



**JIMMA UNIVERSITY
COLLEGE OF NATURAL SCIENCE
DEPARTEMENT OF INFORMATION SCIENCE**

**KNOWLEDGE MANAGEMENT STRATEGY FOR
INDIGENOUS KNOWLEDGE ON LAND USAGE AND
AGRICULTURAL DEVELOPMENT IN ETHIOPIA**

BY

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**Knowledge Management Strategy for Indigenous Knowledge on Land Usage
and Agricultural Development in Ethiopia**

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DEDICATED

To

My beloved Father and Mother

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LIST OF ABBREVIATIONS

Cops - Communities of practice

DAs- Development Agent

FAO-Food and Agriculture Organization of the United Nations

FDECSA- Federal Democratic of Ethiopia Central Statistics Agency

GDP – Group Domestic Production

ICT – Information Communication Technology

IIRR - International Institute of Rural Reconstruction

IK -Indigenous knowledge

KM - Knowledge Management

PRA-Participatory Rural Appraisal

SECI - Socialization, Externalization, Combination and Internalization

ABSTRACT

Knowledge plays a great role whenever there is change and growths follow a complex field and competitive. Agriculture in Ethiopia today is such field. Encouraging knowledge in this field is a critical point in the transformation of agricultural sector in Ethiopia. Also managing knowledge within the communities enhances agricultural development. Therefore the main aim of this study is to develop knowledge management strategy in managing indigenous knowledge of land use and agricultural development in western Ethiopia, Ilu Aba Bora zone which crucial to enhance management of agricultural indigenous knowledge and land use. To end this, data is collected using focus group discussion, questionnaire, information mapping from local communities, extension officers and land management officers of Ilu Aba Bora Zone. The result of the study revealed that local communities had various IK on Land use and agricultural development. However, this knowledge was acquired developed, shared and preserved within a weak and at low rate. The major barriers to indigenous knowledge of land use and agricultural development in the local communities were Poor knowledge sharing culture, lack of IK records, lack of trust, no interest to receive IK by younger generation, Oral transfer of IK, Change of life style and Poor recognition of IK. As a result knowledge management strategy was developed to enable managing indigenous knowledge in local communities. Further research directions are recommended to enhance management of indigenous knowledge of local communities

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the study

Rural communities in a developing country have extensive indigenous knowledge (IK).IK is unique to a given culture or society and is the basis for agricultural development, resource management, health care, education and various activities (Warren, 1991). According to (Grenier, 1998) the contribution of IK for sustainable development is quite strong because they have evolved in close contact with specific cultural and environmental conditions. IK had been playing a great role in sub-Saharan African developing countries because; it has ensuring food security and sustainable agricultural productivity over centuries (Mascarenhas, 2003).

Now days, the value of IK in agricultural development is getting attention and well-recognized (Warren &Rajasekaran, 1993). In different part of the world, Indigenous people and scientists are collaborating to build bridge between Indigenous knowledge and scientific knowledge to improve agricultural development of particular region (Rist & Guebas, 2006). Scientific knowledge is non-traditional knowledge that indigenous people draw from their interaction with non-local people, different institutions, formal education, adoptions of western scientific thinking, philosophies and values (Karlsson, 1995), whereas indigenous knowledgeis tacit knowledge that is orally communicated, trial and error process, stored in the minds of people and practiced over a long time with the interaction of natural environment and geographical space by local communities (World Bank, 1998). Agriculture development planners and policy makers also understood the need of indigenous

knowledge system and have shown the change in this type of knowledge. The necessity of integration of indigenous knowledge within the community and its importance in sustainable agricultural development is also well reviewed (Reijntjes, 2004). Furthermore, “Local knowledge was regarded as primitive are now being perceived as sophisticated” (Chambers, 1983). Farmers have complicated knowledge of agriculture based on capacity of understanding hidden idea from several generations (Kolawole, 2001). Indigenous knowledge is seen as an important national resource to enhance sustainability of development (Warren & Rajasekaran, 1993).

Land degradation is a danger for soil fertility that may decrease the sustainability of agricultural development. Barrera-Bassols et al. (2009) emphasized on the importance and relevance of land management. It is, evident that rural communities have indigenous knowledge about land, in terms of soil and land characteristics, still remains largely unknown to the scientific community (Ingram, 2008). Indigenous farmers got this knowledge from trial and error or informal experiential learning as they interact with their natural environment.

Indigenous communities develop and select land use systems closely together within their culture and well adapted to their ecosystem (Mathiui & Kariuki, 2007). There is a need to consider indigenous knowledge as a means to sustainable soil conservation which is a base for agricultural development (Mitiku et al., 2006). Studying indigenous knowledge systems contributes to gain lessons on ecological management, climate change adaptation and lead to incorporate indigenous practices with natural resources development to ensure sustainability. Although a vast heritage of

indigenous knowledge about ecosystems and their use exists, it does not appear in the world literature (Warren, 1992).

In Ethiopia, there are numerous indigenous knowledge on land use practice contributing to sustainability of ecosystem management. However, IK does not fully utilized in developing country, which is also the case in Ethiopia, because their innovation and practice is organized through experience and applied isolated (Akiiki, 2006). As a result, farmers do not earn high income from their work. Dominant information model based on acquiring, organizing and preserving recorded and codified knowledge are generated by research, university and laboratories (Ngulube, 2002). Dominant approach to research and extension still follows pattern of transfer of technology based on the assumption of knowledge is package spread by extension and to be adopted by farmers (Assefa *et al.*, 2009). These approaches only support codified knowledge and leave the IK, which is the resource of the community and showed its importance in sustainable agricultural developments.

Like other developing countries, agriculture is the backbone of Ethiopian economy because, 80 percent of the population depends heavily on agriculture and 43 percent of Gross Domestic Product (GDP) and 70 percent of export value is agricultural products (UDP Ethiopia, 2012). But, methods of farming activities in developing countries are based on IK which shared and communicated orally have been eroded by death of IK holders (Lwoga, Nglube & Stillwell, 2012).

Knowledge management (KM) which normally give emphasis on capturing, creating, preserving and sharing start to show its importance in the management of indigenous knowledge of agricultural in developing countries (Ha *et al.*, 2008). It is important to

promote KM practices in rural communities by strengthening the interaction between local networks and organizational structures, even though communication and learning processes in rural communities take place in a less structured way through social networks and loose groups or between individuals” (Bode, 2007). The explicit knowledge shared easily stored and popularized.

1.2. Statement of the problem

Indigenous knowledge (IK) is an important asset with regard to the social capital of local people and constitutes the main resource for their livelihoods (Lwoga, Nglube & Stilwell, 2011). IK is considered as basis for problem solving strategy in global knowledge on development process issues (World Bank, 1998). Also according to World Bank (1998), adopting international practice to IK improve the sustainability of the development process. The potential use of IK for agricultural development and land use is widely acknowledged (Nwonwu, 2008). In emerging global economy, a country’s ability to build and mobilize IK is equally essential for sustainable development as the availability of physical and financial capital (World Bank, 1997). The basic component of any country’s knowledge is indigenous knowledge. It encompasses the skills, experiences and insight of people applied to maintain or improve their livelihood.

Nowadays, there is a growing recognition of the role of IK in local decision-making, the manner in which indigenous organizations facilitate the identification and prioritization of community problems and the importance of searching for solutions which result in local-level experimentation and innovation (Amare, 2009). Reed (1997) has noticed that IK of land use and landscapes were recorded in the form of maps,

discourses on the taxonomy and community base studies: areas of use, sensitivity and occupancy were formally mapped land use and landscape has value and relevance in North America. Also the Washambaa of the Usambara Mountains in Tanzania had developed a land use system emulating the climax vegetation of the deciduous natural forest (World Bank, 1998).

In Ethiopia, IK has been playing a great role in ecosystem management for generations. IK system in current land management practices and its contribution in reducing land degradation and ecosystem management have been understood. Some researchers had documented role of indigenous knowledge in some part of the country. The role of indigenous knowledge in climate change adaption was identified (Gebre Michael & Kifle 2009). Dixon (2002) had documented the role of indigenous knowledge in wet land management in south western Ethiopia. Also role of indigenous knowledge in land management for carbon sequestration & soil-based ecological services in Damot sore (wolayita), southern Ethiopia has been documented (Abebe, Hans, Gete & Berhanu, 2011).

However, most IK passes from generation to generation by word of mouth and being threatened because things are dynamic in nature and changes in natural environment, local and global changes are so rapid. Also IK stored in mind of elders is lost at higher rate when they die of old age as proverb of African says when an old man dies; a whole archive perishes with him because most of the IK remains unmanaged in the developing countries (Warren, 1993). According to (Warren, 2004) IK that includes problem solving in many generations and reflects thousand of generations experience

is uncertain in the future. The loss of this indigenous knowledge would diminish society (Labelle, 1997).

Knowledge management strategies for managing indigenous knowledge supports people from taking advantage of their skills and innovations in improving agricultural indigenous knowledge (Lwoga & Nglube, 2008). To manage IK more efficiently, some authorities have put emphasis on the development of KM, with its theories, principles, practices and strategy (Kaniki & Mphahlele, 2002). Therefore, agricultural development that is based on knowledge management will have direct advantage on the overall development of the country. There is thus an urgent need to develop strategy of agricultural indigenous knowledge from the perspective of knowledge management before much of it is completely lost and thus, this research was initiated.

1.3. Research questions

The study attempts to answer the following questions:

- ✓ What are various types of agricultural indigenous knowledge and land use in the local community?
- ✓ Is there any land use and agricultural indigenous knowledge flow mechanism within the community?
- ✓ What are the barriers and challenges of effective management of IK in the community?
- ✓ To what extent are the knowledge management processes (acquisition, preserving and sharing) approach support agricultural indigenous knowledge found within the community?

1.4. General objective

The general objective of the study is to develop knowledge management strategy for managing indigenous knowledge of land usage and agricultural development.

1.4.1 Specific objectives

The specific objectives of this study are as follows

- To identify various types of land use and agricultural indigenous knowledge in local communities
- To assess current management of acquiring, sharing and preserving indigenous knowledge for land use and agricultural development
- To identify barriers of indigenous knowledge acquisition, preserving and sharing in land use and agricultural development
- To propose KM strategy which is suitable for managing agricultural indigenous knowledge among farmers

1.5 Significance of the study

Finding and recommendations of this study has numerous benefits, among others, for researchers to base their innovations in future research works and for policy makers to consider indigenous knowledge for development plan. Moreover, the finding of this study provides evidence on how to managing indigenous knowledge of land use and agricultural development. In addition, the study proposed the appropriate KM strategy in sustainable agricultural development which may support for improving farming activities sustainably and as a result improve agricultural productivity for the

farming community. Above all this research contributed toward rescuing ingenuous knowledge of the farming community by applying knowledge management systems.

1.6. Scope and limitation of the study

In every rural community, indigenous knowledge exists in tacit at individual and group levels. But the scope of this study is limited to use Knowledge management strategy for managing indigenous knowledge of agricultural development and land use. The result of the research would be more fruitful if it is conducted widely by including several rural communities in Ethiopia. However, due to time, and budget constraints the scope of the study is limited to managing indigenous knowledge of communities (farmers) of only two 'weredas' of Ilu Aba Bora zone and limited to land use and agricultural development.

1.7 Organization of the study

This study is organized into five chapters. The first chapter is about the background of the study, statement of the problem, research questions, objective of the study significance of the study and scope and limitation of the study. The second chapter presents review of related literatures to knowledge strategy and related study on that area. The third chapter discusses the methodologies and procedures followed for the data collection, analysis and interpretations. The fourth chapter presents the study results and discussion of the results and developed knowledge management strategy for rural communities. The fifth chapter brings to an end of this survey research with conclusion and recommendations.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. An Overview of knowledge

Knowledge is combination of data and information which analyzed, processed, expert opinion and experience (Gandhi, 2004). According to Halblander (2005) Knowledge is information combined with experience, context, understanding. It is based on the beliefs and experiences of the individual who has the knowledge. Ein-Dor (2006) identified the types of knowledge as follows.

- **Tacit-explicit:** Knowledge type that is embedded in human mind through experience but it cannot express verbally is tacit knowledge while explicit knowledge is codified and externally verbalized.
- **Declarative-procedural:** Declarative knowledge is type of knowledge that resides in human memory for a short time (“know how”) while procedural knowledge represents the understanding of how to carry out a specific procedure (“know what”).
- **Private-public:** private knowledge is current state of knowledge construction while public is the knowledge that deals the way of knowledge is constructed.
- **Certain-Uncertain:** knowledge has different degrees of certainty starting from accurately measured to estimations of an opponent’s intentions based on evaluation of relevant facts which may themselves be subjected to high uncertainty and low veracity.
- **Task - contextual:** task knowledge is the knowledge that requires performing of a job, while contextual knowledge is the contexts in which organizational tasks is performed;

- **Commonsense-expert:** commonsense includes relationship with the physical world and the rule of managing it, community's behaviors and procedures and day to day activities, while expert knowledge is knowledge that hold by individual and gained through training and experience.

2.2. Common knowledge types

The result of knowing something is to have an actionable understanding. Knowledge can be categorized in different ways. However, the common ones are explicit knowledge and tacit knowledge. Both type of this knowledge can be possessed by individual or group.

2.2.1. Exogenous knowledge

Exogenous knowledge is known by modern knowledge, western knowledge, scientific knowledge and international knowledge that gain in university, research institution and private section. It is non-traditional knowledge that local people draw from their interaction with non-local people, different institutions, formal education, adoptions of western scientific thinking, philosophies and values (Karlsson, 1995). Exogenous knowledge is knowledge that is based on scientific evidence, whereby its reliability and its validity are tested over time. This type of knowledge is easily communicated because; it is a documented form that could be generated through logical deduction and formal study.

2.2.2. Tacit knowledge

Tacit knowledge is the knowledge that is stored in the minds of people and difficult to communicate with others, hard to formalize and difficult to share. This knowledge came through experience, training and experimentation. Since large part of human knowledge is tacit knowledge, accessing tacit knowledge presents a number of challenges, due to factors such as absence of documentation. Tacit knowledge can be acquired only through practical experience in the relevant context.”Written information has a permanence that does not reflect the true nature of indigenous knowledge” (Canadian Heritage, 2005).

2.2.3. Explicit knowledge

Explicit knowledge is a type of knowledge that codified knowledge and transmitted into formal and systematic language. It is captured in records of past such as libraries, archives and databases. It can be expresses in words or numbers and shared in the form of data, scientific formulas, specifications and manuals. This is the kind of knowledge readily transmitted between individuals formally and systematically in the organizations (Mcinerney, 2002).

Nonaka (1991) expressed that most of the knowledge applied by individuals in the organizations is tacit knowledge and new knowledge starts from individuals in tacit form. Then it transforms into organizational explicit knowledge valuable to the company as a whole which in turn changed into tacit knowledge in a spiral way. Traditionally, organizations have been concerned with management of explicit knowledge, which is of less importance to the business at any point in time. However, tacit and explicit knowledge are dependent on each other to be complete sources of knowledge.

2.2.4. Indigenous knowledge

Indigenous knowledge (IK) is knowledge that is unique for a given culture or society. Different scholars used the term IK interchangeably with terms like endogenous knowledge, native knowledge, local knowledge, sustainable knowledge, traditional knowledge, folk knowledge, community knowledge, farmers' knowledge, ethnic knowledge, cultural knowledge system, experiential knowledge(WIPO,2002). IK is tacit knowledge that is orally communicated, trial and error process, stored in the minds of people and practiced over a long time with the interaction of natural environment and geographical space by local communities (World Bank, 1998). It is knowledge gain by group of people through generations of living in close contact with nature, which is a base for local people to make decision for solving problem in agriculture, food preparation, natural, education, resource management for center for community activity (warren, 1991). Johnson (1992) stated "IK is the basis for local level decision making in agriculture, natural resource management and other activities." IK is the systematic body of knowledge acquired by local people through the accumulation of experiences informal experiments, and intimate understanding of the environment in a given culture (Warren &Rajasekaran, 1993). IK as described by Flavier et al (1995) is information base for society which initiates decision making and communication. The nature of IK is largely tacit, orally transferred from generations to generations and it is stored in people's minds. Therefore indigenous knowledge is identified as tacit knowledge.

2.2.4.1. The role of indigenous knowledge for agricultural development and land use

The role of indigenous knowledge in agricultural development and land use is widely understood (Hart, 2007). The importance of IK as stated by (Murdoch & Clark, 2005) has a great role in sustainable agriculture development and global concern. Several researches have shown that the importance of IK in improving the importance livestock and crop production in different countries such as Ghana (Kabore & Reji, 2004) and Uganda (Hart, 2007). Since IK is combined knowledge, it improves life of rural society through validated knowledge. Most of the populations in developing country depend on agriculture. Desert based community cannot access scientific knowledge for sake of food preparation and natural resource management; they remained practically with IK (Nanaka, 2002).

Local communities have various IK that is used to solve various problems of crop and livestock production. A study revealed that in South Africa, farmers have broad criteria to classify soil, land, crop and livestock that are relevant for explaining the decision and the action taken by farmers (Magoro & Masango, 2005).

The careful amalgamation of indigenous and exogenous knowledge would be most promising, leaving the choice, the rate and the degree of adoption and adaptation to the clients. Exogenous knowledge does not necessarily mean modern technology, it includes also indigenous practices developed and applied under similar conditions elsewhere. These techniques are then likely to be adopted faster and applied more successfully. To foster such a transfer a sound understanding of indigenous knowledge is needed. This requires means for the capture and validation, as well as

for the eventual exchange, transfer and dissemination of indigenous knowledge (Williams *et al.*, 2004).

2.2.4.2. Exchange of indigenous knowledge

Although IK is readily shared among members of a community (in so far as these IK practices are a part of the daily life of the community), it is generally shared to a lesser degree across communities. Moreover, as IK is predominantly tacit or embedded in practices and experiences, it is most commonly exchanged through personal communication and demonstration: from master to apprentice, from parents to children, from neighbor to neighbor, from priest to parish. Tacit knowledge recording, transferring and disseminating is, therefore, a challenge. Exchange within a community where providers and recipients speak the same language and share its underlying cultural concepts is much more easily accomplished than transferring tacit knowledge across cultures. To facilitate the understanding of the exchange process, it is useful to break down the process into its various elements.

2.3. Knowledge Management

Knowledge management is a process, which has a broad concept about creation, representation, dissemination and utilization of knowledge. Knowledge management is a condition of knowing something with considerable degree of familiarity acquired through association of experience. Similarly, Knowledge management (KM) contains the following important parts: use accessible knowledge from outside sources; embedding and storing knowledge in business processes, products and services; representing knowledge in databases and documents; promoting knowledge growth through the organization's culture and incentives; transferring and sharing

knowledge throughout the organization; and assessing the value of knowledge assets and impact on a regular basis “(Awad & Ghaziri, 2004). According to Eknowledgecentre (2005) KM supports organizations to achieve their goal faster by transferring the right knowledge to the right person at right time.

According to Alavi and Leidner (2001) “the need to manage knowledge is mainly brought by problems faced by many organizations in locating, preserving and using knowledge both within and outside their organizations.” KM supports the knowledge created, built and exploited to serve needs of people, organization and its stakeholders (Wiig, 2004).

2.3.1. Knowledge management process

Probst et al. (2000) noted that KM processes include knowledge identification, acquisition, development, sharing, preservation, use and re-use. According to Serrat (2008) there are five categories of knowledge management processes activities. These are: identify, create, store, share and use knowledge. Also Gold (2001) categorized knowledge management process into four broad dimensions (acquiring knowledge, conversion of tacit into explicit, applying or using it, and protecting it). Further, KM process is about creation, sharing, storage, dissemination and knowledge sharing. In practice, KM process has around five major common tasks namely knowledge creation, acquisition, codification, sharing and application.

2.3.2. Knowledge management conversion model

Knowledge conversion model is the process of interaction between explicit knowledge and tacit knowledge and describes theoretically and practically. Most KM models are emphasis on KM process. There are different types of knowledge management models but each of them has its own characteristic and limitation. Selecting appropriate KM approaches for managing knowledge is used for understanding KM approach available and knowledge problem involved (Probst, et al., 2000).

2.3.2.1. Nonaka SECI model

Nonaka and Takeuch (1995) model emphasis on tacit and explicit knowledge conversation. This model has four elements known as SECI model (socialization, externalization, combination and internalization).



Figure2.1 SECI model of knowledge conversion (Nonaka, 1997)

Socialization

This is the process of tacit knowledge shared or transferred to tacit knowledge in another person. It allows transferring tacit knowledge from person to person through shared experience, observation and imitation. Socialization is the successful way in tacit knowledge transferring (Davenport & Prusack, 1998). Socialization includes capturing knowledge through physical closeness of the individuals. Socialization is the process starts between individuals or a focus group (Nonaka& Takeuchi, 1995).

Externalization

Externalization is the process of conservation of tacit knowledge into explicit knowledge the form of metaphors, models, hypotheses and analogies. It is one of the most important of SECI model and it is the goal of knowledge management which might be easily understandable by other members (Nonaka& Konno, 1998). “Individuals places to the group so, the sum of individuals intention becomes integrated with the groups mental world” (Nonaka & Konno, 1998).

Combination

Combination is the process of combining explicit knowledge with other explicit through systematization of concepts; drawing on different bodies of explicit knowledge and develop other explicit knowledge. The key steps collecting significant internal and external knowledge, dissemination, and editing or processing to make it more usable. Combination allows knowledge transfer among groups across organizations (Nonaka& Takeuchi, 1995).

Internalization

Internalization is the process of conversation of explicit knowledge into tacit knowledge held by individual or group of peoples (Nonaka, 1994).The internalization

process transfers organization and group explicit knowledge to the individual. This requires the individuals to identify the knowledge significant for oneself within the organizational knowledge (Nonaka& Konno, 1998).

2.3.2.2. Boiston model

Boiston (1987) developed a model that considers knowledge as codified and uncoded and diffused and undiffused. In this model codified knowledge is knowledge that prepared for the purpose of transmission. Codified and undiffused knowledge is a personal knowledge (experience, ideas and views) that is shared between small groups of people. Codified and diffused is referred as public knowledge like book, journal and library, which can be accessed easily among groups of peoples. The others part is diffused and uncoded knowledge which develop through internalization and socialization process.

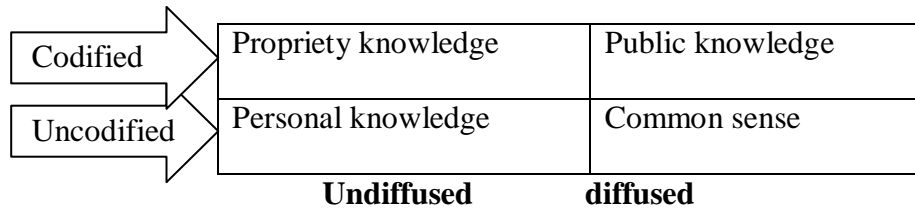


Figure 2.2: Boiston Knowledge category Model (taken from Boiston, 1987)

2.3.2.3. Hedlund and Nonaka’s knowledge management Model

Knowledge sharing is complex not as simple as Nonaka’s simple matrix suggests. Hedlund and Nonaka improved Nonaka’s model conversion of knowledge management. The knowledge management model was categorized into four groups: individual, group, organization and inter-organizational domains. Nonaka and Hedlund believe that a great deal of knowledge is stored in the mind of workers. Their model is presented in table 2.3 below.

	Individual	Group	organization	Inter-organization
Articulated Knowledge	Knowing calculus	Performance	Organization chart	Patent and document
Tacit Knowledge	Cultural and negotiation skills	Team coordination in complex work	Corporate culture	Attitudes and expectation

Figure 2.3. Hedlund and Nonaka's Knowledge Management Model (Hedlund and Nonaka, 1993)

2.4. KM Strategies in the management of IK

In developing country, strategy of knowledge management in management of IK supports tacit and explicit knowledge by understanding action capabilities and other intellectual assets to attain organizational growth (Wiig, 2004). KM shows its importance in management of indigenous knowledge and exogenous knowledge in developing countries (Ha et al, 2008). KM has a great role in improving business performance in developing countries. Since KM is key resource in any development, it needs to be successfully applied in farming activities to improve agricultural products. However, indigenous knowledge is disappearing. IK holders are aging and dying without preserving their knowledge for the next generation (Mascarenhas, 2004). Also IK is tacit and stored in the mind of people and thus is difficult to codify and diffuse. KM strategy can convert tacit knowledge into explicit form and by enhancing tacit knowledge flow through human interaction, so that it is not left in the mind of some people (Eftekharzadeh, 2008). But having low level of formal

education of the people with IK is reason for failure of sharing and documentation of IK (Fairhead & Leach, 1994). Social dimensions like age, gender, status, wealth and political influence also affect knowledge access in the communities. Security mechanism for the local people to protect their intellectual property is another factor (Nwonwu, 2008).

IK would disappear unless its management is strengthened. That is why various scholars recommended KM strategy to externalize and to diffuse tacit knowledge in local communities (Ikoja-Odongo, 2006). There are some theoretical studies that revealed the way how IK can effectively be managed through KM strategy in developing countries (Boateng, 2006).

Some works that have been conducted in the area of indigenous knowledge management and KM strategies are reviewed and presented below:

A study conducted by Wall (2006) in the rural Khorezm region of Uzbekistan, on the way agricultural indigenous knowledge is managed. The objective of the study was to assess management of indigenous knowledge and proposed knowledge management conversion. In his methodology, an anthropological/sociological approach was used, where semi structured and unstructured interviews, direct observation, documents and sociological survey were triangulated. The finding of the study showed that farmers had an extensive base of IK on farming practices but their knowledge was limited by knowledge loss. Modes of knowledge sharing within Khorezm communities were restricted at family level. Also there were examples of explicit forms of knowledge being accessed and then replicate within the knowledge management. Moreover this same study showed that power and culture determined acquisition, sharing and use of

agricultural knowledge in the rural Uzbekistan. The study recommended that there should be constant use and sharing of knowledge to prevent knowledge loss.

Lwoga (2009) conducted a study on the application of KM in managing and integrating indigenous and exogenous knowledge for improving farming activities in Tanzania. The study aimed to develop knowledge model to examine the application of KM that manage IK and integrate with exogenous knowledge in agricultural development by examining the management of indigenous knowledge (IK), access and use of exogenous knowledge, the relevancy of policies, legal framework, information and communication technologies (ICTs), and culture in KM practices in the communities. The author also proposed knowledge management model conversion which helps to integrate IK with exogenous knowledge. For the study, the researcher used mixed method research design with qualitative and quantitative data collection approach. Purposive sampling technique was used to select farmers from the communities. Her research findings indicated that KM approaches can be used to manage IK and appropriately integrate IK with exogenous knowledge in the local communities. At the end the researcher recommended that public and private institutions, knowledge intermediaries such as research, extension, NGOs, libraries and village leaders should be involved in the KM practices in the rural areas, and they should ensure that there is a committed leadership for KM activities, knowledge culture, appropriate ICTs, favorable context and space, and mapping to locate knowledge bearers and knowledge resources in the rural areas

Lwoga, Nglube & Stilwell (2010) carried out a study about the importance of indigenous knowledge in agricultural activities in Tanzania. Six districts are selected

for their study. The aim of their study was to show the importance of managing indigenous knowledge for sustainable agricultural performances in developing countries. To achieve the objective of their study, semi-structured interview items, focus groups, and participant observation were conducted. Stratified and non probability sampling techniques were used to select study participants in these villages based on age, gender, farming activities and Information and communication technology usage.

The findings of the research showed that KM strategy can be used to manage IK and integrate it with other exogenous knowledge taking into account the differences (for example, gender, location, culture, infrastructure). Since KM strategies/approaches can manage IK, they suggested that village leaders, knowledge intermediaries like development agents and researchers should create conducive environment for knowledge development. The study recommended that KM strategy can be applied for the management of IK and its integration with other knowledge systems for agricultural development in developing countries including Tanzania.

Noeth (2004) conducted a study on the strategy of KM for agricultural development in three rural communities in South Africa with the aim to assess status of knowledge management in the local communities and to develop knowledge management strategies in South Africa. The study showed that there were no information and knowledge neither shared nor preserved which had a negative impact on the development of the service in the surveyed local communities. Therefore, the study proposed that a generic KM model could be used to eliminate many of the problems encountered in these communities and subsequently improve the range, as well as the

quality of services available to community members. This model comprises the KM enablers (that is, organizational culture, leadership, preservation, and organizational structure) which can either support or hinder KM processes in the local communities, which include knowledge identification, mobilization, generation and elaboration, application and evaluation.

A study was conducted to assess the management of knowledge for the use of river in the local communities of Eastern Cape in South Africa by Mosia and Ngulube (2005). The data collection method they employed was focus groups discussion, questionnaires and Semi-structured interviews to determine how knowledge was shared and distributed in the local communities. Their finding revealed that knowledge sharing activities of the communities were fragmented. The communities mainly shared their knowledge through person to person communication, such as community meetings, general meetings and workshops. Local communities had limited access to explicit knowledge on the management of estuaries contained in documents and databases. This study recommended that communities practice and storytelling could be effective ways to facilitate knowledge sharing.

From reviewed literatures the research made sure that there is only a few works done on KM strategies in managing indigenous knowledge in agricultural development and to the knowledge of the researcher, so far no study is done in Ethiopia in this very area. However, some studies done in Ethiopia have focused on the role of indigenous knowledge for sustainable agricultural developments, like a study conducted to assess Management Knowledge Centers for Extension Communication and Agriculture Development in Ethiopia (Abebe, Ermias, Hoekstra & Abraham, 2010).The objective

of this study was to attain opportunities in KM at district level and Woreda Knowledge Centers in Ethiopia. Mixed research design methodology was used in the study. Data collection methods involve questionnaire, group discussion, timeline, SWOT analysis and KM performance assessment and document review. They purposively selected 500 respondents from the local communities and experts. This study showed that the use of knowledge management increased staff capacity to identify, access, assemble, document, share and use knowledge contributing to improve extension communication and agriculture development reaching farmers and pastoralist at grass root level.

Dixon (2002) had documented the role of indigenous knowledge of wetland in south western Ethiopia, Ilu Aba Bora zone. The study showed the importance of indigenous knowledge in managing wet land. The researcher used participatory group session to collect data from the community. Also the role of indigenous knowledge in land management for carbon sequestration & soil-based ecological services in Damot sore (wolayita), southern Ethiopia has been documented (Abebe, Hans, Gete & Berhanu, 2011). The research finding showed that indigenous knowledge maintains land conservation by preventing land degradation.

2.5. Agricultural Development in Ethiopia

Ethiopia's economy is based mainly on agriculture. The sector accounted for 43% of GDP and the livelihoods of 80% of the population are directly dependent on agricultural products (UDP, 2011). The total land area of Ethiopia is 123 million hectares, 47 million hectares are arable land and remaining 77 million hectares are classified as marginal and non-arable land (FAO, 1988). Thus, there is huge potential

for agricultural development in Ethiopia and coupled with the current policy of the country, the agricultural lead industrialization a lot is yet to be done.

2.5.1. Development of Agricultural Research and Extension Systems

Agricultural extension started in 1931 with the establishment of Ambo agricultural college which is the first agricultural college with major focus on agriculture in Ethiopia. The school only focuses on training students and demonstrating the potential effects of improved varieties and agricultural practices to the surrounding farmers, the school did not do extension work in the real sense of the term that we understand today. The Ministry of Agriculture established in 1943 started limited extension activities in different areas. However, there was no separate division in the Ministry which was responsible for extension work; it was the various divisions of the Ministry that made available different services to farmers. According to Haile Selassie (1959), “the services rendered were more of regulatory in nature and included providing advice in: soil conservation through the grow-more-trees campaign; better variety of seeds and seedlings; cleaning and seed selection; protection of game fish; preservation of hides and skins.”

The real agricultural research and extension system began in the early 1950s with the establishment of the Imperial Ethiopian College of Agriculture and Mechanical Arts in Haromaya University with the assistance of the United States under the Point Four Program. The academic program of the College was established on the Land Grant College system with three fundamental responsibilities which are:

- ✓ training of high level manpower
- ✓ promotion of agricultural research and

- ✓ Dissemination of appropriate technologies.

There are numbers of empirical literatures available on agricultural extension system in Ethiopia. Those literatures indicated that agricultural extension has been not effective in bringing large scale of improved practice. Because there are problems such as poor performance of the agricultural extension system including: the distraction of extension workers by their involvement in input supply, failure to involve farmers in research problem identification, problem prioritization and extension program planning, extension agents' ignorance of farmers' traditional and experience-based knowledge system, lack of relevant research results, inadequate planning and coordination and lack of interaction with research and the formulation of extension programs and policies without due consideration to the farmers' opinion and traditional knowledge system. (Belay, 2010).

2.5.2. Land use

Land use refers to the purposes for which humans exploit the land and its resources. Land is a critical resource for agriculture. It is well documented that most people in Sub-Saharan Africa are rural based and rely on agriculture for their livelihood (United Nations Economic Commission for Africa (UNECA, 2004). Availability of land for smallholder farmers is crucial, not only for food production but also for household incomes (Jayne et al., 2003).

Land use well practiced South Western part of Ethiopia. In this regard, the konso's indigenous terrace building and method of land management practices in North Shewa Zone are well described (EEPA, 2004). Also Assefa (2007) expressed terracing practice in Ethiopia especially on geographic variation in the Northern part

of the country. The study shows the importance of the indigenous knowledge on terracing the as key to survival in areas of Konso in Southern Gamo Gofa. In the western part of Ethiopia (Abera & Belachew, 2003) identified local soil management practices. In Ethiopia, there are various traditional cultivation systems, which are characterized by a high adaptation to the local ecological conditions as well as to social circumstance (Mitiku *et.al.* 2006).

2.5.3. Crop production

Ethiopia's agricultural practices on crop production are various, involving substantial variation in crops grown across the country's different regions and agro-ecologies. Five major cereals, namely teff, wheat, maize, sorghum and barley are the core of Ethiopia's agriculture and food economy, accounting for about three-quarters of total area cultivated, 29 percent of agricultural GDP in 2005/06 (14 percent of total GDP) and 64 percent of calories consumed. There has been substantial growth in cereals, in terms of area cultivated, yields and production since 2000, but yields are low by international standards and overall production is highly susceptible to weather shocks, particularly droughts. Thus, both raising production levels and reducing its variability are essential aspects of improving food security in Ethiopia, both to help ensure adequate food availability, as well as to increase household incomes.

Ethiopia's crop agriculture in general, and the cereals sub-sector in particular, faces serious challenges. Soil degradation from erosion and soil compaction also threatens crop yields (Hamza & Anderson 2005).

The sound performance of agriculture warrants the availability of food crops (FDECSA, 2013). Agriculture can a great role in a country's political, economic and

social stability makes measures of agricultural productions extremely sensitive. Nowadays Ethiopia has more than doubled its domestic grain production (from 8 million metric tons in 2000 to 15.6 million metric tons in 2010) and is now Sub-Saharan Africa's second largest grain producer next to Nigeria (USDA, 2012).

The study on analysis of smallholder farmer's participation in production and marketing of export potential crops in the case of sesame in Diga district, east wollega zone of Oromia regional state was conducted (Geremew, 2012). The specific objectives of the study were to analyze determinants of participation decision of smallholder farmers' in sesame production, to identify factors determining household's level of sesame production participation and analyze factors affecting and explaining marketing of sesame in the study area. Qualitative and quantitative data were collected and used for the study. The study result showed that the major source of income for sampled farmers was on-farm activities and crop was is the major cash crop primarily produced for market in Diga Wereda. However, lack of land management is one of the major factors putting smallholder farmers in the area in a low position to cultivate larger areas of land under crop, which also results in low sesame crop yield.

In general, indigenous knowledge if managed and used can contribute greatly to the agricultural development and proper land use in Ethiopia. In this regard, this study has large contribution for the rural communities and for the country as a whole for understanding and to practice the level of knowledge management strategy activities in managing indigenous knowledge.

CHAPTER THREE

3. METHODOLOGY

3.1. Description of the Study Area

The study was conducted in Western Ethiopia, Oromia Region, Ilu Aba Bora zone located at about 600 km away from the Capital, Addis Ababa to the West. Ilu Aba Bora zone is bordered on the South by the Southern Nations, Nationalities and Peoples Region, on the Southwest by the Gambela Region, on the West by East Wollega Zone, on the North by the Benishangul-Gumuz Region and on the East by Jimma Zone. The mean annual temperature of Ilu Aba Bora is 20.7C⁰ and rainfall is more than 1800mm per year. The main activity of the people in the area is agriculture and some are engaged in subsistence mixed farming with trade as additional activity. The study areas include two districts from the zone and from each district two kebeles were selected; namely from Mettu district, Boto and Tulube and from Yayo district Bondawo and Geci kebele were selected.

3.2. Research Design

The research method used for this research was both qualitative and quantitative research design. This was done in order to reveal knowledge management strategies in managing indigenous knowledge of land use and agricultural development. Studies in area of IK show that “effective method to collect different types of data, which can be used to confirm the validity and consistency of IK of a certain locality” (Kiptot, 2007). For the quantitative method questionnaire was used whereas for the qualitative data collection such as in group discussion, observation and participatory rural appraisal (PRA) technique (information mapping and linkage diagram) were used.

The group discussions were concerned to examine the indigenous knowledge of land use and agricultural development from the local communities. The information mapping and linkage diagram aims to add further interpretation to focus group discussion and meaning to the qualitative findings by discussing issues mentioned in the focus group discussion in more detail by selecting representative from the group. Questionnaires were distributed for the agriculture sector offices to understand what they did and how they managing indigenous knowledge of land use and agricultural knowledge. The observation was to find out indigenous knowledge they use for their land management and crop protection. Figure 3.1 shows the steps starting from design up to the result and proposed strategy of the research.

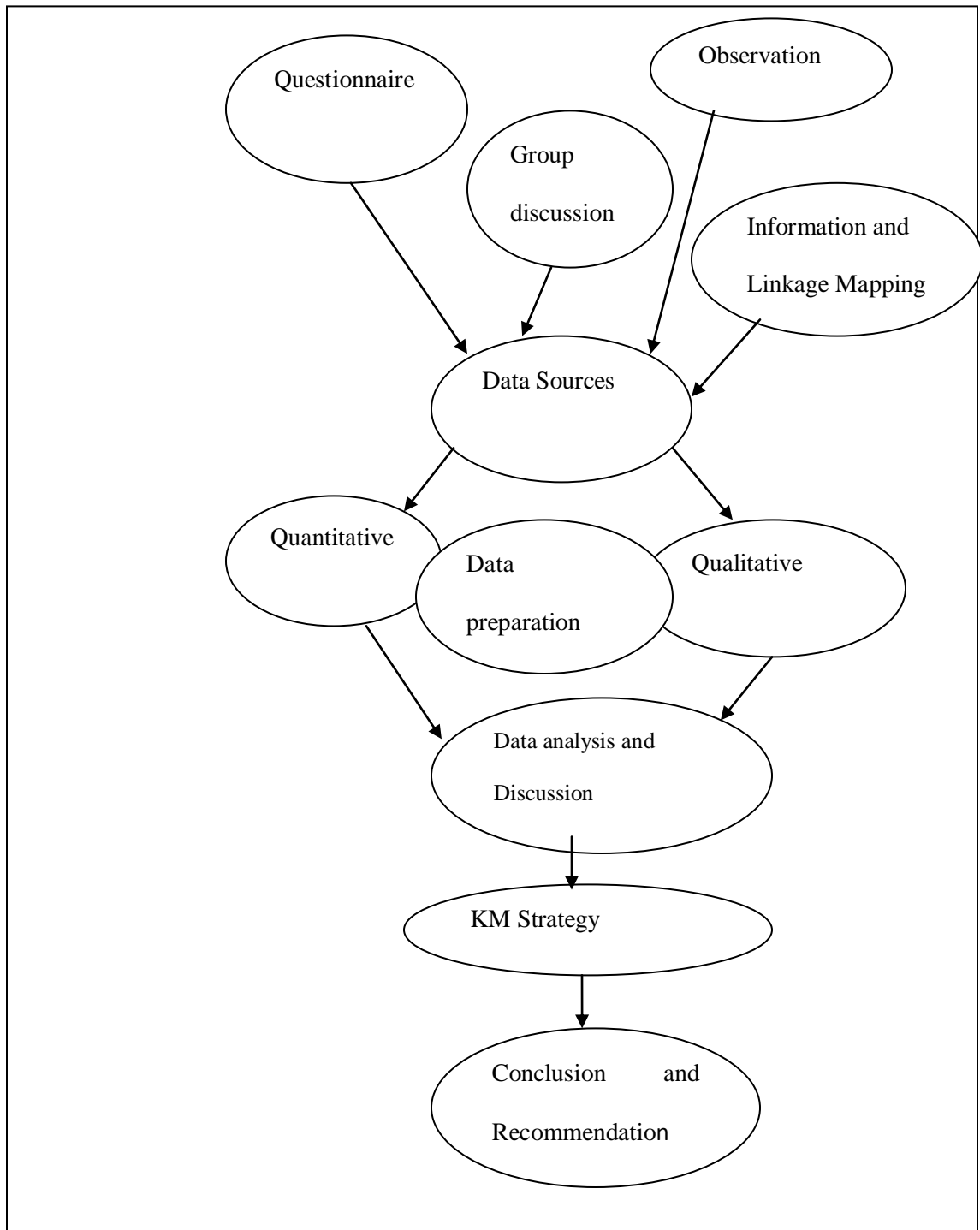


Figure 3.1 Research design for the study

3.3. Population of the Study

The study was conducted in Mettu woreda and Yayo woreda with the rural communities of kebeles population. The total populations of the kebeles are 10,573. The study populations include farmers and agricultural extension workers/Development Agents (DAs). The study includes farmers because their livelihood based on agriculture. Farmers have extensive amount of IK that is accumulated over generations through local experiments and innovations and agricultural extension workers or DAs were selected to participate because they are involved in management of IK in rural areas.

3.4. Sampling Procedures

Representative sample was taken from four purposively selected Kebeles of both Woredas in the Zone. Because it is a method that is limited to specific types of people who can provide the desired information, either because they are the ones who have it, or they conform to some Criteria set by the researcher (Sekaran, 2003). The elders more than 50 years were selected from the local communities. Then farmers that have IK were selected based on information obtained from informants. The purposive sampling was used to select local communities but for agricultural officers and land management officers, no sample was done since numbers of respondents was manageable.

3.5. Sample size

For focus group discussion of the study, Samples were selected from the local communities. A total of 150 elders, 108 farmers were selected based information

obtained from the informants. For questionnaires, a total of 28 surveys were distributed for extension officers and land management officers. A total of 24 questionnaires were returned; of which 4 incompletes were discarded.

3.6. Data Collection Methods

Focus group sessions were held in each district with the local communities. The set of focus groups were formed through discussions with groups based on farming activity. Magoro and Masoga (2005) also used the same process to select the focus groups' respondents when examining the extent to which the local farmers' knowledge can be protected. In addition, focus groups could be conducted with non-literate individuals. This study is used primary data collection methods through group discussion, questionnaire, observation and information mapping and linkage diagram to gather /collect data from the respondents. Gathering data from different respondent/sources is done to strength the limitation of each method and yields the data that are more valid for the output of the research (Marshall, 2006). The use of focus group discussion, observation and information mapping and linkage diagram (qualitative data) and questionnaires (quantitative data) used in this study allowed collection of data from large and varied groups of farmers, extension officers/development agents and land management officers. Most of the questions were adapted from Lwoga (2009) but some modifications are made in order to meet local context.

3.6.1. Focus Groups Discussion

Focus group discussion was used for the purpose of generating information and information had not documented. The use of group discussions with community elders were used to elicit information on land use and agricultural indigenous

knowledge from the farmers. The sizes of focus groups were eight to twelve respondents depending on their availability.

3.6.2. Questionnaires

The questionnaire contained close-ended questions and some open ended questions. Questionnaires were prepared after extensive review of literatures in the field of KM and indigenous knowledge. Those questions in the questionnaires focused on the research problems objective and questions rose in the statement of the problem.

Questionnaire was used to inquire the pattern and movements which help to describe what is happening in managing indigenous knowledge of land use and agricultural development and provide a measure of respondents' opinions, attitudes, feelings and perceptions about issues of particular concern to the researcher.

The questionnaire has three parts: part I contains the characteristics of the respondents, gender, age, education levels, positions. Part II contains questions requesting the respondents to state their agreement or disagreement on the issues of managing indigenous knowledge of land use and agricultural development. In this study, the 5 point Likert scale (1 =Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree) was used to state the extent to which the respondents agreed or disagreed with the statements in the questionnaire. Part III contains open ended questions were used to request the agriculture sector employees to write their ideas.

3.6.3. Observations

The observation served especially on the existing practices on land use and agricultural development such as what people do and why under a given circumstances within the larger framework of what they know and think, and how they share were observed. In this study, observation is used to gain insights how local communities practice indigenous knowledge on land use and agriculture that could not obtained in any other methods.

3.6.4. Participatory Rural Appraisal

Participatory Rural Appraisal (PRA) was employed in this study because such methods reveal the hidden complexity of IK systems and it yields many insights into IK since it puts great emphasis on local people's own knowledge and practices and it normally takes place within the community. PRA is also recommended by various IK studies as an appropriate method to study and analyze the way local communities manage their IK for sustainable agricultural development processes (Dixon & Barr, 2005). In developing countries, many studies have also used PRA to examine agricultural IK in the local communities (Hart & Mouton, 2005). Various authors have also used PRA to examine the role of IK for agricultural development in the rural areas (FAO, 2006).

3.6.4.1. Information Mapping and Linkage Diagram

The purpose of information mapping and linkage diagram was to identify and visualize the relative importance of indigenous knowledge in the community which impact upon the livelihoods of target individuals and groups (Sillitoe, Dixon & Barr, 2005). The completed diagram can serve the focus group discussions to analyze the

strengths and weaknesses of the various institutions and their contributions to the development of the community (IIRR, 1996). Also this tool was used to identify source of agricultural IK and land use in their locality and their importance in providing access to agricultural IK and land use in the local communities.

3.7. Data Collection Procedures

Data collection for this study began on 10th of March 2014 and ended first of April 2014. The support letters obtained from the Jimma University and the researcher's informants from the community helped to get permission to conduct the research in the selected kebeles of the woredas. Entering and gaining access to the research site also involves writing a letter to inform the study participants about the aim of the study and thus permission letters were obtained from Yayo and Mettu Woreda.

3.8. Procedures on Data Analysis

The collected data was cleaned and coded then entered into SPSS version 20 and Microsoft office excel. Frequencies, percentages and forms of graphical presentation were used to analyze and present quantitative data, while the data from qualitative is presented qualitatively.

3.9. Ethical Considerations

The study ensured that informed permission is obtained from participants. Also the study considered research ethics like protection of respondents from harm, privacy, confidentiality of research data and honesty with professional colleagues. Therefore,

this research work violates no ethics as the researchers shall stick to research ethics throughout the study and also when analyzed the data and reporting the result.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1 Results

4.1.1. Socio-Demographic Characteristics of Respondents

Despite the fact that respondents' socio-demographic characteristics were not part of the study objectives, it was considered necessary to present these data because the background of the respondents could partly explain the KM related activities in the sample under study. Therefore, the study described the characteristics of the respondents who participated in the focus group discussions and survey using questionnaire in terms of gender, age, education level, etc. The socio-demographic characteristics of the study participants are presented below.

4.1.1.1. Local Communities

One hundred and eight farmers participated on the focus group discussion, where 90 83.33% (90) were males and 16.66 % (18) were females. Respondents' gender, age and level of education were recorded during the focus group discussion. Elders in the community were purposively selected as they are believed to be the holders of indigenous knowledge. Thus, the age of the respondents is above 50 years. Almost all of the respondents were illiterate. Table 4.1 shows respondents' demographic profile of the study participants.

Table 4.1 Profile of respondents at focus group discussions

Demographic character of the respondents		Tullube	Boto	Bondawo	Geci	
Number of respondent in focus group discussion	N	26	27	29	26	
	%	24.1%	25%	26.85%	24.1%	
Gender	Male	N	22	21	24	23
		%	20.37%	19.44%	22.22%	21.30%
	Female	N	4	6	5	3
		%	3.7%	5.56%	4.63%	2.78%

4.1.1.2. Stakeholders of the study subject

Based on the demographics information obtained, majority of the respondents were males (79.2%). As to the age of the respondents, 41.7% of the respondents are in a range between 25 - 34 years, 29.2% range between 35–44 years and 25% range between 45 – 54 years. Only 4.2 % of the respondents are found in the age range of 55-64 years.

Table 4.2 respondents' demographic profile of stakeholders

Measures		Frequency	Percentage (%)
Age	25-34	10	41.7%
	35-44	7	29.2%
	45-54	5	25.0%
	55-64	1	4.2%
	>65	0	0%
	Total	24	100%
Gender	Male	19	79.2%

	Female	5	20.8%
	Total	24	100%
Level of Education	Masters	1	4.2%
	Bachelor	13	54.2%
	Diploma	10	41.7%
	Total	24	100%

Respondents are also categorized by their level of education into masters, 1st degree and diploma. Figure 4.1 depicts respondent's level of education.

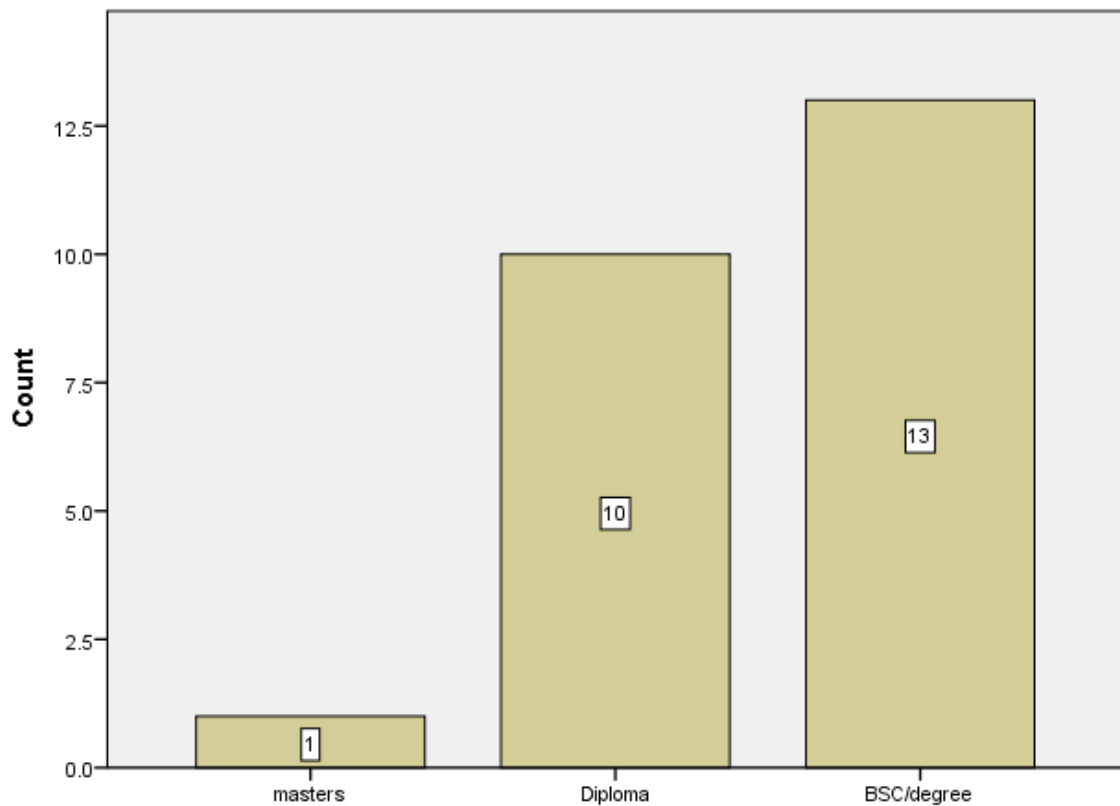


Figure 4.1. Respondents by their level of education

As it is described in, figure 4.1, the distribution of respondents by the level of education showed that majority of the respondents from the stakeholder (54.2%) are bachelor degree holders followed by 41.7% diploma holders 4.2% are second degree holders. From this it can be said that majority of the respondents of the extension officers and land use management officers at the study site are first degree holders.

4.1.2. Indigenous knowledge of land use and farming activity in local communities

4.1.2.1. Soil fertility

The respondents were posed with a question on the method they use to improve soil fertility. Accordingly, the result indicated that most of the respondents use animal manure 93.52% (101), 86.1% (93) of the respondents use nitrogen fixing legume crops such as beans, lentils, chickpeas, 79.63% (86) use crop rotation, 78.7% (85) use short term fallow. The less used methods were tree leaves 46 (42.59%) and laying of crop stalks/plant by product 37(34.295%) organic materials 25.93% (28). Figure 4.2 depict these indigenous knowledge used by the local communities of the study area to improve soil fertility.

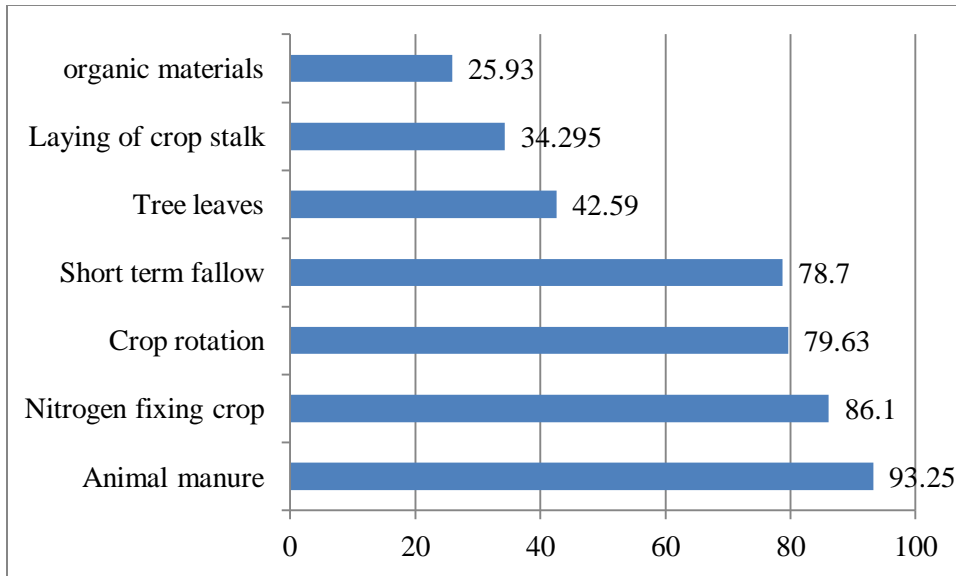


Figure 4.2 Method used to improve soil fertility by farmers

Moreover, the respondents were asked to list the top three methods used to improve soil fertility and they disclosed that animal manure, nitrogen fixing plant and crop rotations were the top three methods used in improving soil fertility. There are also other methods used for this purpose, such as laying crop stalks/plant by products on the farm land also and any other organic materials. On the other handsome farmers use mineral (inorganic) fertilizers but they indicated that the cost is very high and it is not good for soil fertility as the organic materials, help only increase crop production for the time being. In the past, the farmer used to burn straws and grasses and spread the ash on the farm, however, agricultural development agents thought them that doing so is burn the minerals. Additionally, respondents practice long term fallow but at low rate because there is shortage of land due to every increasing population density.

When the respondents were asked why above methods is used most in that area, they said that the methods improve fertility of the soil and the materials are locally

available. The occurrence of trees and green grasses in the study area abundantly shows that the soil is fertile and suitable for planting crops

4.1.2.2. Criteria to select land for different crop types

Among one hundred and eight farmers participated on the study, most of them used different criteria to decide which crop type to be planted on a given plot of land. It was revealed that 86.15% (93) use types of soil as criteria, 67.6% (73) used fertility of the land as criteria and 56.48% (61) used type of plants as criteria to select the land for planting different crops. Other criteria include: weather condition 24 (22.2%) and water hold capacity 17(15.74%).

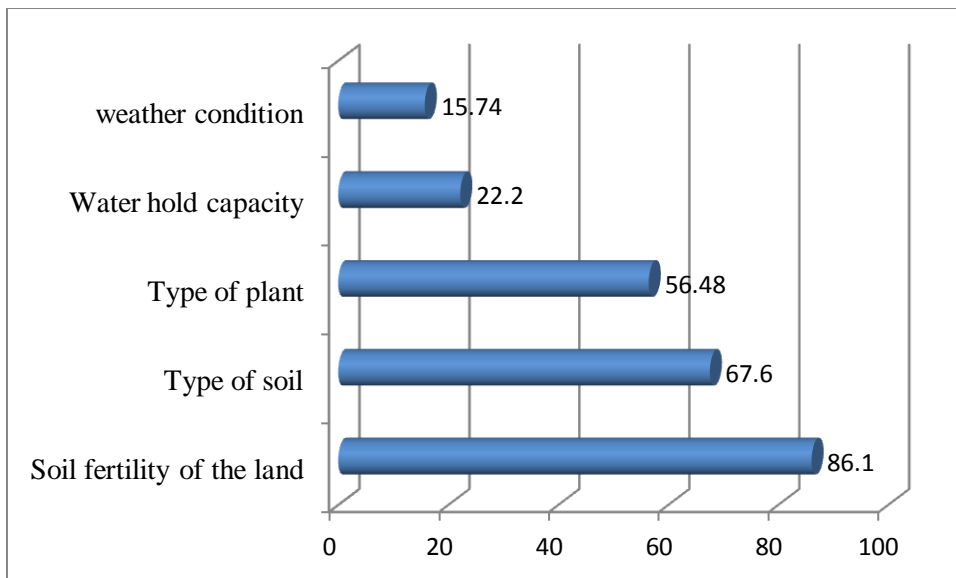


Figure 4.3 Criteria used to select land for different crops by the farmers

The findings from the focus group discussions showed that mainly the type of soil, soil fertility and type of plants were important criteria to select land for planting different crops.

4.1.2.3. Methods of weed control

When the respondents were asked ways or methods used for weed control different methods that are in use were revealed to control weeds. Majority of the respondents used hand weeding 78.7% (85) followed by crop rotation 65.4% (71), short term fallow 53.7% (58), herbicide 16.66% (17) and long term fallow 9.23% (10) to control weeds using the indigenous farming techniques. The finding indicated that all most all farmers use indigenous knowledge of weed control except few farmers, using modern agricultural input, namely herbicide.

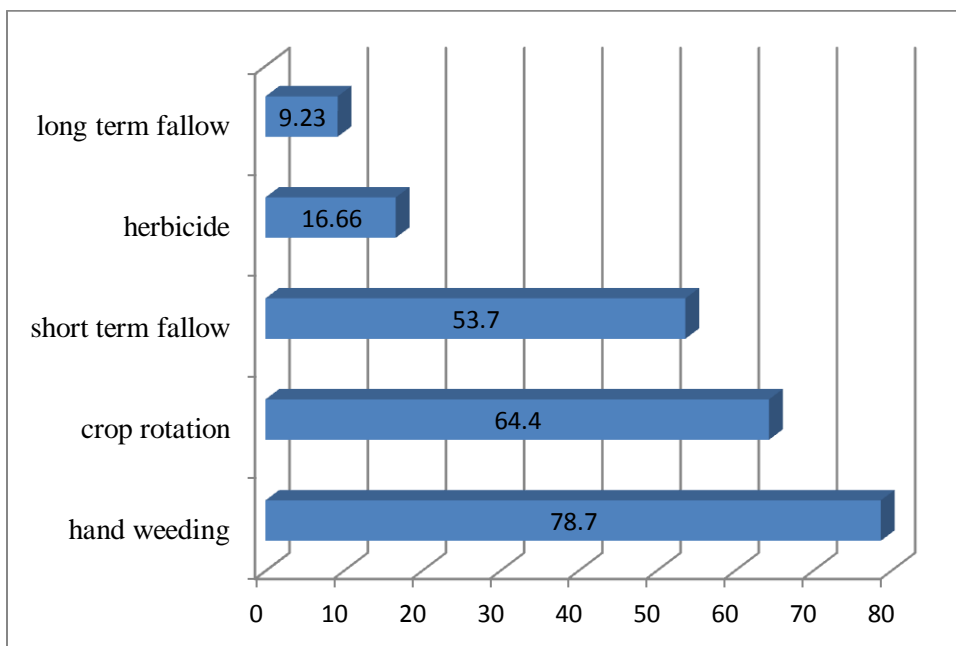


Figure 4.4 Methods of weeding control used by the farmers

As to the time of weed removal from their farm, they indicated that it is done three weeks to five weeks after planting because weeding at early stage avoid competition of nutrients between weed and crops. The respondents asked which method they prefer in weed control and they replied that indigenous weed control method is preferred because indigenous weed control has no affect on the land.

4.1.3. Method of storing and preservation of seeds

The respondents asked whether they prefer either indigenous knowledge or exogenous knowledge for storing their crops. They prefer indigenous techniques because they are locally made and were cheap. For storing and preserving, crops after harvest, they use 'gotera', a storehouse made of wood and mud and big clay pots. Especially, the storehouses (granaries) are built outside houses, but in the compound and are used to store teff, maize and sorghum. The reasons why the local communities use such indigenous method that traditional seeds were safe, easily available and resistant to insects such as weevils (seed beetles) and rodents. Some farmers use exogenous technique to store their crops, such as sacks because it is easy to use and carry. The reason why the local communities use exogenous knowledge is that not all indigenous methods were effective to preserve seeds.

To avoid soil erosion, making terraces around their farming land is practiced. Moreover, they sow mono crops on their farms because it avoid competition for nutrients and increase yield. During the focus group discussion it was revealed that use transplanting techniques for sorghum because there is no failure in case of sorghum while for other crop there is a failure. This indicates that farmers try out different things and found that transplanting sorghum is possible.

4.1.4. The current management of indigenous knowledge of agriculture and land use in the local communities

4.1.4.1. Sources of indigenous knowledge

The respondents were asked to indicate main sources of indigenous knowledge of land use and agricultural development and they gave multiple responses as shown in

table 4.3. The result of this study shows that family 89.8% (97) and neighbors/friends 81.48% (88) were the main sources of agricultural indigenous knowledge and land use in the local communities. In addition personal experience 62.94% (68), demonstration and observation 61.1% (66), farmers' group worker 53.7% (58) were among the sources. Though considered lesser, village leaders 36.1% (39), NGOs 23.14% (25) and religious institutions such as churches/mosques 18.51% (20) were also considered as sources of agricultural indigenous knowledge and land use source by the local communities.

Table4.3 Sources of agricultural indigenous knowledge and land use by the local communities

Source of IK		Tulube(25)	Boto(27)	Bondawo(28)	Geci (26)	Total(108)
Family	N	25	23	23	26	97
	%	23.15%	21.29%	21.29%	24.07%	89.8%
Neighbors/friends	N	21	19	24	24	88
	%	19.4%	17.6%	22.22%	22.22%	81.48%
Personal experience	N	20	14	16	18	68
	%	18.52%	12.96%	14.8%	16.66%	62.94%
Observation and demonstration	N	17	21	16	12	66
	%	15.74%	19.44%	14.8%	11.11%	61.1%
farmer group worker	N	11	16	12	19	58
	%	10.18%	14.8%	11.11%	17.59%	53.7%
village leaders	N	6	9	14	10	39
	%	5.56%	8.33%	12.96%	9.26%	36.1%
NGO	N	4	6	8	7	25
	%	3.7%	5.56%	7.4%	6.48%	23.14%
Religion bodies	N	5	4	8	3	20
	%	4.63%	3.7%	7.4%	2.78%	18.51%

4.1.4.2. Information mapping and linkage diagrams for source of indigenous knowledge

The information mapping and linkage diagrams confirmed that local and informal contacts of parent/family, personal experience and neighbors / friends, observation and demonstration and farmer group work were the dominant sources of knowledge in the local communities. In addition Village leaders, agricultural shows, NGOs and religion bodies were important sources of indigenous knowledge in some local communities. There was no explicit source of knowledge considered as important sources of indigenous knowledge in the communities.

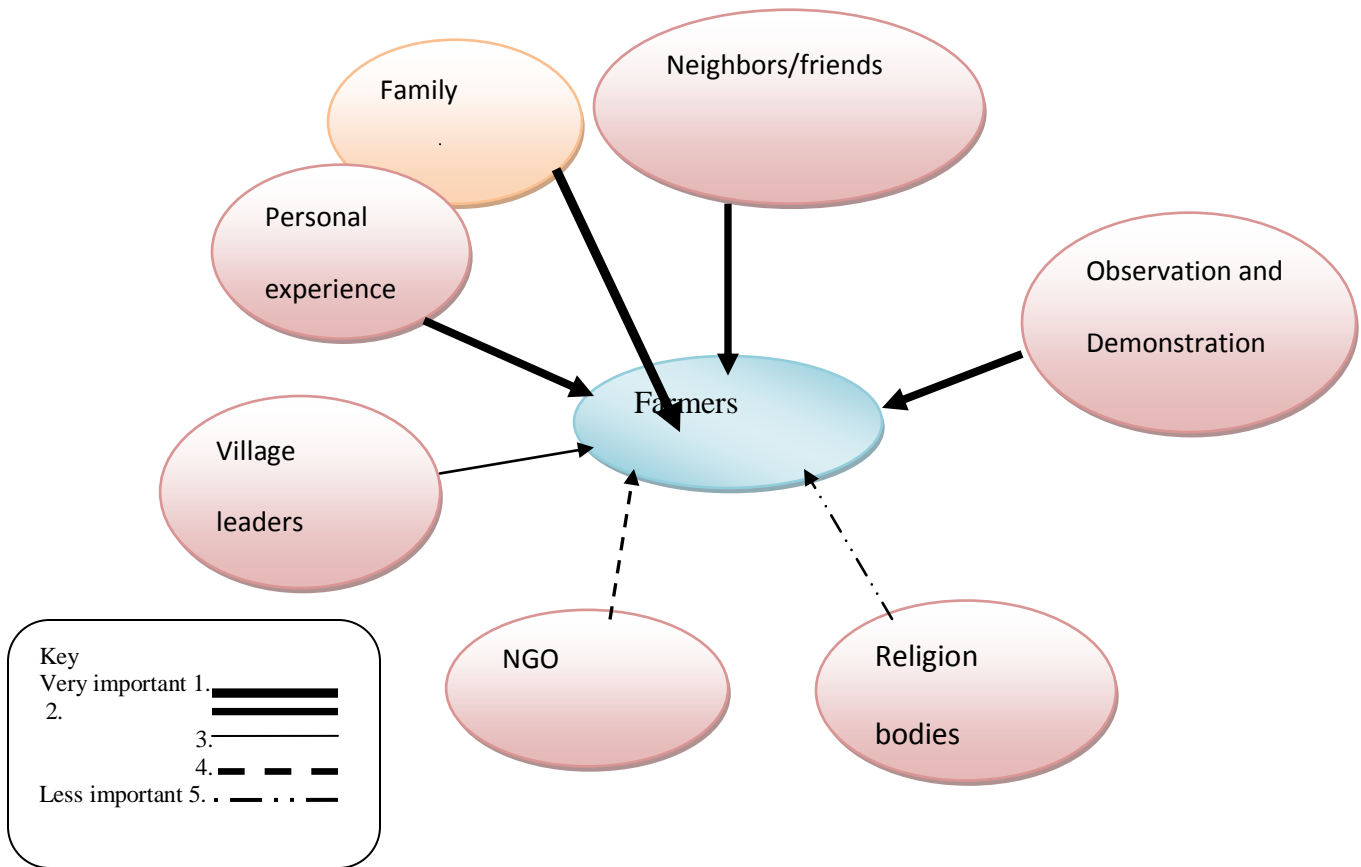


Figure 4.5 the consolidated information maps of the kebeles

4.1.4.3. Sharing and preservation of indigenous knowledge

4.1.4.3.1. Folklore practices

The respondents of focus group discussion were asked to describe folklore performed in their communities, in agriculture development and land use and the purpose of performing those aspects of folklore.

Farmers have folklore practices in the local communities. Songs are the major form of folklore practiced in the communities. This folklore is significant used to encourage farmers in agricultural development. Among the folklore, the following famous proverb is what the study respondents told the researcher.

“Haati qottuu dhagaa waqaratti haati sobduu ganda keessa deemti”. This is to mean the mother of a good farmer prepares her millstone; the mother of a liar (deceiver) wanders through the village. Such, proverbs are used to encourage farming. It is common that shepherd use songs to encourage brave farmers echoing the song across the mountains.

Another common proverb is: *“Qoti in qonnaa yaa daalee qonneetu bajjii tarsaasnaa galleetu beela wal baafnaa”*. Farmers do not only encourage one another, but also their oxen and the above proverb is a good word about their oxen, they sing while they plough. Roughly translated it is to mean that my ox, the ‘daalee’ let’s plough hard and crake the new plot of land, the ‘bajjii’ and we come back home and relieved each other from hunger. As it is known such folklore are powerful to influence the community member to be hardworking.

When asked to indicate how they preserved their agricultural IK, the respondents replied affirmatively that they preserved their knowledge in their minds. They also

said that the transfer of IK of agriculture and land use to their children and sharing it among each other is done through the word of mouth or orally. This shows that there is a danger of losing indigenous knowledge if not codified and documented.

4.1.5. Barriers of indigenous knowledge acquisition, preserving and sharing

4.1.5.1. Barriers that inhibit the effective acquisition of agricultural indigenous knowledge

The respondents were asked about the barriers of effective acquisition of agricultural indigenous knowledge and land use in local communities. Accordingly, the majority indicated that poor recognition 94.4% (102), lack of IK records 88.89% (96); poor knowledge sharing culture 75% (81) and difficulty to identify the indigenous knowledge bearers 59.26% (64) are the barriers that inhibit effective acquisition of agricultural IK.

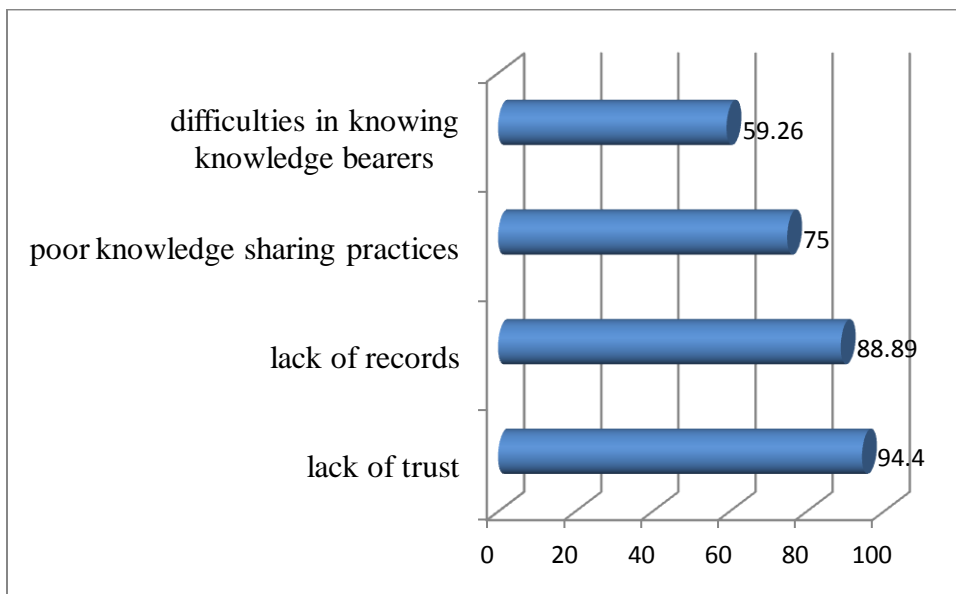


Figure 4.6 Barriers that hinder acquisition of IK

4.1.5.2. Barriers that hinder the sharing of indigenous knowledge

The barriers that inhibited farmers from sharing their agricultural IK and land use were poor recognition of IK 85.55% (85), lack of IK records 73.15% (79), lack of trust 67.59% (73), poor knowledge sharing culture 28.7% (31) and selfishness occurrence 9.26% (10) (Figure 4.7).

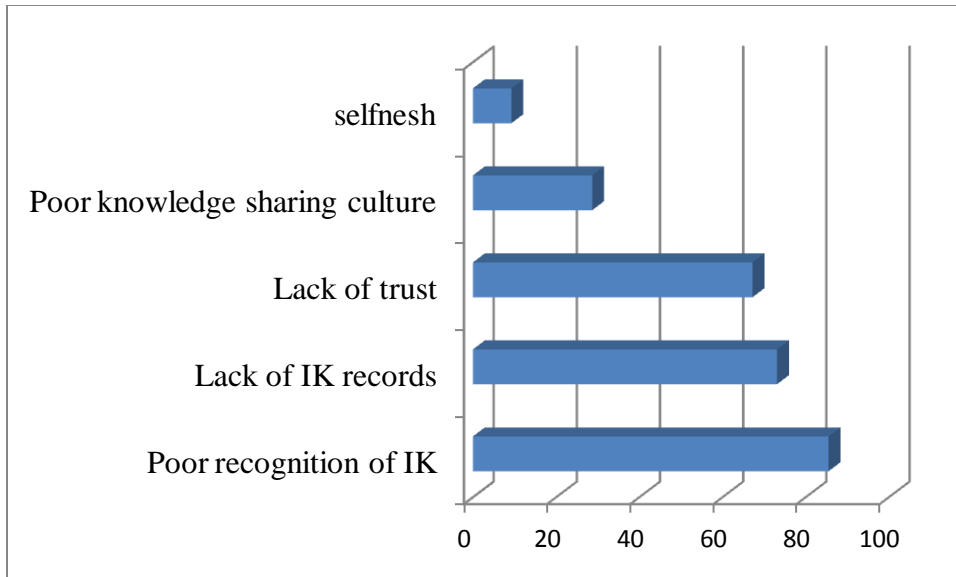


Figure 4.7 Barrier that hinder IK sharing

4.1.5.3. Barriers the hinder to preserving indigenous knowledge

The respondents were posed with a question to indicate the problem they faced in preservation of agricultural IK. They mentioned several problems faced in the preservation of agricultural IK which include: IK not received by younger generations 86.1%(93), poor recognition of IK 80.55% (87), lack of IK record 71.3% (77) and poor knowledge sharing culture 27.77% (30) and lack of trust 25.93% (27).The figure below (Figure 4.8) depicts barrier that hinder preserving IK.

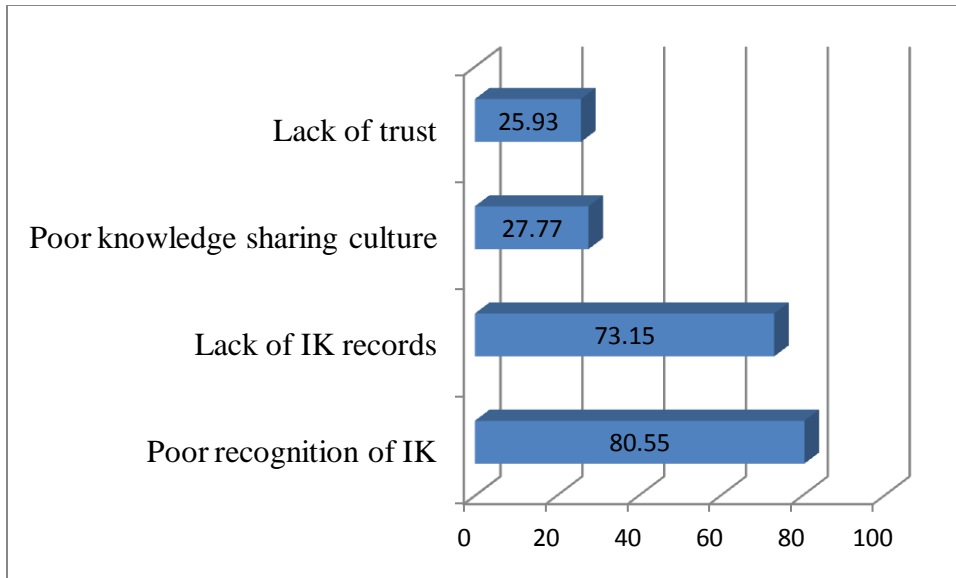


Figure 4.8 Barriers that hinder preserving IK

4.1.6. The flow mechanism of land use agricultural indigenous knowledge

The study needed to establish whether the knowledge extension officers understood IK flow mechanism of the local communities. There are different questions posed to know the knowledge flow such as carefully accessed IK, forum of IK like meeting, sharing of IK at individual level, concerns to share IK, the view of the younger generation to learn about IK from elders and impact of modernization/technology. Summary of the response of the extension officers is presented in table 4.4.

Table 4.4 Indigenous Knowledge Flow mechanism in the local community

Questions Items		Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Missing	Mean	St. deviation
IK is carefully accessed and used easily by farmers in the local communities	No	5	11	1	4	3	0	2.54	1.35
	%	20.8%	45%	4.2%	16.7%	12.5%	0%		
There is a forum for indigenous knowledge sharing, like face to face(example, meeting)	No	5	12	1	3	3	0	2.46	1.318
	%	20.8%	50.0%	4.2%	12.5%	12.5%	0%		
IK is shared informally at individual level	No	3	2	5	12	2	0	3.42	1.139
	%	12.5%	8.3%	20.8%	50.0%	8.3%	0%		
Everybody is interested to share IK	No	4	12	1	5	2	0	2.54	1.25
	%	16.7%	50.0%	4.2%	20.8%	8.3%	0%		
Old and knowledgeable people in the Community feels responsible to Transfer/share IK	No	2	7	4	10	1	0	3.04	1.122
	%	8.3%	29.2%	16.7%	41.7%	4.2%	0%		
No one is concerned to share IK	No	4	8	3	5	4	0	2.88	1.393
	%	16.7%	33.3%	12.5%	20.8%	16.7%	0%		
Younger generation is learning about IK from Elders	No	6	10	1	4	3	0	2.5	1.383
	%	25%	41.7%	4.2%	16.7%	12.5%	0%		
The impact of modernization/technology is high on sharing IK	No	3	4	1	10	4	2	3.36	1.364
	%	12.5%	16.7%	4.2%	41.2%	16.7%	8.3%		

Regarding the first questions respondents are asked whether IK is carefully accessed and used easily by farmers in the local communities or not. About 20.8% (5) of the

respondents replied that they strongly disagreed and 45% (11) of the respondents disagreed with access of indigenous knowledge by farmers in local communities. However, 16.7% (4) and 12.5% (3) of the respondents are disagreed and strongly disagreed concerning this question. From this, we can conclude that indigenous knowledge is not easily accessed by the farmers in local communities.

Respondents asked whether there is a forum for indigenous knowledge sharing, like face to face (example, meeting and apprentice) showed that 20.8% (5) of them were strongly disagree, while 50% (12) were disagreed. Whereas 12.5% (3) of the respondents were agreed and strongly agreed respectively. This indicated that no formal forum of indigenous knowledge in the local communities.

The question of the IK is shared informally at individual level revealed that 12.5% (3) are strongly disagreed, while 8.3% (2). Among the respondents, 50 % (12) of them agreed that indigenous knowledge was shared at individual level and 8.5% (2) of the strongly agreed. Responses indicated that indigenous knowledge of land use and agricultural knowledge is shared at individual level.

In responding to the question regarding everybody is interested to share IK in the local communities, 16.7% (4) of the respondents were strongly disagrees and 50% (12) of them were disagreed. However, 20.8% (5) of the respondents were agreed and 8.3% (2) were strongly agreed. This reflects that most respondents confirmed not everybody interest share indigenous knowledge in local communities.

With the question of Old and knowledge people in the Community feels responsible to transfer/share IK, about 8.3% (2) of the respondents were strongly disagreed with the view and 29.2% (7) of the respondents were disagreed. Among the respondents,

41.7% (10) agreed that Old and knowledge people in the Community feels responsible to transfer/share IK, while 4.2% (2) strongly agreed. This indicated that Old and knowledge people in the Community feels responsible to transfer/share IK.

Regarding no one is concerned to share IK, about 16.7% (4) strongly disagreed and 33.3% (8) disagreed. However 20.8% (5) of the respondents agreed and 16.7% of the respondents were strongly agreed. From this we conclude that major parts of the community concerned to share indigenous knowledge for their community.

For the younger generation is learning about IK from Elders, about 25% (6) of the respondents strongly disagreed and 41.7% (10) of them were disagreed, whereas 16.7% (4) respondents agreed and 12.5% (5) of them strongly agree with it. This indicates that younger generations were not learning about IK from Elders.

Concerning the impact of modernization/technology is high on sharing IK, 12.5% (3) of the respondents were strongly disagreed and 16.7% (4) of the respondents were disagreed. However, 41.7% (10) of the respondent agreed, while 16.7% (4) of them strongly were agreed. This reflects that most respondents agreed that the impact of modernization/technology is high on sharing indigenous knowledge.

Moreover, the mean value and standard deviation calculated for each of the questions in this mechanism of knowledge flow in the local communities. Figure 4.3 described the mean values of mechanism of knowledge in local communities. Moreover, the standard deviation value for the knowledge flow mechanism is presented in table 4.4.

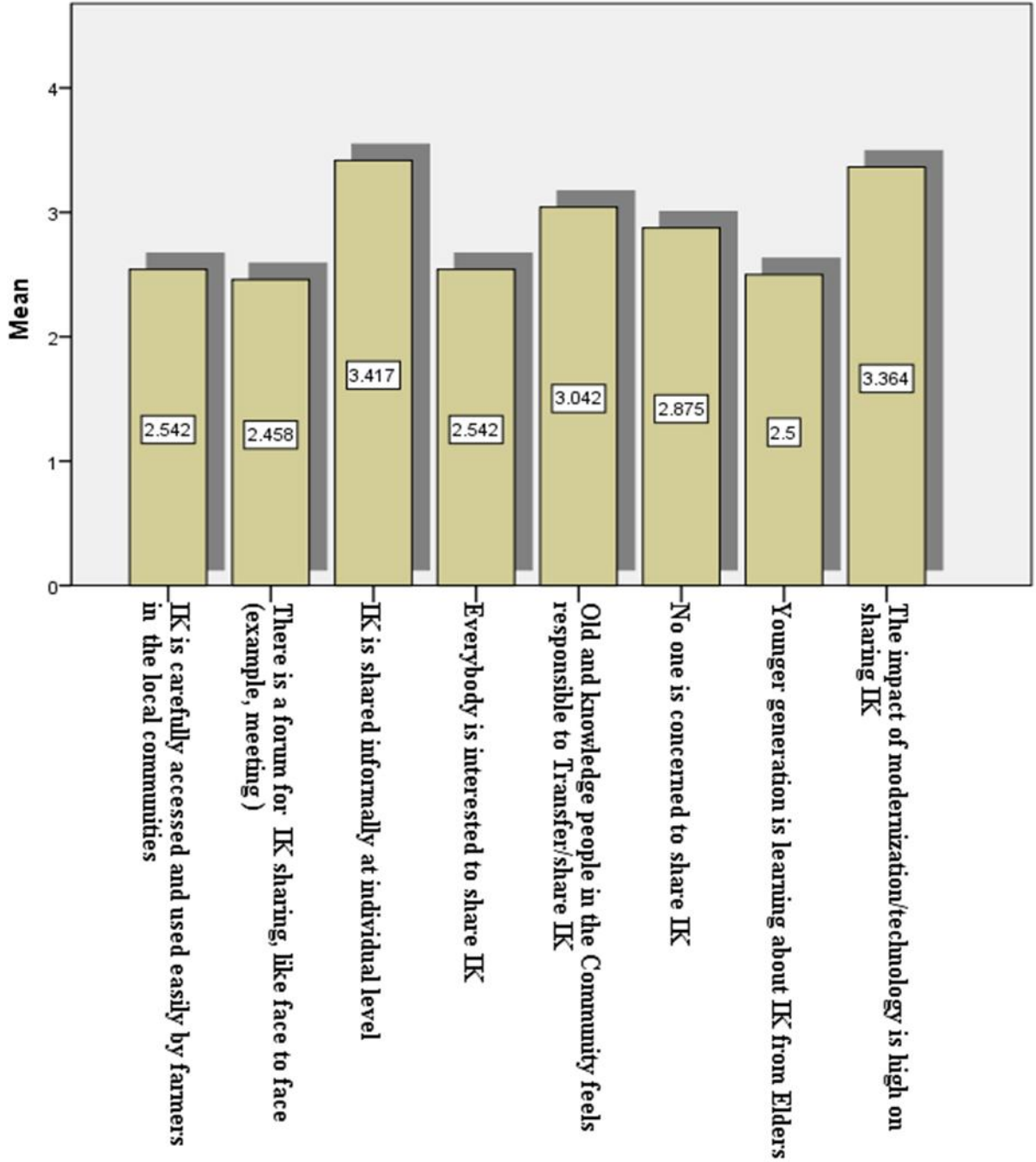


Figure 4.9 Mean value of Knowledge flow mechanism

The highest mean value for knowledge flow mechanism in local communities is 3.417, with a standard deviation of 1.36, which is for the question statement: IK is shared informally at individual level. This shows that IK shared at individual level in local communities. Moreover, a statement: Old and knowledgeable people in the community feels responsible to Transfer/share IK is scored a mean value of 3.042 with a standard deviation of 1.122, which is a wanted behavior as the holders of IK are willing to share than hording their knowledge.

4.1.7. The management of indigenous knowledge in the local communities

4.1.7.1. Acquisition of agricultural indigenous knowledge

The stake holders were asked whether they are aware about the individuals who possess indigenous knowledge of land usage agricultural development. Majority of the respondents 70.8% (17) knew about the farmers who possess indigenous knowledge of land use and agricultural development and the remaining 29.2% (7) did not know them. Those farmers who possess IK are the elders. But the acceptance they had by the younger generations is quite low. When asked to specify if they had collected IK in local communities, 62.5% (15) of the respondents' said they captured from local communities. The type of IK they have capture from the local Communities include crop production 33.3% (8), natural resource, 12.5% (3), and did not collect IK. An inquiry about the strategies used to capture agricultural IK in the communities found out that most of the respondents use training, 25% (6), conference/meeting, 8.3% (2), face to face, 27.8% (5), and agricultural shows, 27.8% (5).

The respondents were asked to indicate the purpose of collecting IK in the communities. The result shows that 45.8% (11) of the respondents said extension services as their major purpose for collecting IK. Other purposes include interest in managing IK, 16.7% (4), for research purpose, 16.7% (4), raise of IK profile, 12.5% (3) and marketing agricultural inputs, 8.3% (2).

4.1.7.2. Preservation and sharing of agricultural indigenous knowledge

With respect to preservation and sharing of IK, 79.2% (19) of the respondents said oral, i.e. minds of people is used to preserve IK, 16.7% (4) used written form to preserve IK, 30% (3) used leaflets 10% (1), 10% (1) used books to preserve and share IK. Furthermore an inquiry about the strategies used to disseminate/share IK in the communities revealed that a quarter of the respondents, 25% (6) used training, and other strategies such as conference/meeting, 8.3% (2), face to face, 27.8% (5) and agricultural shows 20.8% (5) were also used to preserve and share IK.

4.1.8. Barriers to effective management of indigenous knowledge in local communities

There are different questions and issues raised to know barriers in management of land use and agricultural indigenous knowledge such as Knowledge is carefully accessed and used easily by farmers in the local communities, There is a forum for knowledge sharing, like face to face (example, meeting), Knowledge is shared informally at individual level, Everybody is interested to share IK, Old and knowledge people in the Community feels responsible to Transfer/share IK, No one is concerned to share IK, Younger generation is learning about IK from Elders. The summary of the responses is presented in table 4.5.

Table 4.5 Barriers that hinder knowledge effective management of IK

Questions Items		Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Missing	Mean	Std. deviation
		1	2	3	4	5			
Poor IK sharing culture	No	1	5	1	9	8	0	3.5	1.383
	%	4.2%	20.8%	4.2%	37.5%	33.3%	0%		
Poor recognition of IK	No	2	4	0	8	10	0	3.38	1.373
	%	8.3%	16.7%	0%	33.3%	41.7%	0%		
Lack of IK records	No	1	1	1	11	10	0	4.17	1.007
	%	4.2%	4.2%	4.2%	45.3%	41.7%	0%		
Lack of trust	No	0	3	1	10	10	0	4.13	0.992
	%	0%	12.5%	4.2%	41.7%	41.7%	0%		
No interest to receive IK by younger generation	No	1	5	0	9	9	0	3.83	1.274
	%	8.3%	20.8%	0%	37.5%	37.5%	0%		
Oral transfer of IK	No	1	0	0	15	8	0	4.21	0.833
	%	4.2%	0%	0%	62.5%	33.3%	0%		
Change of life style	No	0	1	0	12	11	0	4.38	0.711
	%	0%	4.2%	0%	50%	45.5%	0%		

The first statement is concerning whether poor knowledge sharing cultures is among the barriers that hinders effective IK management in the local communities. The study findings showed that 4.2% (1) of the respondents replied that they strongly disagree and 20.8% disagree. However, 37.5% (9) and 33.3% (8) of the respondents agree and strongly agree respectively. From this, it is can be said that there is poor knowledge sharing culture in the local communities as the majority agree and/or strongly agree with the statement.

Regarding, Poor recognition of IK about 41.7 % (10) of the respondents replied that they strongly agreed and 33.3 % (8) agree, whereas 8.3% (2) of the respondents are strongly disagreed and 16.7% (4) of the respondents replied they agreed. From this it is possible to conclude that there is poor knowledge recognition in the local communities.

For the question regarding lack of records of IK in the local communities, 41.7% (10) of the respondents replied that they are strongly agree and 45.8% (11) of the respondents replied that they agree on the lack of IK records in the local communities whereas 4.2%(1) disagree and 4.2%(1) strongly disagree that there is lack of IK records in local communities. This revealed that there is a problem of IK recording in the local communities.

Respondents were asked whether there is lack of trust or not in the communities. The result shows that 41.7% (10) of respondents strongly agreed and exactly the same percent agreed, whereas 12.5% (3) disagreed on lack of trust in local communities. From this it is possible to say that there is a lack of trust of agricultural IK and land use in local communities, because the majority strongly agreed and agreed with the statement: there is lack of trust in the community for effective management of IK.

For the question whether younger generation had no interest to receive IK, from the elders, 4.2 % (1) of them strongly disagreed and 20.8 % (5) disagreed, whereas, 37.5 % (9) of the respondents' agreed and 37.5% (9) strongly agreed. From this we can say that younger generations have no interest to receive indigenous knowledge from the elders in local communities.

Regarding the oral transfer of IK of land use and agricultural development, the majority 62.5% (15) of the respondents agreed and 33.3 % (8) strongly agree with oral transfer of IK, while only 4.2% (1) of the respondents disagreed with oral transfer of IK from generations to generations. From this, we can conclude almost all of the respondents believe that indigenous knowledge of land use and agricultural knowledge is transferred from generation to generation orally.

The respondents were also asked about the changing life style and its impact on IK, Accordingly, 4.2% of the respondents agreed in change of life style in local communities. About, 50% (12) of the respondents replied that they are agreed and 45.5% (11) with the change of life style in local communities. Form this we can conclude that there is change of life style in local communities, which will have impact on the way IK used to exist in the local communities. The mean value for each of the barriers of effective indigenous knowledge questions are calculated and presented in the figure 4.10.

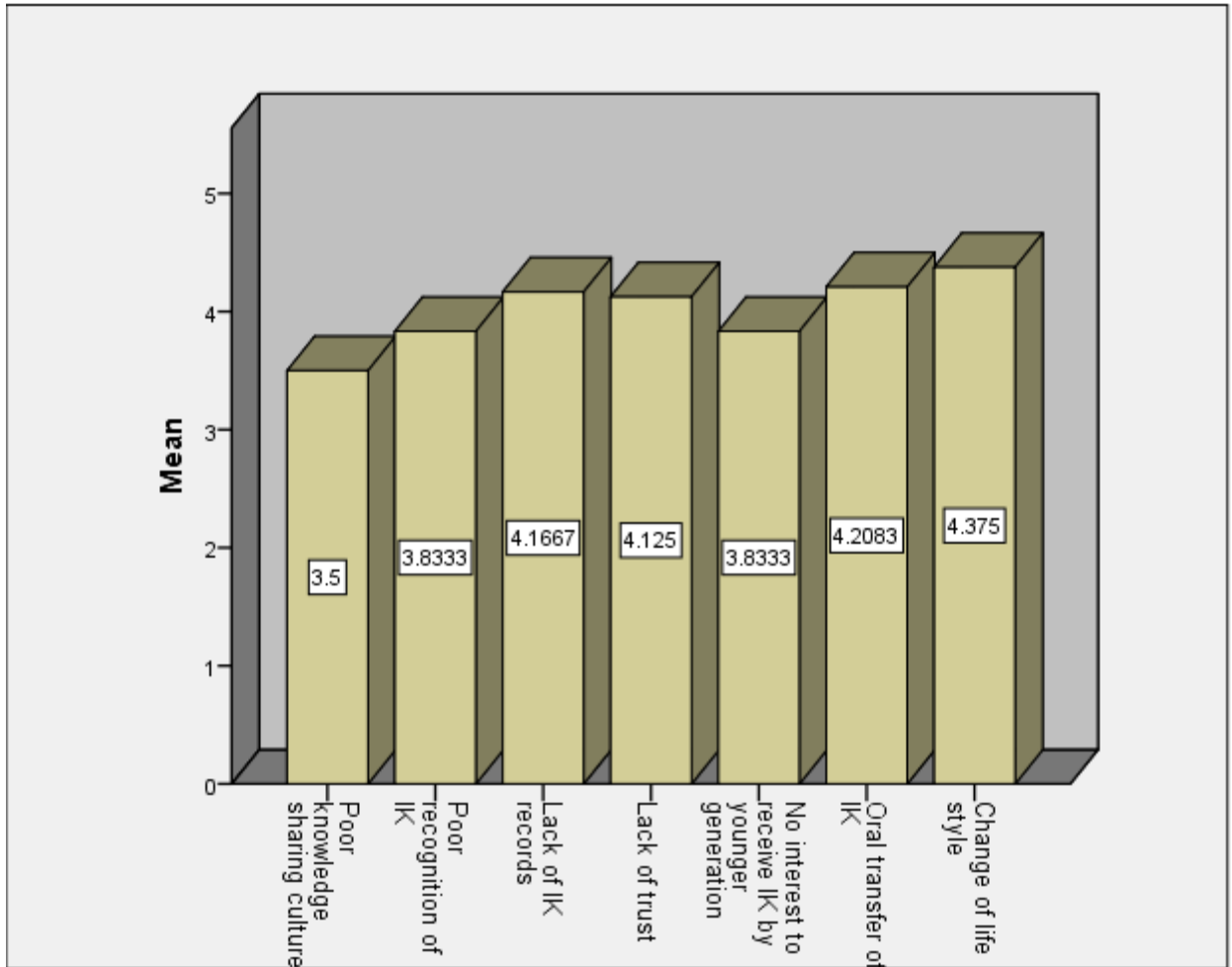


Figure 4.10 Mean value of barriers of effective management of IK

From the table explained and figure, the highest mean value at barriers of effective management of indigenous knowledge of land use and agricultural development is 4.375, which is for the question of life change style with the standard deviation value of 0.711. This shows that the standard deviation from the mean value is relatively small, from this we can understand that most of the problem in effective management of land use and agricultural indigenous knowledge is life style change. Whereas, the lowest mean value is 3.5 for the question poor knowledge sharing culture with the standard deviation value of 1.383 that is the lowest mean value for this question gives

an understanding that problem of poor knowledge sharing culture in land use and agricultural indigenous knowledge.

4.2. Discussion

In this section, results in 4.1 were presented. Also the relevant literature and the extent to which the current research findings presented a common view with the previous indigenous knowledge research of a similar nature were also presented.

Types of agricultural indigenous knowledge and land use

The study findings confirmed that farmers possessed IK on various farm tasks such as soil fertility, weed control selecting land for crops or arable land, weed control, method of preserving and storing seeds, soil erosion, and cropping system. A similar observation was made by Lwoga (2010) in Tanzania and Eyong (2007), who reported that local people in Central Africa possessed an enormous wealth of IK that covered clearing the land, selecting crop for planting, harvesting and storage. Related observations were made by various studies in developing countries, such as Laos (Saito *et al.*, 2006) and Bangladesh (Miah *et al.*, 2005).

The management of agricultural indigenous knowledge

This focuses on the managing agricultural IK in the local communities such as acquisition, sharing and preservation of IK. The result of this study shows that family (89.8% (97)), neighbors/friends 81.48% (88), personal experience 62.94% (68), demonstration and observation 61.1% (66), farmers' group worker 53.7% (58) were among the sources. Though considered lesser, village leaders 36.1% (39), NGOs 23.14% (25) and religious institutions such as churches/mosques 18.51% (20) were the source of agricultural knowledge and land use. These findings were the same as

with the results of other finding such as Uzbekistan (Wall, 2006). Similar observation were made in other African countries such as Lwoga, Nglube & Stilwell (2010) in Tanzania, Ethiopia (Dixon 2002), that informal sources were the dominant sources of agricultural.

In the sharing agricultural IK and land use is discussed related indigenous practices that enable sharing and distribution of IK in the local communities. Songs are the major form of folklore practiced in the communities. This folklore is significant used to encourage farmers in agricultural development. The finding similar with previous studies (Owuor, 2007) had found that IK was shared among individuals and within the communities through events such as apprenticeships, initiation rites and folklore.

In preserving, the present study showed that local communities preserved their knowledge in their minds thus it was disappearing at a high rate. The same study presented (Mosia & Nglube, 2005); IK was limited by knowledge loss due to the lack of prescribed structures and preserved in human minds.

Barriers that inhibit the management of agricultural indigenous knowledge and land use

The major problems that faced farmers when acquiring agricultural IK and land use, poor recognition 94.4% (102), lack of IK records 88.89% (96); poor knowledge sharing culture 75% (81) and difficulty to identify the indigenous knowledge bearers 59.26% (64) are the barriers that inhibit effective acquisition of agricultural IK. Similar study was made in other country in Ecuador (Bode, 2006). This finding indicates that farmers inadequately recognized and explored their knowledge and capacities to innovate to improve their farming activities.

In relation to barriers that hinder knowledge sharing , study findings showed that poor recognition of IK 85.55% (85), lack of IK records 73.15% (79), lack of trust 67.59% (73), poor knowledge sharing culture 28.7% (31) and selfishness occurrence 9.26% (10). It is thus important for the village leaders and extension officers to encourage a knowledge sharing culture, mutual trust and relationship building to enable local people to openly share their knowledge. Similar study was made by Akullo *et al.*, (2007) found that formal education, disappearance of local inputs, and large scale farming, government laws and selfishness inhibited sharing of agricultural IK in the local communities in Uganda.

The study findings on preservation of agricultural knowledge and Land use showed IK not received by younger generations 86.1%(93), poor recognition of IK 80.55% (87), lack of IK record 71.3% (77) and poor knowledge sharing culture 27.77% (30) and lack of trust 25.93% (27).Similarly, a study by Agea *et al.*, (2008) found that lack of records on IK was the major limiting factor to the use of IK in enhancing food security in Uganda.

4.3. KM strategy

This section presents a KM strategy for rural farming community in order to fulfill the last objective of the study that is to recommend a KM strategy for effective managements of indigenous knowledge. The KM strategy will make IK a key deliverable by which rural community can improve its effectiveness in achieving its effective management of IK.

4.3.1. Goal of KM strategy

To fully manage the knowledge in the mind of people and transfers to the next generations to contribute most effectively.

The strategy's more specific objective is to facilitate the knowledge capturing, sharing, preserving and use knowledge through storytelling, face to face and printed materials. The achievement of the overall goal and specific objective is supported by four strategic pillars: enhancing knowledge capture, enhancing knowledge sharing and dissemination; leveraging knowledge through partnerships and enabling knowledge use as presented in figure 4.11.

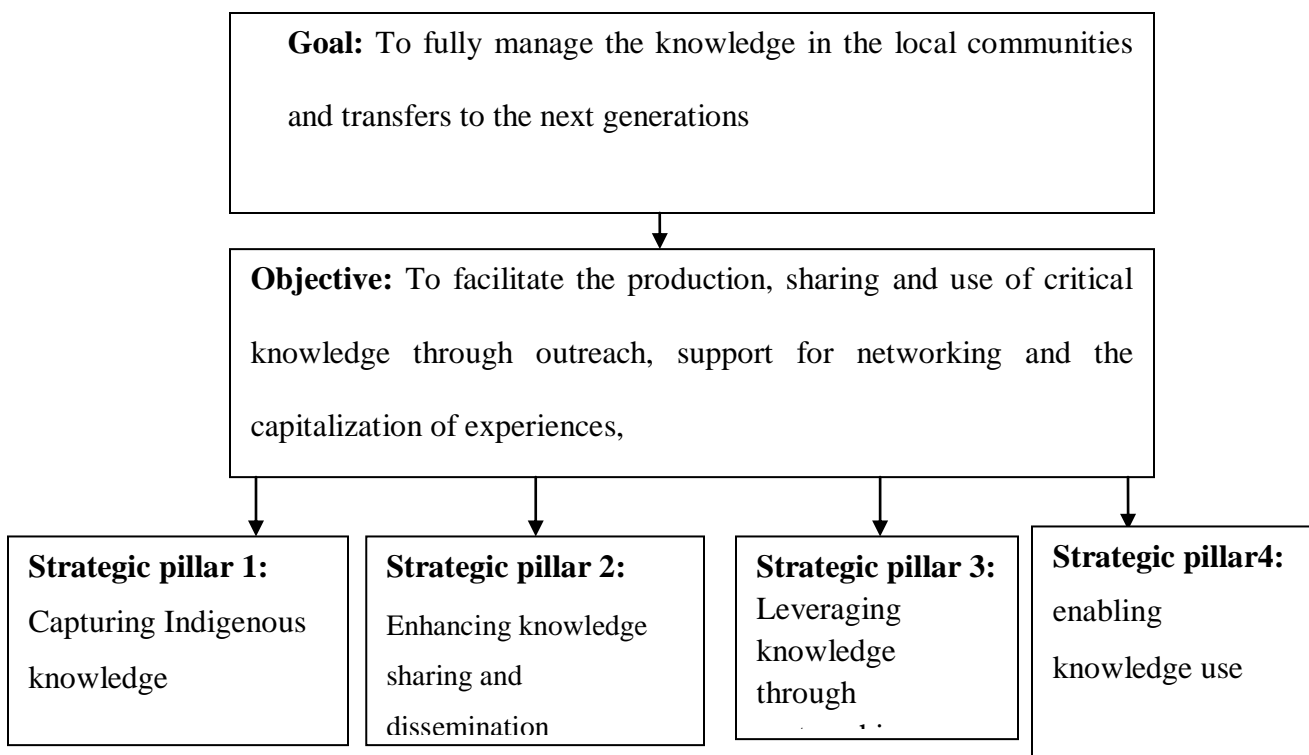


Figure 4.11. Approach to developing the KM strategy

The rural communities KM strategy action plan comprises repetitive, phased approach designed to provide opportunities and enable the strategy to evolve through the communities using new approaches. The three phases are designed to KM

strategy which starts in 2015 and ended in 2018 (2015-2018). Within this repetitive approach, the main recommended actions focus on the four strategic pillars.

4.3.1.1. Strategic pillar 1: Improving the capturing of knowledge from the community

The study established that the rural communities have no strategies to capture the indigenous knowledge or the knowledge of experienced elders to making available in rural communities. Leaders, researchers in NGO and government should deliver on.

4.3.1.2. Strategic pillar 2: Enhancing knowledge sharing and dissemination

Leaders, public and private officers are by far the more significant vehicle in the rural areas for facilitate, sharing IK, learning and it receives most attention in KM strategy action plan. These leaders can facilitate KM practices by establishing knowledge sharing forums. They should also set time and space for farmers to meet and share knowledge, such as through knowledge sharing forums and other KM practices in the local communities. Leaders should also encourage farmers to attend meetings, farmer groups, establish communities practice and use different cultural practices, agricultural shows and printed materials to share agricultural knowledge amongst each others.

4.3.1.3. Strategic pillar 3: Leveraging knowledge through partnerships

This is the most necessary pillar whereby the rural communities have great role to play in the KM strategy. Local community active engagement in several of NGOs, as well as with many governmental organizations, provides a foundation on which the

local communities could be significant contributor of IK by facilitating sharing IK with them.

4.3.1.4. Strategic pillar 4: Enabling knowledge use

This pillar is aimed at building knowledge capacities and fully realizes community's potential. The full implementation of the activities of pillars one, pillar two and three requires a level of capacity within communities that possessed only by elders and is in need of development.

The action plan will be implemented in pillar three will progressively linking the KM strategy in the practices, communities and different organizations. They will also ensure that communities' KM continues to benefit from the strategy and responsiveness in the face of likely ongoing change in the communities environment.

4.3.2. Phases KM strategy into action

The rural communities' KM strategy action plan comprises three phases as follows:

4.3.2.1. Phase one

With duration of about one year and five months Phase 1 is aimed at capturing IK from the local communities through activities that can be undertaken. The focus is mostly on achievable at the level of the rural communities; leaders could create conditions for the effective implementation of phase one and two. Phase one involves knowledge capturing from the local communities and related works (strategic pillar 1) so that:

- ✓ Leaders, extension officers should identify the IK holders month

- ✓ Leaders could create conducive environment for the researchers, extension officers, land management officers and others participants who could capture IK from the IK holders.
- ✓ Additional process-related to barriers of IK to improving /facilitate IK capturing (if any) is identified.

Two issues should be examined with a view to improving relationship between rural communities and stakeholders; establishing committees from local communities and the expert from knowledge management officers and aligning the committees of the communities. After all, the researchers, extension officers, land management officers and others participants could capture IK from the IK holders/elders.

4.3.2.2. Phase Two

The second phase of the KM strategy of rural communities' action plan/work plan is predicted as one year process that begins to tackle longer-term KM challenges that require sustained effort and the engagement of various partners. The goals of phase two are to codify indigenous knowledge that is captured from the local communities. It involves three sets of activities: establishing indigenous knowledge forum, codifying IK in a form of brochure to make strong learning (strategic pillar two and three).

The extension of the communities KM strategy for the remaining period of the communities strategic action plan (supporting all three strategic pillars) are crucial for its overall development. To be robust, the KM strategy must build on earlier experiences: the leaders, extension officers, land management officers and communities partners, therefore, will need to review progress on the actions undertaken in phase one and the early stages of phase two(strategic pillar three).

4.3.2.3. Phase Three

The third phase of the KM strategy of rural communities' action plan is envisaged as about five months. The specific goals and activities of phase three will be identified through the support of phase one and phase two to enable generate a KM strategy for the period, 2015–2018. The stakeholders should do specific activities of which will provide many opportunities which enable them to use the knowledge. In general, the KM strategy should focus on facilitating capturing, collaborative learning

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

This section presented the summary of finding, in accordance with the research objectives. The key idea which emerged from the findings was that farmers possessed an extensive base of IK on various farm tasks. There was high use of indigenous knowledge and techniques in the acquisition of agricultural indigenous knowledge and land use, improvement of soil fertility, criteria for selecting land, weeding method of storing and preserving crops. For their knowledge needs, farmers mainly depended on the informal network of friends, neighbors' and families, and formal sources such as extension officers. Traditional culture, such as folklore and initiation sharing agricultural IK and land use although, they were practiced at a low rate. Most of agricultural IK and land use was preserved in human minds. Access to agricultural IK was influenced by poor recognition of poor knowledge sharing culture; lack of IK records, lack of trust life change style and no younger generation accept IK.

5.2 Conclusions

In this study, it was attempted to develop knowledge management strategies in management of indigenous knowledge of land use and agricultural development of selected rural districts of Ethiopia. To this end, primary sources data were collected from the local communities, extension officers and land management officers for the research. Focus group discussions and information mapping and linkage diagram held with local communities. Also questionnaires distributed for extension officers and land management officers. In addition non participant observation was done by the

researcher on how the local communities protect their crops and manage their knowledge in local communities.

The study showed that local communities use indigenous knowledge highly in improving soil fertility, selection of land for different crops, weed control, method of storing seed and preservation of seeds. The local communities acquired from family, friends/neighbors, personal experience, demonstration and observation, NGOs, village leaders and religion bodies. These findings indicate that while trust can enable knowledge sharing in the local communities, it can also inhibit access to knowledge if it is not nurtured. Various indigenous cultures enabled the sharing of indigenous knowledge in the local communities, which included cultural practices such as folklore. However, these cultural practices were practiced at a low rate to share agricultural knowledge in the local communities. It can thus be concluded that it is important to strengthen these cultural practices to improve sharing of IK in the local communities.

5.3. Recommendations

- It is recommended that knowledge sharing activities through face-to-face interactions between individuals and groups, as well as demonstration and observation should be encouraged in the communities to enhance knowledge acquisition.
- Print materials should be used as something for future reference. Extension officers, village leaders and land management officers should play a key role in this. Extension officers should also capture and disseminate IK in the communities to enhance access to IK and increase farmers' confidence in adapting new knowledge.
- The Ministry of agriculture and information science professionals should digitize this knowledge
- Extension officers and also other stakeholders should also consider the differences in access to IK according to location and vulnerable groups are not marginalized in the rural KM strategies.
- It is recommended that the communities should continuously share and preserve knowledge in tacit formats in their communities. Public, researchers and private partnerships would be needed to facilitate the knowledge capturing.
- This study recommends that knowledge maps should be used to identify IK holders so that the local people can easily locate knowledge sources in their communities. The knowledge intermediaries should incorporate IK in their

extension services and disseminate knowledge that is relevant to farmers' needs.

- Further studies should be directed towards examining the KM strategy practice of rural communities.

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Appendix 1:

Guide for Group Discussion with communities

Personal Information

1. Sex Male Female

2. Age > 45

Educational level: high school Elementary illiteracy post secondary

other, please specify.....

3. District _____

4. Kebele _____

Session I. Indigenous knowledge on land use

1. What methods do you use to improve the fertility of soil

1. = Short-term fallow the land (1 season)

1. = Nitrogen-fixing crops (eg. beans, peas, lentils, chickpeas)

2. = Crop rotation

3. = Ash from burning straws and grasses

4. = long-term fallow (more than 2 years)

5. = Laying of crop stalks/plant by-products

6. = Organic materials

7. = Animal manure

8. = Special trees/plants

9. = Tree leaves

10. = others

2. Which of the above methods are used most in your area (List top three?)

1. _____

2. _____

3. _____

3. Why you use mostly those methods to improve soil fertile?

5. Which indicators do you use to determine changes in the fertility of a soil?

.....

Session II. Various types of agricultural indigenous knowledge in the farming

1. What methods are used for seed storage for next year planting?

.....

2. Criteria of selection of seed for planting.....

3. Which methods do you prefer for storing seeds?

1= Indigenous 2= Exogenous

Please give reason(s) to prefer one over the other.....

4. Is there postharvest storage method used to keep the crop for longer period

without damage (Any Indigenous knowledge used)? -----

Farming practice

5. What criteria do you use for selecting land for planting different crops?

1= Good water holding capacity 2= Weather condition 3= Fertility of the
land 4= Type of soil 5. others, please specify.....

6. How do you prepare land for crops, methods to conserve soil or avoid erosion?

7. Do you diversify by sowing different types of crops on your parcel of land? If so

why?.....

8. How do you sow crops? Scattering? Line planting? Transplanting?

.....
.....
.....

9. For the crops you transplant, what indigenous knowledge do you use to avoid failure? At what stage? When?.....

10. Time of sowing? Which type of crop do you sow first and which one last? Why?

.....

11. What methods do you use to control weeds?

1= Long-term fallow (more than 2 years)

5= use of herbicides

2= Selective weeding

6= burning before land preparation/burning after

3= Short-term fallow (1 season)

harvesting

4= hand weeding

7= others, please specify.....

12. At what stage do you weed your crop and why.....

13. Is there special advantage of hand weeding method of weed control...

14. Which methods do you prefer from indigenous knowledge and exogenous knowledge?

1= indigenous knowledge 2= exogenous knowledge

15. Why one or the other or why both? Please specify.....

16. Which type of knowledge is difficult to use?

1= indigenous knowledge 2= exogenous knowledge

What is the reason? Please specify.....

17. Which types of knowledge is more advantageous?

1= indigenous knowledge 2= exogenous knowledge

What is the reason? Please specify.....

Session III. Managing IK on agriculture and land use in the communities of Ilu Aba

Bora Zone

Sources of IK

1. Where do you obtain knowledge with regards to land use and agricultural

development? (Possible to select multiple answers)

1= Personal experience

6= Farmers association

2= Church/mosque

7= Village meetings

3= Parent or family

8= Demonstration and observation

4= Neighbor/Friends

9= other, please specify.....

5= Village leaders

2. **Sharing of indigenous knowledge**

Knowledge sharing model constructs (multiple answers are possible)

1. Knowledge is carefully accessed and used easily by farmers in the local communities

2. There is a forum for knowledge sharing, like face to face(example, meeting)

3. Knowledge is shared informally at individual level

4. Everybody is interested to share IK

5. Old and knowledge people in the Community feels responsible to Transfer/share IK
6. No one is concerned to share IK
7. Younger generation is learning about IK from Elders
8. The impact of modernization/technology is high on sharing IK

Indigenous organizations

Is there any structure or hierarchy of indigenous knowledge in the community?

4. If question 4 is yes, Are you a member of any associations (network) that exist in the community to discuss about community development?
 - a. Yes b. No

If yes, name them -----
5. What are the activities of these groups/networks?
6. Where does each group that you are a member meet and discuss on issues related to agricultural development/land use?
7. How do members find out about the decisions made on community development?

Indigenous education with respect to land use and agricultural development

8. What apprenticeships arrangements exist in your community?
9. Which subjects are taught in these apprenticeships.....?
10. Who teaches the apprentice?
11. How long are apprenticeships?
12. Other ways of sharing indigenous knowledge, please name them.....

13. Is there a responsible body/individuals encouraging IK preservation/sharing
yes/no?

14. If yes for question number 14, how much is their acceptance by the community?

Preservation of indigenous knowledge

13. Do you use any non-ICT based tools to preserve agricultural indigenous
knowledge

(Example, written, carvings)? 1= Yes 2= No 3= don't know

14. If it is yes for question number 13, what non-ICT based tools do you use when
preserving agricultural indigenous knowledge?

1= Written 2= Carvings 3= Rock painting 4= others, please specify.....

15. What problems in acquiring, sharing and preserving agricultural IK and land use
(barriers of effective management of IK)?

1. Poor knowledge sharing culture
2. Lack of IK records
3. Lack of trust
4. No interest to receive IK by younger generation
5. Oral transfer of IK
6. Change of life style
7. Poor recognition of IK

Appendix2:

Questionnaires with Agricultural Extension Workers/Agriculture professionals

Information about respondent

1. Sex: Female Male
2. Specify your age
 18-25 26-35 36-45 46-55 56-65 >65
3. Highest education level
4. PhD Masters Bachelor Diploma Certificate High school

Indigenous knowledge sharing

Please indicate the extent to which you agree or disagree with the following statements by putting a tick (√) mark in the appropriate box.

Knowledge sharing model constructs		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Knowledge is carefully accessed and used easily by farmers in the local communities					
2	There is a forum for indigenous knowledge sharing, like face to face(example, meeting)					
3	Knowledge is shared informally at individual level					
4	Everybody is interested to share					

	IK					
5	Old and knowledge people in the Community feels responsible to Transfer/share IK					
6	No one is concerned to share IK					
7	Younger generation is learning about IK from Elders					
8	The impact of modernization/technology is high on sharing IK					

The management of agricultural indigenous knowledge in the local communities

1. Are you aware about farmers who possess agricultural indigenous knowledge?

Yes No

2. If yes, which age group and why? How is their acceptance by the community members?

3. Do you capture agricultural indigenous knowledge from the local communities?

Yes No

If No, what are the reasons?

4. If the answer of question number 3 yes, what strategies do you use for collecting agricultural IK and land use in the local Communities? (Please explain the strategies you used.)

5. What type of agricultural indigenous knowledge do you capture from the local Communities?

1= crop production 2= natural resource management

3= other, please specify.....

6. What is the purpose of collecting agricultural indigenous knowledge?

1= Raise the profile of IK 3= Interest in managing IK 5= Research

2= Extension services 4= Marketing agricultural inputs 6= Teaching

7. What strategies used for preserving agricultural IK and land use in local communities?

1= orally 2= written 3= others, please specify.....

8. What strategies do you use for sharing of agricultural IK and land use in the local Communities?

1= Training 3= Conference/meeting 4= Face-to-face

2= Agricultural shows others, please specify:

.....

9. What is your stand/view on IK preservation? How to go for it? Its contribution for community development? (Please explain it).....

10. **Barriers of effective management of IK**

Please indicate the extent to which you agree or disagree with the following statements by putting a tick (✓) mark in the appropriate box.

	Problem	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Poor knowledge sharing culture					
2	Poor recognition of IK					
3	Lack of IK records					
4	Lack of trust					
5	No interest to receive IK by younger generation					
6	Oral transfer of IK					
7	Change of life style					

Appendix 3:

Observation checklist for local communities

Information about the local community

1. District:.....
2. Keble:.....

Indigenous knowledge management

The current status of managing agricultural indigenous knowledge in the local

Communities

Sources of indigenous knowledge

1. Where do farmers obtain knowledge with regards to agricultural indigenous knowledge and land use in agricultural farming activities?
.....

Sharing of indigenous knowledge

2. What types of folklore are practiced in the village regarding to agricultural indigenous knowledge?
3. Are there any cultures that influence sharing of agricultural indigenous knowledge in the community?
4. How do they influence sharing of agricultural knowledge?
5. How does status/hierarchy enable sharing of agricultural knowledge in the communities?
6. How does status/hierarchy inhibit sharing of agricultural knowledge in the communities?

Preservation of indigenous knowledge

- 7. What non-ICT based tools do farmers use for preserving indigenous knowledge on farming systems?

.....
.....

Barriers that hinder the effective management of agricultural indigenous knowledge

- 8. What problems do farmers face when acquiring, sharing and preserving agricultural IK and land use?
- 9. Observation on protection of erosion how they plough the land, crop diversity, which crop on which topography,
- 10. Seed selection and preservation, storage facilities and how they protect weevils or wild animals from damaging their crop.....

Appendix 4:

Information mapping and linkage diagram

Procedure

1. Grouping representative participants from group discussion.
2. Draw a circle representing the farmers in the middle of the "local area" section.
3. Ask respondents where they get agricultural indigenous knowledge and land use and who they share their knowledge with.
4. Draw a circle for answer the give where they get IK, and draw a line between each circle and the circle the farmers. The size of the line will denote the importance of the knowledge source
5. For each of these sources ask participants to describe (and make notes against the lines on the paper):
 - ✓ What type of agricultural knowledge is obtained from the source
 - ✓ How reliable are the sources of knowledge? (Very reliable; 2=moderately reliable;3=not reliable)
 - ✓ How satisfied are they with the source of knowledge on agriculture?
 - ✓ What types of agricultural knowledge did they accept in their farming activities?
What are the reasons for accepting such knowledge in their farming systems?
 - ✓ What types of agricultural knowledge did they reject in their farming activities?
What are the reasons for rejecting such knowledge in their farming systems?

Once the information mapping is complete, the researcher will ask participants the following questions in order to solicit their knowledge needs:

- ✓ What types of knowledge required for your farming activities have been most difficult for you to obtain?
- ✓ Have they tried to access this knowledge?
- ✓ What happened when they tried to access the knowledge?
- ✓ What source did you consult to access this knowledge?
- ✓ What problems did you encounter when you tried to access this knowledge?