If yes, what courses and for how many hours of computer training have you taken in each course? ----------

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9) How were you trained
   a) Formal computer training (enrolled student in an educational institution such as college, ATVET ----------

b) Short-term intensive training ----------

c) Self-study courses (using computer-based-training (CBT) or books) ----------

d) On the job training by from a more knowledgeable colleague ----------

e) Other ----------

10) Do you use the facilities of the WKC?

a) Yes ----------

b) No ----------

11) If yes, which aspects of it do you use most? (rank your choices from 1 to 4 based on frequency of use)

a) Computers----------

b) TV, DVD ----------

c) Books, other printed materials----------

d) demonstration products ----------

12) How do you use ICT tools in your organization in terms of facilitating access to knowledge? (You can tick all choices that apply)

a. As data storage devices ----------

b. As data processing devices ---------

c. As communication devices ----------

d. As knowledge gathering devices --------

e. As analysis and decision support tools ----------

13) What other sources do you use to get information/knowledge to fulfill your responsibilities in your official capacity? (Please tick all that apply)

a) Refer to government provided package guidelines

b) Talk to more senior experts

c) Talk colleagues in the local or other Woreda Office of Agriculture & Rural Development (WOoARD)

d) Search on the Internet, WKC DVD/CD, or other ICT-supported sources

Refer to books or previous training manuals

14) From those you checked in the previous question, which are your top three information sources?

15) Are there any formal or informal mechanisms to document and/or preserve indigenous agricultural knowledge of farmers in your district?
16) Do ICT tools play any role in facilitating the documentation and/or preservation of indigenous knowledge? (You can consider computers, video cameras, tape recorders, TV, etc as part of ICT tools)
17) Do you have local area network in your organization?
    a) Yes ----------
    b) No --------
18) If yes, do you use the network to exchange any type of information with colleagues in your WOoARD?
    a) Yes
    b) No
19) Is there an Internet connection in your organization? Yes -------- No --------
20) If you answer above is Yes, where is it connected?
    a) Office of the WOoARD head
    b) Selected desks in the WOoARD
    c) Woreda WKC
    d) Other ----------
21) What the average connection speed at which you are able to connect?
    a) Below 14kbps --------
    b) 14kbps – 19kbps ----------
    c) 19kbps – 33kbps --------
    d) 33kbps – 56 kbps ----------
    e) Above 56kbps---------
    f) I don't know ----------
22) If your answer for Q.16 is yes, is it always accessible during business hours? Yes ----No ----
23) Who has official access to the Internet facility
    a) Every SMS or member of the WOoARD
    b) Few designated staff
    c) Everyone in the WoARD
    d) Other ----------

24) How many times per week do you visit the WKC?

a) Not at all ----------
b) 30 minutes to 1 hour ----------
c) 1 to 2 hours ----------
d) 2 to 3 hours ----------
e) More than three hours per week ----------

25) Will you please rank the tasks you do at the WKC from 1 to 5 according to the frequency of use?

a) Internet browsing seeking agricultural information ----------
b) E-mail ----------
c) Writing reports ---------
d) Personal development --------
e) Entertainment ----------

26) Are there any restrictions regarding the use of the WKC in terms of the amount of time one can spend there? (you can tick more than one)

a) We can go to the WKC anytime if it is to look for specific work-related task --
b) We can go to the WKC on our free time but not during work hours----------
c) We are encouraged to use the WKC to develop ourselves professionally--------
d) We are discouraged from using the WKC since it is considered a waste of time--------

27) What are the hours of operation for the WKC? (you can tick more than one)

a) The WKC is open during all regular office hours ----------
b) The WKC is open after office hours for ____ hours.
c) The WKC is open during weekends (Specify) ----------
d) We can have the WKC open at anytime by request ----------
e) The WKC is only open at certain times of regular office hours (please specify)----------
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28) How do you compare your access to agricultural knowledge and information before the WKC was established with your access after the WKC was established? (you can tick more than one)

a) You get about the same amount and type of information ----------

b) You get more volume information ----------

c) You get more diverse (different kinds) of information ----------

d) You get less information ----------

29) In your opinion, is having ICT tools in the WKC bring about any positive impact in terms of agricultural extension service delivery

a) Yes ----------

b) No----------

c) No difference

30) If you believe having ICT tools have positive impact, what is the most typical impact in your opinion?

a) It facilitates access to new information ----------

b) It makes getting to new information quicker by using the Internet ----------

c) It helps make my routine tasks (reports, analysis) easier because I can do them faster, better, etc) ----------

31) In your opinion, is having ICT tools in the WKC bring about any negative impact in terms of agricultural extension service delivery?

a) Yes ----------

b) No ----------

c) No difference ----------

32) If you believe having ICT tools has negative impact, what is the most typical impact in your opinion? (you can tick more than one)

a) It overwhelms us with too much information ----------

b) We waste time searching for information that is not relevant to us ----------

c) The information found on the Internet is not reliable ----------

33) Do you think it helps to have more computers than there are now in the WKCs?

a) Yes----------

b) No----------

c) Makes no difference ----------

34) Do you think having a computer on every desk of Woreda SMS or experts improve agricultural extension service delivery?

a) Yes----------

b) No----------

c) Makes no difference----------

35) If yes, why?----------

36) Do you use the TV/DVD at the WKC?

a) Yes ----------

b) No ----------

37) If yes, how often do you use the TV/DVD?

a) once a day----------

b) 2 -3 times a day--------

c) one a week----------

d) 2 – 5 time per week----------

38) What do you use the TV/DVD most?

a) For training others using training videos-------

b) For learning new things from DVDs/VCDs available at the WKC---------

c) For TV news, information, and/or entertainment----------

39) What are the challenges in capturing, storing and disseminating agricultural knowledge in your WKC? (You can tick more than one)

a. Unavailability of important enabling ICT tools ----------

b. Inappropriateness of the existing ICT tools----------

c. Skills to use the available ICT tools ----------

d. Other, mention it, ---------- ----

40) Are you aware of the Ethiopian Agriculture Portal?

a) Yes----------

b) No ---------

41) Do you search for agricultural information in the Ethiopian Agriculture Portal (EAP)?

a) Yes ---------

b) No ----------

42) Do you use the Internet via the WKC?

a) Yes----------

b) No----------

c) We don't have Internet connection at the WKC ----------

43) How do you rate the amount of Internet time you are allowed at the WKC?

a) Too few minutes ----------
b) Adequate ----------
c) Plenty of time ----------
d) We don't have Internet connection at the WKC ----------

44) How do you rate the **usefulness** of the agricultural information you get from the EAP, the Internet, or CDs/ DVDs in the WKC?

a) Useful---------
b) Average ----------
c) Not useful ----------

45) If you rate the usefulness of the agricultural information as *c) Not useful*, what factors do you think are the main reasons for this problem? (you can tick more than one)

a) Language barrier----------
b) Complexity of documents----------
c) Simplicity of documents ----------
d) Format of the documents----------

46) According to the present situation of your WKC, in which of the following using ICT plays a major role in capturing, storing and, disseminating agricultural knowledge? (you can tick more than one)

a) In facilitating and speeding up the process ----------
b) In minimizing the cost of dissemination ----------
c) Support to easily understand the agricultural knowledge content ----------
d) Have no difference than manually----------

47) How do you rate the **relevance** of information you get of the agricultural information you get from the EAP, the Internet, or CDs/ DVDs in the WKC

a) Relevant ----------
b) Average ----------
c) Not relevant ----------

48) If you rate the relevance of the agricultural information as *c) Not relevant*, what factors do you think are the main reasons for this problem?

a) Topics typically found are not connected to the problems in our Woreda ----------

b) There is no new knowledge/information offered. We already know what is there ---------

c) The documents/information available is either too complex of too simple to be relevant for us ---------

49) How do you rate the **timeliness** of information you get of the agricultural information you get from the EAP, the Internet, or CDs/ DVDs in the WKC

a) Timely ----------

b) Average ----------

c) Outdated ----------

50) Please rate your preference on what format do you prefer to get agricultural information using numbers 1 to 5

a) Printer paper -------

b) E-mail ------

c) CD/DVD based video format --------

d) In person explanation by someone who knows it best --------

e) From Internet resources ----------

51) How do you rate the level of the current stage of development of the WKC in your Woreda?

a) It is great. We get all we are looking for ----------

b) It is good. We get most of what we are looking for but there are some information we needs that we cannot get at the WKC ----------

c) It is OK. We get some information there but there is a lot more we would like to get that we cannot get from the WKC ----------

d) I never got anything new from the WKC ----------

52) If you believe the stage of development of the WKC is backward (not advanced), what do you think are the major challenges in making it better?

a) Better technology ---------- b) Assigned staff to manage the WKC ----------

b) Limited number of reading materials (books, CDs/DVDs, printed material) ----

c) Limited time to visit the WKC ----------

53) What do you think are opportunities around the concept of WKCs that the Woreda can take advantage of? ----------

54) Do you have any suggestions related to ICT use and Information Communication Management in your WKC? If yes, please specify.

Appendix 2

Interview questions for RDO/RDA

1. Was the establishment of this WKC request first initiated by you or it was simply the plan of IPMS?
2. Did you imagine that the KC service is such a crucial thing for the accomplishment of your very objectives?
3. How do you express the importance of the WKC in your Woreda in its current position?
4. In your opinion does your KC serve by its full capacity? If not what are the reasons?
5. According to your Woreda context, do you think that the service provided by this KC can cover the current demand? If not what have to be done?
6. How did you maintain that the WKC will be more functional?
7. What were the challenges to institutionalize your KC?
8. If others are in need to establish their own KC what is your advice?
9. From your experience in managing the WKC, do you have any advice for the new beginner?
10. What are the opportunities that you are harvesting from your WKC?
11. Did you have any collaboration with other WKCs with regard to:
    a) Sharing experience and information?
    b) Solving problems encountered?

12. Do you have any suggestions related to ICT infrastructure, use and Information Communication Management in your WKC? If yes, please specify

13. Do you have any comment or advice or message about this research or about your WKC?

Interview questions for WKC Coordinator

1. How did you find the operation of your WKC?
2. In your daily activities what are your challenges with regard people?
3. In your daily activities what are your challenges with regard processes?
4. In your daily activities what are your challenges with regard technology?
5. From your experience in this WKC are there any major shortages that hinder the function of the centre? If any, what are they?

6. If other beginners of KC need your advice, what do you like to comment them from your experience?
7. Do you remember any major challenges you faced while running this WKC? IF any how did you overcome them?
8. For the question above, based on your current experience and understanding, do think that the methods you used to solve the problems were the right approach or if they were the other way it was preferable?
9. Is there any other question you like that it should be raised with regard to your operation or your WKC?
10. Do you have any suggestions related to ICT infrastructure, use and Information Communication Management in your WKC? If yes, please specify
10. Do have any other comment on this research or the function of your WKC?
11. Do you have other comments on this research or about the function of your WKC?

Interview questions for WOoARD Administrator

1. How do you express your effort to establish your WKC?
2. What were your major challenges in establishing your WKC?
3. What counter action was taken to overcome such a challenges?
4. Did you face any challenges while you were institutionalizing your WKC? IF yes, would you specify, please?
5. What are you major challenges in running your WKC?
6. What are your strategies in further expanding and developing the functions of your WKC?
7. Do you have any suggestions related to ICT infrastructure in your WKC? If yes, please specify.